# EVALUATING THE ROLES OF MATERIALS MANAGEMENT IN ENHANCING BUILDING CONSTRUCTION PROJECT PERFORMACE AMID ECONOMIC CHALLENGES

**BY**

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## CERTIFICATION

This is to certify that this research work was carried out by **MOSHOOD MEMUNAT ADEBISI** the supervision of **HRH MK OWOLABI** department of building technology, institute of Environmental studies, Kwara State Polytechnic, Ilorin. This Research Project Diploma (HND) in Building Technology.

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## DEDICATION

This project is wholeheartedly Dedicated to Almighty Allah, the most gracious and most merciful, for his love, guidance, and strength that have brought me this far. Without Him, none of this would have been possible.

I also dedicate this work to my wonderful Parents, Mr. And Mrs. ALH HASSAN for their endless care, support, and prayers throughout my life. Your love has been my greatest motivation.

A special appreciation goes to my project supervisor for his support and encouragement during this research.

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All thanks and praise go to Almighty Allah, the most gracious and most merciful, for granting me the strength, wisdom, and patience to successfully complete this research project and my higher national diploma program. His guidance has been my greatest support throughout this journey. His guidance has been my greatest support throughout this journey (Alhamdulillah).

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I also extend my deep appreciation to my friends, both in school and from childhood. Your companionship, motivation, and shared experiences have made this academic journey a memorable one. May we all succeed and come out in flying colors, In Shaa Allah.

Finally, I acknowledge all the lectures and staff of the department of building technology your knowledge, support and dedication have contributed immensely to my growth and learning, may Almighty Allah bless you all abundantly. Amen

**ABSTRACT**

*Material management is the system for planning and controlling to ensure that the right quality and quantity of materials and equipment are specified in a timely manner. Materials should be obtained at a reasonable cost, and be available for use when needed. The cost of materials represents a large proportion of the cost. A good management system for materials management will lead to benefits for construction. Cash flow has become crucial for the survival of any business, if materials are purchased early, capital may be tied up and interest charges incurred on the excess inventory of material. Material may deteriorate during storage or be stolen; also delays and extra expense may be incurred if materials required for particular activities are not available. Impact the strong effect or influence that something has on a situation or process. A negative, a positive or an adverse effect on a situation. Materials the elements, constituents, or substances of which something is composed or can be made. Management the way something is being handled, careful treatment, supervising skills, or those in charge. Project a series of task that needs to be completed to reach a specific out. A set of inputs and outputs required to achieve a particular goal. Any activity that as a beginning and an end.*

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# CHAPTER ONE

# INTRODUCTION

## 1.1 BACKGROUND TO THE STUDY

Materials management practice is a procedure that coordinates planning, assessing the requirement, sourcing, purchasing, transporting, storing and controlling of materials, minimizing the wastage and optimising the profitability by reducing cost of material (Phu& Cho, 2014). Management of construction material is a new practice in the construction industry (Harris &McCaffer, 2013).

In the present situation, the management and the designers are mainly concerned on how to control cost without any emphasis on material management measures (Wahab&Lawal, 2011). On the whole, it is accepted that cost of materials accounts for a great percentage of the total cost of construction projects (Kerzner, 2013). Therefore, a critical management of materials on site should be adopted. According to Adafin, Daramola&Ayodele (2010) construction material management is of central importance to the economic development of the construction industry.

Ajayi et al (2017) define construction material management as a reduction in the amount and environmental effect of material waste generated, by reducing the amount of materials consumed in a project. Muleya&Kamalondo (2017) also identify material management as an integrated process of designing, constructing new structures or re-modelling existing structures, using materials more efficiently with a great importance of contributing to construction industry's performance improvement as well as solving material waste management problems. Several authors from different parts of the world have shown that material waste from the construction firm represents a relatively large percentage of the production costs (Saidu&Shakantu, 2016).

The poor management of materials leads to an increase in the total cost of building projects (Ameh&Itodo, 2013).

However, there is no project that can start without an adequate supply of materials, apart from the careful planning of materials required by the builder: it has the advantage to foster a good relationship with the suppliers, many of whom would have been selected due to their fulfilment of orders to the standard required and meeting of delivery times over a number of years (Adeyinka et al, 2014). According to Patel & Vyas (2011) building materials account for 60 to 70 percent of direct cost of a project, while the remaining 30 to 40 percent being the labour cost. Therefore, efficient procurement and handling of materials represent a key role in the successful completion of the work.

The management of materials on construction project to reduce, reuse, and recycle has a serious bearing on the cost, quality, time and impact of the project on the environment (Dania, Kehinde&Bala, 2007). More so, Adewuyi (2012) notes that there is a significant relationship between the level of materials waste on site and the cost overrun of a project. The cost of material waste which exists on sites represents unnecessary cost in construction which can either be eliminated or reduced (Bekr, 2014).

Material management is the system for planning and controlling to ensure that the right quality and quantity of materials and equipment are specified in a timely manner. Materials should be obtained at a reasonable cost, and be available for use when needed. The cost of materials represents a large proportion of the cost. A good management system for materials management will lead to benefits for construction. Cash flow has become crucial for the survival of any business, if materials are purchased early, capital may be tied up and interest charges incurred on

the excess inventory of material. Material may deteriorate during storage or be stolen; also delays and extra expense may be incurred if materials required for particular activities are not available.

Despite the importance of the materials, very little research has been directed towards understanding the management of materials from order to production; most research is focused upon the management of the design and procurement process and on labour site productivity. Materials management, which includes procurement, shop fabrication, logistics, supply chain management, production on site, and field servicing, requires special attention to achieve cost reduction. The supply chain is a convenient term used to describe a complex web of activities. The use of new equipment and innovative methods of materials handling has influenced changes in construction technologies in recent years.

Modern methods of material management have been embraced by the manufacturers across a wide range of industry sectors outside of construction.

## 1.2 STATEMENT OF PROBLEM

Ogunlana and Proukumtong (1996) studied construction delays in a fast growing economy: comparing Thailand with Nigeria and some of the construction delays were attributed to material management. The study blames material shortage on site on unreliable supply from material suppliers occasioned by the general shortage in the industry, although there were specific instances in which poor communication between sites and head office purchasing, planning and co-ordination could be cited. However, much research has not been done on material management and project delivery in Nigeria considering the economic situation of Nigeria and

the market full of substandard products. This study will therefore examine the impact of material management of project delivery in Nigeria in terms of economic hardship.

## 1.3 AIM OF THE STUDY

The aim of the study is to know the impact of material management on project delivery in Nigeria in time of economic hardship.

## 1.4 OBJECTIVES OF THE STUDY

The objectives of the study are as follows:

1. To examine the impact of material management on project delivery time in Nigeria

2. To examine the impact of material management on project quality in time of economic hardship.

3. To determine the advantages and disadvantages of material management in project construction.

## 1.5 RESEARCH QUESTIONS

1. What is the impact of material management on project delivery time in Nigeria?

2. What is the impact of material management on project quality upon delivery in Nigeria?

3. What are the advantages and disadvantages of material management in project construction in Nigeria?

## 1.6 SIGNIFICANCE OF THE STUDY

This study will be of importance to building professionals and the general public because it would not only clarify but also create awareness of the extent to which inadequacies in material management can adversely affect project delivery. The study will also help contractors, clients, consultants and all parties involved in construction projects about ways of improving their current method of material management. This research will also serve as a resource base to other scholars and researchers interested in carrying out further research in this field subsequently.

## 1.7 SCOPE OF THE STUDY

This study is on Impact of material management on project delivery in Nigeria in time of economic hardship, using some selected companies as case study. This study will look at their level of adoption of material management approach considering their successes with respect to project delivery quality and time

## 1.8 LIMITATION OF THE STUDY

Financial constraint- Insufficient fund tends to impede the efficiency of the researcher in sourcing for the relevant materials, literature or information and in the process of data collection (internet, questionnaire and interview).

Time constraint- The researcher will simultaneously engage in this study with other academic work. This consequently will cut down on the time devoted for the research work.

## 1.9 DEFINITION OF TERMS

**Impact:** The strong effect or influence that something has on a situation or process. A negative, a positive or an adverse effect on a situation.

**Materials:** The elements, constituents, or substances of which something is composed or can be made.

**Management**: The way something is being handled, careful treatment, supervising skills, or those in charge.

**Project:** A series of task that needs to be completed to reach a specific out. A set of inputs and outputs required to achieve a particular goal. Any activity that as a beginning and an end.

# CHAPTER TWO
# LITERATURE REVIEW

## 2.1 INTRODUCTION

Unlike earlier days, today the construction industry has become highly complex due to the technological developments, globalization, uncertain economic conditions, social pressures, political instability and so on (Walker, 2015). The conventional methods are incapable to meet with the demands of today's environment that is described by the authors as being more dynamic and filled with greater uncertainty (Keith, et al., 2016). With the increasing complexity and uncertainty, project delivery is not only management of three project constraints: cost, scope and time, but perceive it to be an assessment of the uncertainty within which the project is operating and itscontinuing ability to respond to the reason why it was needed in the first place (Melton & Iles-Smith, 2009). Effective delivery is all about the control and management of uncertainty. Therefore, one needs to identify the uncertainty related to the project and sculpt the best strategy to deliver the project so that the chances of success are increased. There are certain sets of methods followed in delivering a construction project. Even though these processes vary from country to country and also from project to project there is a common process that is mostly recognized by a country's construction industry. Likewise, the current conventional process of design and construction that is used by Nigerians involves the developer or the client to proceed with the detail

designing of the building. The documents and drawings are usually prepared before selecting a contractor. Moreover, the construction documents needed for tendering will be prepared by the design firm, hired by the client or the developer. The design firm also will be acting as a consultant during the design and construction of the project. In addition, the design firm will

represent the developer in dealing with the contractor and the government authorities. The detail design stage and the construction will take place separately (Tholhath& Ibrahim, 2013).

## 2.2. Material management in construction project

Construction material is recognized to be a major component in the construction project cost. Depending on different project it is assumed that the material cost can represent from 30% to 70% of the total project (Donyavi& Flanagan, 2009). Construction materials consist of various raw materials extracted from different markets. Sadly, the prices and availability of these materials are highly vulnerable to the turbulences of the varying market conditions (Christopher, 2011).

Thereby making the construction materials a highly uncertain component in the construction project. The range and variety of construction material are accelerating with the advancement of technology. This has resulted the construction industry to shift away from localized use of materials to centralized worldwide production. Gradually the simple materials are being replaced by the introduction of engineered composites and mixed assemblies. Moreover, chemical additives have enhanced the materials producing a wider array of properties (Calkins, 2009). The ample options of materials with varying properties have been considered as an accomplishment to the construction industry however the availability of too many options have caused complications in making the right choice. Experts and specialists are required to select the most compatible construction material to compliment the project. The material choice will determine the machinery and workmanship required and making the right choice from initiation can pave the path for a smoother delivery. After the selection of material till the final product is erected it involves a series of processes, which is referred as material management. This involves storage, identification, retrieval, transport and construction methods (Pellicer, et al., 2013).

Material management is the system of planning and controlling to ensure the right quality and quantity of materials and equipment are specified in a timely manner. (Donyavi& Flanagan, 2009). All these process posses' high uncertainty, as they are interlinked with other series of activities with unknown variables. Therefore, according to many authors effective materials management is the key to the success to construction project (Gulghane&Khandve, 2015). More researches even eloboratethat effective material management can improve the productivity of the project and thus can lead to success (Pande&Sabihuddin, 2015).

According to building code (Ministry of construction and Public Infrastructure, 2008) the buildings are classified into 7 categories. They are Housing, Communal residential, Communal non-residential, commercial, Industrial, outbuilding and Auxiliary. Furthermore, in another research conducted by Rashfa(2014) describes that the main types of construction project that are taken place in Nigeria are categorized into residential buildings, non-residential buildings, civil engineering and resort development projects. Among these 4 categories the local contractors are mostly involved in the residential buildings and non-residential buildings projects.

The residential projects are described as the projects that cover the construction of dwellings. Non-residential projects include construction of health facilities, mosque, shopping complex, restaurants and so on. Therefore, this research will be focusing on exploring about the material management system practiced in these two types of projects. Even though having an effective material management is highly crucial to building projects, there has been no such study done on this area. The uncertainty involving in material management is inconceivable, especially because most of construction materials are not locally available in Nigeria. Depending on imported construction material, increase the complexity in the process. These are the general problems

facing by the construction industry and Nigeria as a country problem that were repeatedly emphasized in these publications.

1. Limited skilled professionals
2. Lack of unskilled labourers so depending on foreign labourers
3. Unavailability of local construction materials (rely on imported materials)
4. Few suppliers in market
5. Poor infrastructure
6. Lack of space/storage

Moreover, this ignites the curiosity to understand more about the material management process that is being followed in the construction industry.

### 2.3. Material management processes and techniques

Material management consist of a series of processes that need to be integrated, coordinated and synchronized well to ensure that materials are available at their point of use when needed. Material management process begins from need generated from site followed by this information conveyed to store department and material is ordered in the store, indent is generated.

Usually vender selection is to be carried out for the least value and best items. Materials are received at store departments and inspection is carried out.Below in Figure 2 is a material management process flow chart (source from Patil&Pataskar,2013).


Figure 1: Material Management Processes (source from Patil&Pataskar, 2013)

### 2.3.1. Planning

Material planning is the initial process that needs to be carried out accurately in order to provide guide to all the subsequent activities. According to Gulghane&Khandve (2015) material planning includes quantifying, ordering and scheduling. The materials planning process covers the set up maintenance of records and determines the target levels and delivery frequency. Adopting a good material management plan can increase productivity and profit. Hence, it can help to increase the success of project delivery (Kasim, et al., 2005).

### 2.3.2. Testing

Quality is a prime factor to measure the performance of a project. Quality assurance of building materials is vital in order to create strong durable and cost effective structures (Savitha, n..d). Each construction project has a different set of specification and requirements. The contractors are required to select and procure suitable construction materials so that they can meet the contract specification. Unless a specific brand and model number is stated, it is advisable to conduct thorough study and analysis of the different material properties to check for its compatibility in the different zones of the building. The materials are only ordered after receiving approval (Low & Ong, 2014). Proper assessment of the various materials is important to ensure quality and durability of the final product.

### 2.3.3. Procurement

Procurement is not only about appointing contractors and preparing contract, but is also very much a starting point in the process of delivery (Mead &Gruneberg, 2013). Activities included in the procurement process range from purchasing of equipment, materials, labour and services required for construction and implementation of a project (Kasim, et al., 2005). Another author

has defined procurement as identifying and analysing user requirements and type of purchase, selecting suppliers, negotiating contracts, acting as liaison between the supplier and the user, and evaluating and forging strategic alliances with suppliers. For many organizations, materials and components purchased from outside vendors represent a substantial portion of the cost of the end product, and hence effective procurement can significantly enhance the competitive advantage of a project (Morris & Pinto, 2007). Many authors have suggested that choosing best option of procurement can help to reduce the impact of uncertainties such as late deliveries, substandard raw material qualities, resource constraints and so on (Morris & Pinto, 2007).

Therefore, to successfully deliver a project it is not about adopting a procurement system with best practice tactic to fix all problems, but to embrace an approach that has the best-fit tactic that gets the job done most efficiently (Keith, et al., 2016).

### 2.3.4. Logistics

Logistic is defined as concept that includes movement and it may encompass planning implementing and controlling flow and storage of all goods from raw materials to the finished product to meet customer requirements (Kasim, et al., 2005). For smoothly handling the materials, space need to be carefully allocated for material handling equipment, access roads, warehouses, workshop, and laydown materials in the construction site (Pellicer, et al., 2013). Planning these tasks accurately can help to formulate an efficient construction site layout that can provide easy access and routing of materials within the construction site. Moreover, introducing slopes in theconstruction site can ease the circulation of materials because of the gravity effect. To control access and to increase the security of the site, setup wall or fence can be considered as a requirement for the construction site. Optimum forecasting for material movement (Mahdjoubi& Yang, 2001) and planning of access and routing of materials within construction

site (Faniran&Caban, 1998) are factors that need to be taken consideration during logistics process for effective material management.

### 2.3.5. Handling

Various materials posses' different features and properties, that makes the handling of materials critical. Effective material handling involves handling, storing and controlling of construction material (Kasim, et al., 2005). Proper protection during storage is often ignored, and this can result poor material quality or material deterioration. Moreover, it is also advised that transportation, loading and unloading of material should not be conducted in the rain. It is also recommended that the storage area needs to be enclosed, clean and dry with good air circulation and for some materials need to be stacked on pallets, not more than a certain safe height to preventdampness and so on (Low & Ong, 2014). By adopting proper material handling and storage will help to keep the material intact and in good quality. And also will reduce loss of profit due to theft, damage and wastage as well as running out of stock (Kasim, et al., 2005).

### 2.3.6. Stock and waste control

Material waste is a significant factor in construction cost, Calkins (2009) states material waste is 9% by weight in the Dutch construction industry and 20-30% of purchased materials in the Brazilian construction industry. Material wastes are caused by several sources such as design, procurement, material handling, and operation and so on. Shen et al. (2003) defined building material wastages as the difference between the value of materials delivered and accepted on site. Moreover, material waste has been recognized as a major problem in the construction industry and it can also implicate inefficiency in project delivery. Adopting a proper stock control will help to increase the productivity and also can be one of the way to improve waste

control in the construction site. By introducing minimizing strategies to reuse materials in both design and construction phase can be a mean to reduce waste (Dainty & Brooke, 2004). Some authors simplify these stages into distinctive phases. As a matter of fact, one of the research done by Manteau (2007) on the material management practices in Ghana explains that the current material management phases in Ghanaian construction industry are bidding phase, sourcing phase, material procurement phase, construction phase and post construction phase. A study conducted in India by Patel & Vyas (2011) has summarized the material management processes into 8 main parts. They were planning, benchmarking, purchasing, receiving, inspection, storage, issuing material and inventory control.

Therefore, it is very evident that in various countries these processes are carried out in different ways. There can be many factors that might influence these processes such as culture, work environment, belief and so on. Moreover, different groups have learnt to deal with uncertainty in different ways, often because they find themselves faced with different levels of uncertainty. Adams (1965) writes of 'risk thermostat' in relation to individuals' ability to deal with and be comfortable when exposed to risk. Therefore, already established material management processes that are being practiced by other countries can be used to identify the processes that are being practiced and those that are neglected in the Nigerian construction industry.

## 2.4. Root causes of ineffective material management

During the past years, various academics researchers have conducted studies investigating to find out the issues causing ineffective materials management in construction projects. Among these studies were: A study carried out Zakeri et al (1996) suggested that transport difficulties, waste, improper handling on site, misuse of specification, lack of proper work plan, inappropriate

materials delivery and excessive paperwork all have an immense effect on materials management.

Another researcher, Dey (2001) emphasized that the common issues regarding material management are as follows:

- Receiving materials before they are required which may increase inventory cost and may increase the chance of deterioration in quality, not receiving materials during the time of requirement causing to decrease motivation as well as productivity.
- Incorrect materials take-off from design and drawing documents.
- Constant design changes
- Theft or loss of item
- Choice of type of contract for specific material procurement
- Vendor evaluation criteria
- Piling up of inventory and controlling of the same
- Management of surplus material.

In another study conducted by SohrabDonyavi (2009) states the common problems in material management are as follows:

- Failure to order on time which may cause delay in the projects
- Delivery at the wrong time which may interrupt the work schedule
- Over ordering
- Wrong materials or wrong in direction of materials requiring re-work
- Theft of materials from delivery into production
- Double handling of materials because of inadequate material

Moreover, a study conducted Kasim (2008) highlighted that problems could emerge due to human error, especially because some construction firms still rely on manual methods for material management which involves paper based techniques. In addition, she states that problematic useof paper based reports for exchanging information relating to materials component with supply chain can result misunderstanding and poor coordination.

In another research done by Gulghane&Khandve (2015) state that problematic management of material are due to overstock materials because of improper planning, damaged materials due to logistics, handling or in application, loss of materials because of improper supervision, waiting of the materials to arrive in location due to improper tracking system, frequent movement of materials due to improper site layout, inflation, material changes in buying or purchasing situation starting from the prepared cost estimation, bulk construction material, the shortage and changes of construction materials quantity required, material inefficient on site, stealing and loss of construction material, material shipment, work repairing, delay in updating or posting storage system on site, in accurate estimation of shipment quantity of materials, uneconomical order quantity of materials poor shipping time, increasing transport cost of materials, material over usage in location of project, choosing the wrong materials for construction, the increasing storage cost of materials, the poor buying ability of managers, delay of payment for materials.

A study done by Kasim (2008) investigates the problems in material management by conducting a research on 6 case studies. Case study A and B are two small projects from two different construction companies, while the other 4 case studies are larger or more complex studies. The interviewees under study were experience constructional professionals ranging from 8- 32 years' experience. Moreover, the cost of the projects ranged from £ 1.78 million to £ 4.2 billion. 17 possible issues causing ineffective material management were revealed. The major problems that

were discovered are material management activities related to constraints site storage, site logistics with regards to material handling and distribution and also ordering and delivery of materials to the construction site. The following are the identified 17 causes:

- Late delivery
- Site storage problems
- Logistics problems
- Incorrect delivery
- Inadequate loading area
- Site access problem
- Regulation consideration
- Congestion time
- Others: Incomplete delivery
- Lack of materials
- Improper handling
- Tower crane distribution problem
- Supply chain challenge
- Project size challenge
- Project location challenge

A study done by Patel & Vyas (2011) had an interesting approach to identify the problems occurring in the material management process. They have used 3 projects from Hyderabad, India to reveal the problems in the material management. Initially they divided material management process into 4 main phases, which are material identification, Vendor selection, Procurement and

Construction phase. Next the problems associated with each phase were clearly identified, disclosing the usual problems occurring in these phases.

## 2.5. Consequences of ineffective material management on project delivery

A success of a construction project lies in the ability of all the stakeholders to plan effectively, as well as properly manage the resources. Furthermore, this grand plan encompasses of sub plans, which helps to determine, sequence, strategize how to allocate the resources effectively. Construction projects are well known for being complex and are subjected to high uncertainty and variability. Construction materials are involved throughout the construction project and variability and uncertainty can be traced back to construction material. Therefore, formulating a good material management plan is highly mandatory to support the grand plan.

Unavailability of materials when needed can affect the productivity and it may cause delay and difficulties to meet the schedule. On the other hand, having excessive materials on site will also create problems to the managers. Storage of materials can increase cost of production thus increasing the overall cost of the project. Furthermore, if the site lacks space to store all the materials may burden the managers to rent alternative storage areas which will cause more trouble and cost (Haddad, 2006).

In most contracts, the cost and time requires to complete the specified scope of works are defined in project documents. Control of quality of materials and workmanship is achieved through proper quality control plan and its implementation through a preset level of quality control and inspection of various activities and materials. Budget control is done through monitoring progress payments and variation costs. The schedule is monitored by ensuring timely approval of materials, shop drawings, timely procurement of materials and execution of works as planned.

Quality control and safety are achieved through inspection of works during the construction process, ensuring the use of approved materials and workmanship (Rumane, 2011). It is a fact that those construction projects that are unable to use their resources efficiently will reduce their productivity reflecting their poor management skills. According to a study done by Baldwin &Bordoli (2014) state that 40% of the time lost on the site can be attributed to bad management, lack of materials when needed poor identification of materials and inadequate storage. By formulating an ineffective materials management plan can have a negative impact on cost, quality and time, which will affect the project delivery. There have been various studies conducted in different countries to identify the factors causing cost overrun, delay and quality issues in construction projects. Surprisingly, the factors are more or less very similar in various cases, but the ranking of the factors were different. The fact that cannot be ignored is that factors related to construction material appeared in most of these list of factors causing cost overrun, delay and quality issues.

In a study conducted by Wanjari&Dobariya (2016), the highest factor causing cost overrun in India construction industry was identified as price escalation of raw material. In another study done by Cheng (2014) about an exploration into cost influencing factors on construction projects revealed that material shortage or supply delay is a prominent project risk that will influence the project cost.

# CHAPTER THREE

# RESEARCH METHODOLOGY

## 3.1 RESEARCH DESIGN

Qualitative research does not involve intervening and controlling phenomena and studying them as they are. The design adopted for this study is qualitative techniques. Data collection was empirically based, to provide a common basis on which to compare the opinion. Qualitative research focuses on finding statistical relationship within numerical data. The research data obtained from structured questionnaires were transformed into dependent variables, which were influenced by Independent variables.

## 3.2 POPULATION OF THE STUDY

The population of Nigeria construction industry consists of clients, contractors and consultants. It is impossible to test everyone in the population so it is highly crucial to select a good sample to represent this population. Moreover, this sample should consist of potential participants who are able to contribute to the research. Even though client and consultants represent a significant portion of the construction industry population, their involvement in material management is insignificant.

For this study, 20 contractors, 20 subcontractors, giving a total of 40 respondents constituted the sample size for the study. The population size was narrowed down to this number to effectively maximize the cost and time allocated for the research.

## 3.3 METHOD OF DATA COLLECTION

The approach adopted for carrying out this research was employed due to the nature of the investigation and the type of data and information that was required and available. The approach adopted for this research is the field work (primary and secondary data collection).

The field work research refers to the methods of primary data collection and in this case the practical approach used in the problem solving approach. Also questionnaire will be used for data collection.

## 3.4 METHOD OF DATA ANLYSIS

In the method of data analysis, this descriptive static of frequencies and percentage used for the collection of demographic data will be tested using Likert scale statistics. It is important to identify the type of scale used in the analysis since the statistical test is dependent on the type of scale. Four types of scale are identified as ordinary, ratio, nominal and interval. In this research the ordinal scale of data (Likert Scale) was used whereby 1= Strongly Disagree (SD), 2= Disagree (D), 3= Agree (A), 4= Strongly Agree (SA).

The result would be analyzed in percentage and figure using descriptive statistics and presented in the form of pie charts and tables.

# CHAPTER FOUR

## 4.0 RESULTS AND DISCUSSION

### 4.1 INTRODUCTION

This chapter focuses on the analysis of the various responses from the administered questionnaires and deductions made from the analysis.

### 4.2 ANALYSIS AND PRESENTATION OF DESCRIPTIVE DATA

#### 4.2.1 Survey Responses

Fifty questionnaires were randomly administered (Twenty-five to Contractors, Twenty-five to Contractors). As at the time of compiling this report, a total of forty usable responses were received, representing 80% effective response rate. The maximum responses from each sampling frame are shown below

**Table 4.1 Response Rate**

| | Contractors | Subcontractors | Total |
|---|---|---|---|
| **No. Distributed** | 25 | 25 | 50 |
| **No. Received** | 20 | 20 | 40 |
| **Percentage** | 40% | 40% | 80% |

Source: Field Survey, 2025

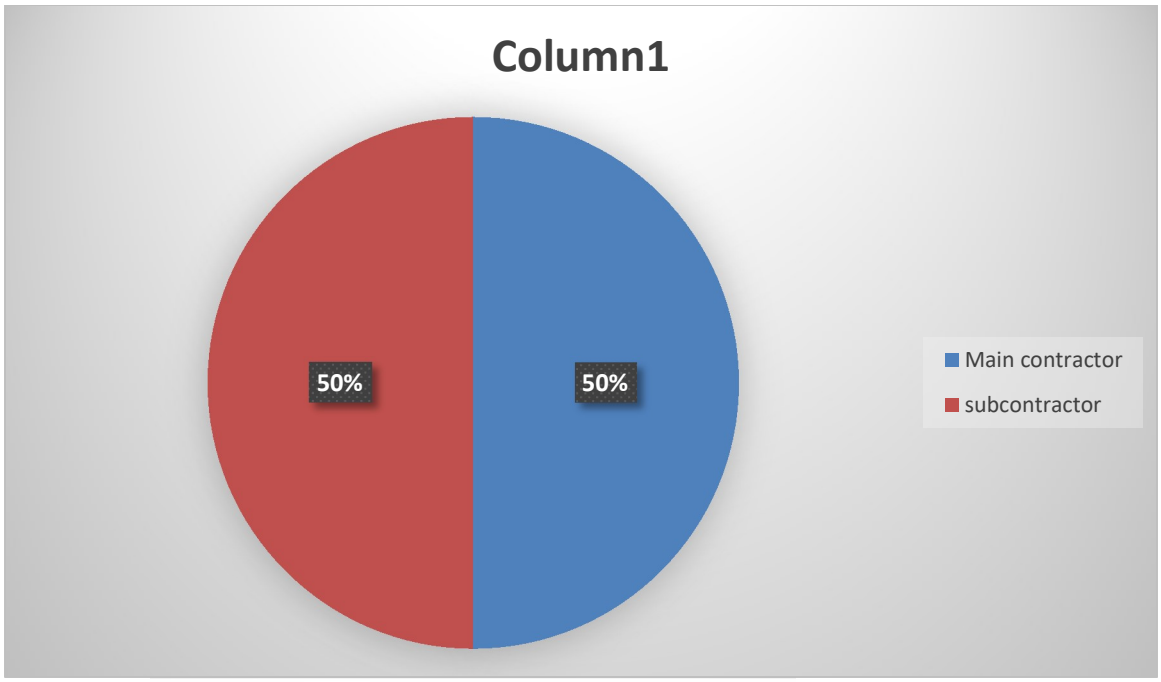


**Figure 2: Participants job positions**

The result indicates that out of 50 questionnaires that were distributed, 40 were successfully completed and returned. Out of the 40 questionnaires returned, 20 (50%) were answered by contractor and the rest 20 (50%) were responded by the subcontractors (Figure 4.1).

### 4.2.2 Participants work experience

**Table 4.2: Participants' work experience**

| OptionsNo of respondentPercentage % | | |
|---|---|---|
| 0-10 | 17 | 42.5% |
| 15-20 | 8 | 20% |
| 21-30 | 15 | 37.5% |

| | | |
|---|---|---|
| Total | 40 | 100% |

Source: Field Survey,2025

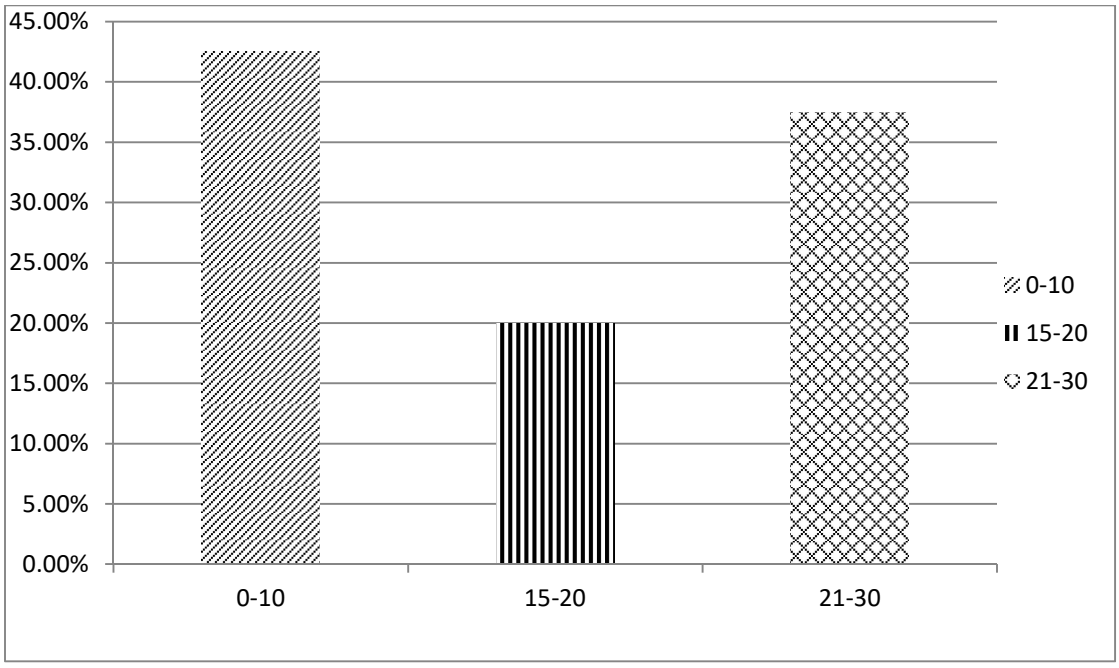


**Figure 3: Participants Years' Experience**

The duration of practice of respondent is represented in figure 2. above which indicate that 42.5% of the respondent have been practicing within the period 0-10 years, 20% of the respondentbeen practicing within the period 11-20 years, while 37.5%of the respondentbeen practicing within the period 21-30 years.

### 4.2.3 Types of project handle by Respondents

**Table 3: Project handle by Respondents**

| Options | No of respondent | Percentage % |
|---|---|---|

| | | |
|---|---|---|
| Road construction | 10 | 25% |
| Structures | 20 | 50% |
| Water related | 10 | 50% |
| Total | 40 | 100% |

Source: Field Survey,2025

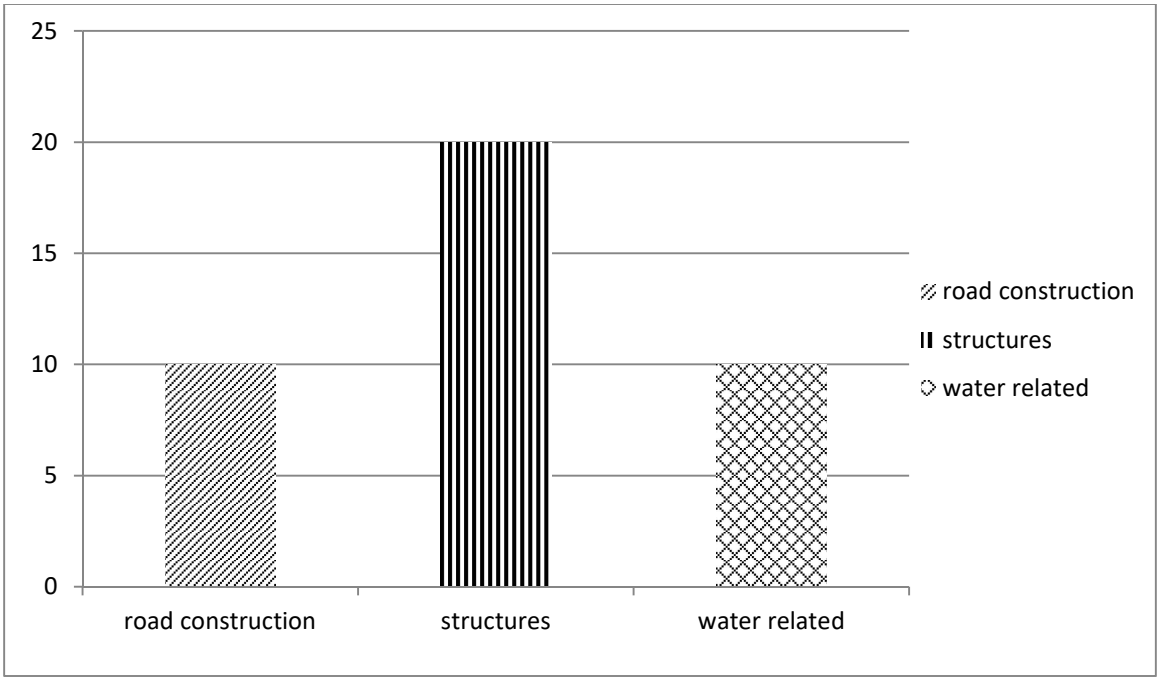


**Figure 4: Type of project handled by Respondents**

In figure 3 indicates that 25% of the respondent for road construction, 50% of the respondent is for building of structure and 25% responded for water related.

### 4.3. Material Management process

#### 4.3.1. Content Analysis

The semi-structured questions (refer to Appendix A) were designed to explore the common material management processes that are practiced in the Nigeria construction projects. Initially the data collected from the section B was analyzed using content analysis (Refer to Appendix H).

Respondents were asked to sequence 9 material management processes and to mark the processes they were not practicing. It was found that 'check availability from warehouse (P2)' were not practiced by 25 respondents, while the other 15 respondents were involved in this process. Furthermore, splitting the respondents into two groups, respondents with a warehouse and respondents without a warehouse. Next a deeper analysis within each group were conducted and it was found that respondents without warehouse had some conflicting processes between them. As a matter of fact, processes such as 'check availability from local supplier shops (P3)' and 'Indent is generated' (P4) were only practiced by 11 respondents among the 25 respondents. Hence the respondents without a warehouse again split into 2 groups into respondents depending on local supplier shops and respondents who were not.

There was no significant difference observed in the material management process followed by the 15 respondents with a warehouse (Refer to Appendix D). Therefore, based on the content analysis, the responses gathered were categorized into groups; subsequently 3 material management process types were identified. The Figure 4 below illustrates the different material management processes that were identified. It was found that 14 respondents have similarities in their practice of material management processes.

They have identified that once materials are needed for the site, they are delivered according to a pre-planned schedule. Moreover, the respondents following this type rely on the prepared Bill of Materials (BoM) and upon the selected vendor to purchase the material. The vendor is provided with a schedule of the project and the periods in which the material will be required are

identified. The main reason for not bulk purchasing the material is due to lack of storage space and one respondent explains this "We still do not operate with a central supply store or warehouse so need to buy materials per stage basis to avoid storage space shortcoming." The client/ consultant approves the materials that need to be purchased for the project before the project begins.

The distinguish feature of this material management type is being dependent over phase-by–phase delivery. On the other hand, another 15 respondents have showed similarities in the material management process they were following. The material management process they were following was identified as material management type 2.

The sequences of the material management processes slightly differ between the respondents, but major matching processes between the respondents remained prominent. Moreover, from the data gathered it showed that all the respondents following this material management type have a warehouse. So once the construction material need is generated from the site, the company warehouse is informed and the needed materials are supplied to the site.

The stock of the warehouse is managed to be equipped according to the ongoing projects. 11 respondents who are following similar material management process wereidentified as material management type 3. This type follows a very typical material management process, because when the material need is generated from the site.

Quotations from different supplier shops are gathered and indent is generated for the best price offered shop. Materials inspections are carried out once the stock is received. If there is no problem the materials are delivered to the site. The distinguish feature of this type is being dependent over local supplier shops.

### 4.3.2 **Project Value Against the Identified Material Management Types**

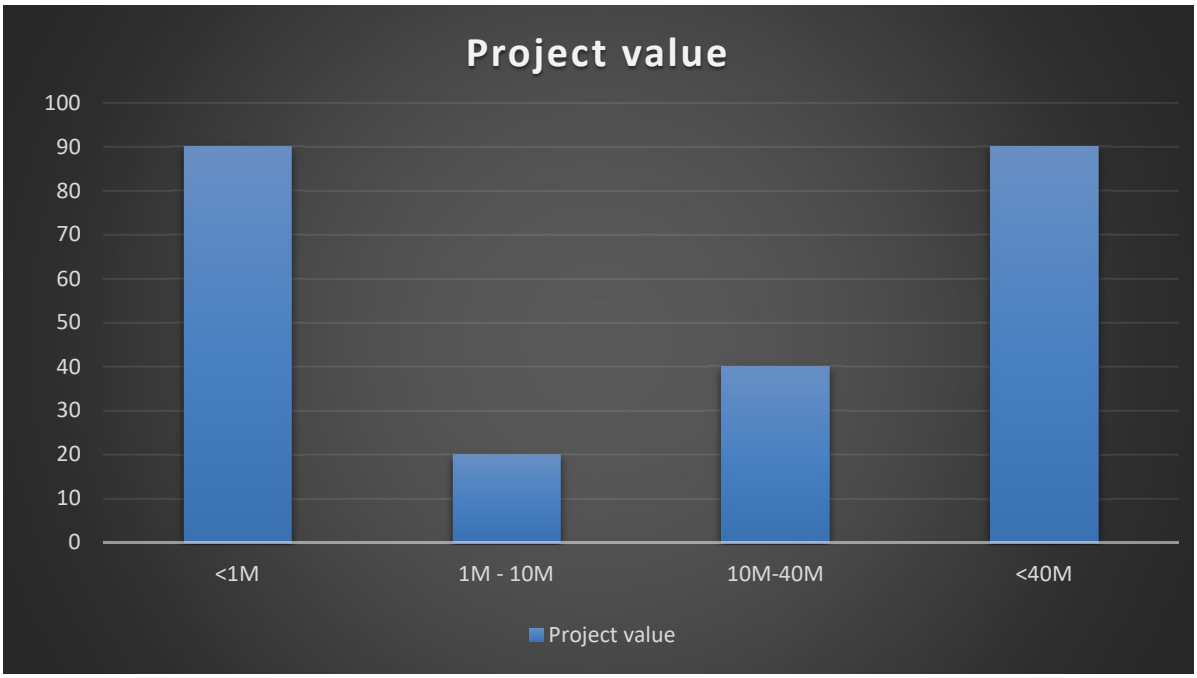


**Figure 5: Project value against material management type**

From the above analysis it shows the distribution of the different material management type against the project value (Figure 5).It is noticed from the analysis that material management type 1 are involved in average value projects (1MVR – 40 MVR). Among all the MMP types the most

precise delivery is required in this type as material delivery is based on the project schedule,phase by phase. Even though the respondents following this material management type do not have their own warehouse and still they do not depend over local supplier shops. This is because they are involved in average value projects so they will have the capability of hiring their own material suppliers for the projects. Furthermore, from the data analysed there is an apparent trend that material management type 2 followers are involved in projects having high value (more than 40 MVR). Moreover, looking at the material management process type 2 (Figure 6), it shows that they do not conduct one project at a time, but carry out several projects in a row and also have their own material supply unit and warehouse. Construction materials that are common for the projects are bulk purchased and are stored in their warehouse and this is reflected in this material management type. Moreover, the material management followers of this type being involved in high value project indicate that they will have a good material supplier network to cater for their projects. Likewise, another trend that is noticed from the analysis is that most the material management type 3 are involved in least value projects (less than MVR 1M). Due to the small project value it justifies their dependence over the local supplier shops. As a matter of fact, it is inconvenient for these respondents following material management type 3 to hire their own supplier and also it is not economically effective to import such a small quantity. Hence this analysis has helped to better define the existing material management processes that are practiced in Nigeria building projects.

## 4.4 **Root causes of ineffective material management**

To analyse the root cause of ineffective material management, SPSS was used to calculate the mean distribution of each possible cause. The possible causes were classified into 4 phases in the project, which are material identification (A), vendor selection (B), procurement phase (C) and

construction phase (D). Next the possible causes were ranked based on the frequency of response by the respondents. The possible causes that scored the highest mean were ranked top possible causes of ineffective material management faced in building projects

### 4.4.1 Material Identification

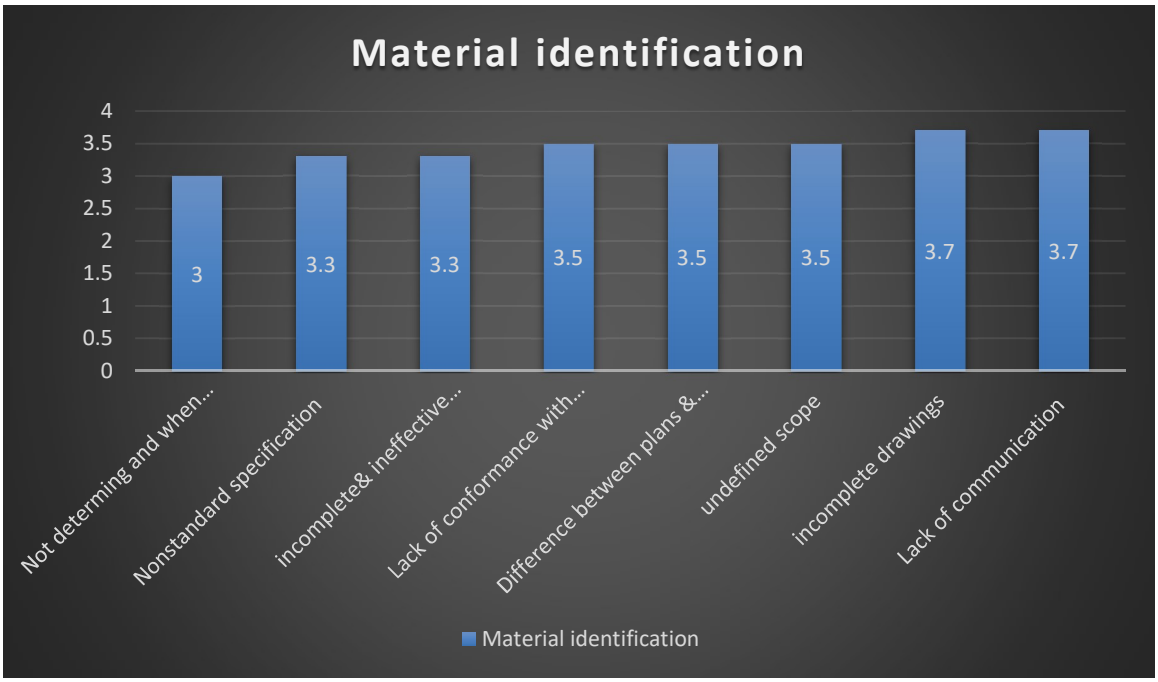


**Figure 6: Root causes of ineffective material management in Material Identification phase**

From the above analysis (Figure 6) it shows that in the material identification phase 'lack of communication (A2)' (mean = 3.76) is ranked as the top root cause for ineffective material

management. However, the least concerning cause in this phase is identified as 'Not determining what and when material needed (A8)' (mean = 3.0).

Initial stage of a project usually considered having the highest risk factor, as many elements remain unknown at the beginning. Even though effective communication is crucial throughout the project life cycle, it is even more important to communicate more at the beginning of a project. Especially in Nigerian building projects, materials are imported therefore correct specification, quantity and delivery dates need to be clearly communicated at the beginning stage, if not cost can escalate and can cause unnecessary complications to the project. Hence many respondents have ranked lack of communication to be a root cause of ineffective material management in the material identification phase. Difficulties and complications regarding material management is a known fact among the Nigeria building projects. Therefore, most of the professionals determine what and when materials are needed for the project. So it is not among the crucial causes of ineffective material management as these paper works are prepared in almost all the building projects.

### 4.4.2 Vendor Selection

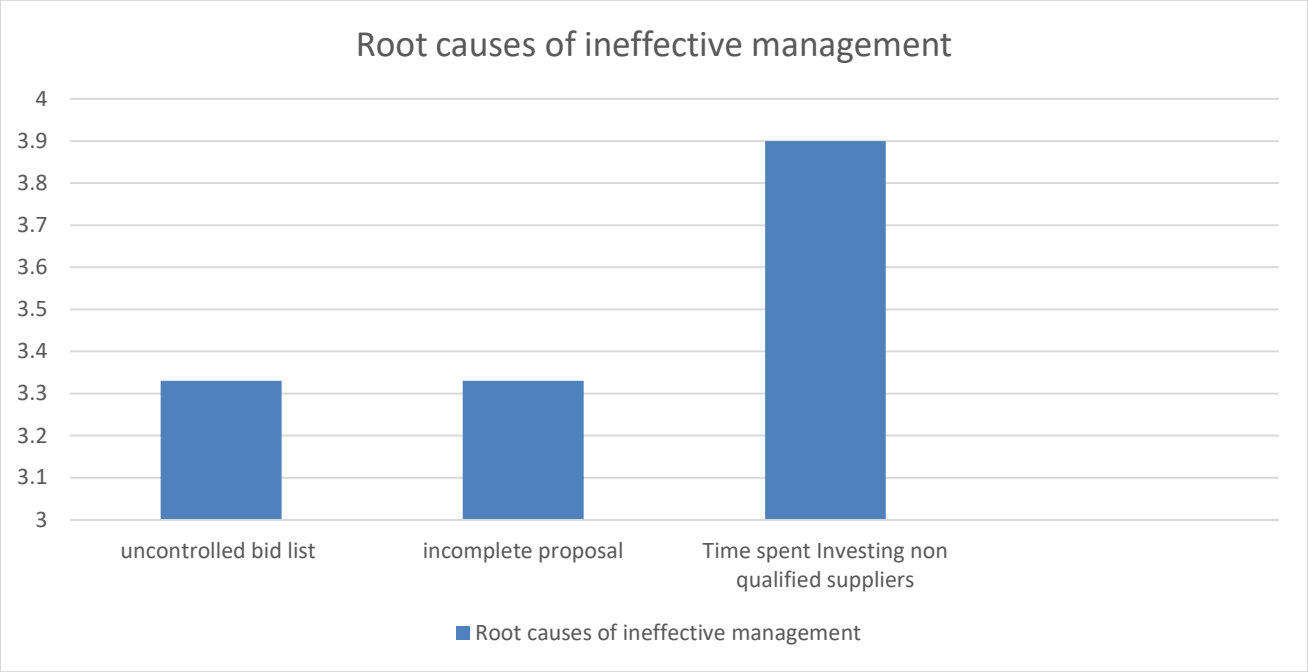


**Figure 7: Root causes of ineffective material management in Vendor selection phase**

In the vendor selection phase, as per the result (Figure 4.6) it shows highest ranking is 'time spent investigating non-qualified suppliers (B3)' (mean = 3.91) and the lowest ranking is 'Uncontrollable bid list (B1)' (mean = 3.35).

Selecting the most suitable supplier to undertake the work is a rigorous process. Especially in Nigeria being a country with a small base of supplier make this even more challenging. With the limited options available, according to the respondents their biggest concern is tied up with wasting time in investigating non-qualified suppliers. As the contractors / sub-contractors do not want to leave any stone unturned as the bargaining power of the suppliers are higher in Nigeria.

The least ranking being uncontrollable bid list, again gives support to the fact that Nigeria have limited numbers of suppliers. As uncontrollable bid list is not experienced in most of the projects therefore it is not considered as a concerning issue causing ineffective material management.

### 4.4.3 Procurement phase

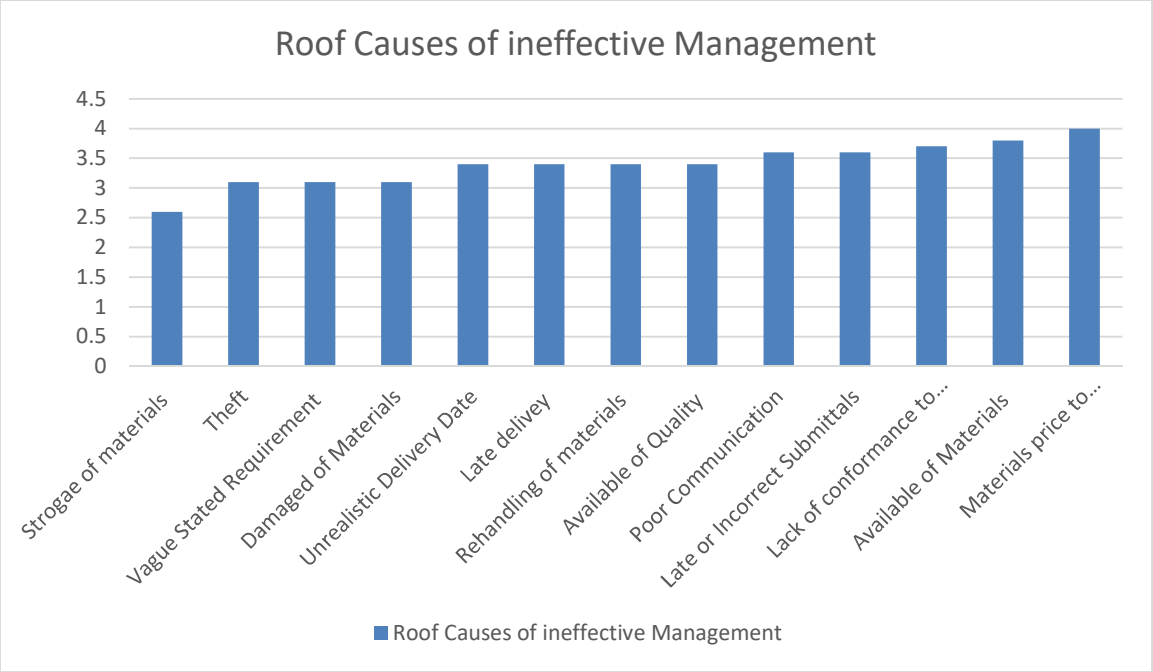


**Figure 8: Root causes of ineffective material management in Procurement phase**

It is observed (Figure 8) that the highest-ranking cause in procurement phase is 'matching price to competitors' price (C3)' (mean = 4.00), while the lowest ranking cause is 'storage of material (C11)' (mean = 2.62).

In order to gain the projects, contractor/ sub-contractors bid at the lowest possible value. In this process the biggest challenge that the contractors/ sub-contractors face is to find ways to beat the price of the competitors. Construction material being the dominant factor of a project cost the ultimate sacrifice in the cost reduction is related to project material. Hence this is identified to be a root cause of ineffective material management in the building projects of Nigeria.

Nigeria having more sea than land is a known fact, so the construction industry professionals have been adapted to this constrain. Due to this the least concerned cause noticed is storage of materials. Because respondents either have their own warehouse or if they do not have it the material management type that they are following is designed by eliminating the need of storing material. Therefore, storage of material is among their least concerns.

### 4.4.4 Construction Phase

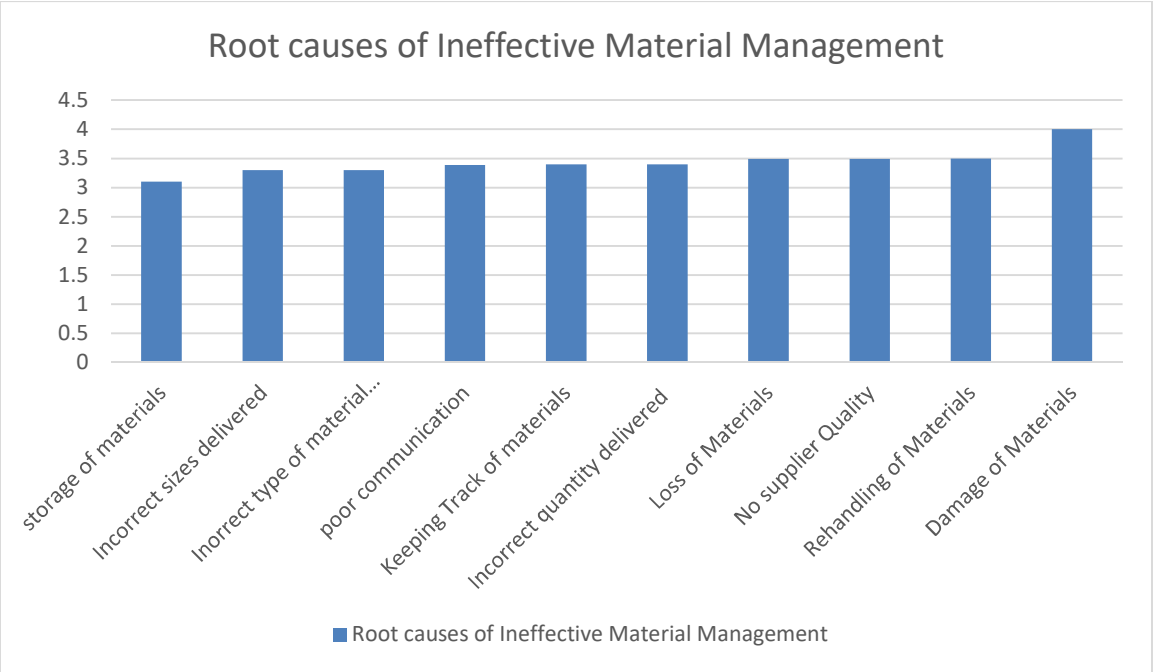


**Figure 9: Root causes of ineffective material management in Construction phase**

It is noticed (Figure 4.8) that the highest-ranking cause in the construction phase are identified as 'damage of material (D8)' and 're-handling of material (D5)' (Mean = 3.56). On the other hand, the least ranking cause is 'storage of material (D6)' (Mean = 3.12).

In Nigeria construction industry, especially the workers in the construction phase are majority expatriate workers (unskilled worker), so the handling of materials is not done properly.

Moreover, site supervisors are not dedicated to be present in the site most of the time, as there are few skilled professionals available in the industry, so many projects hire staff to multi-task. Thereby poor re-handling of material lead to damage of material and this can contribute to great loss for the contractor/ subcontractor. As mentioned earlier construction material are imported therefore time takes to replace the damaged material, which will cause complications in the project. Similar to procurement phase, even in this phase storage of material is identified as the least concerning cause. As a matter of fact, this is because respondents either have their own warehouse or if they do not have it the material management type that they are following is designed by eliminating the need of storing material. There is a significant relationship between material management process type and project delivery in terms of delay and cost overrun

# CHAPTER FIVE

# 5.0 CONCLUSION AND RECOMMENDATIONS

## 5.1 Conclusion

This research had three goals; in order to achieve these goals initially an extensive literature review was carried out to identify the pitfalls in Nigeria construction industry and gain insights

about the root causes of ineffective material management faced by other developing countries and their impact on project delivery. Second, based on the literature review a questionnaire was developed and the data collected helped to underpin the following major findings**:**

1. There are 3 distinctive material management process types practicing in Nigeria building projects.
2. There is a significant relationship between these material management process types and project value.
3. Top 3 root causes of ineffective material management were identified as matching price to competitor's price; time spent investigating non-qualified suppliers and availability of material.
4. The identified top root causes of ineffective material management are consequences of existing problems in Nigerian construction industry such as depending on imported construction material, few suppliers in market and lack of skilled workers.
5. Storage issues have been a well-known problem among the construction professionals that it is no longer categorized as a threat as they are well prepared and mitigated from this problem.
6. There is a significant relationship between material management process type and project delivery in terms of delay and cost overrun.

## 5.2 Recommendations

Research into effective material management is a vast area of study, which can be explored with new approaches and perspectives. This research has managed to discover the current material management practices in Nigeria building projects through semi-structured questionnaires. However, a case study or a site observation based research would be desirable to reinforce the

discovered material management practices. Moreover, in this research due to time and budget constraint, it only concentrated on time and cost in terms of project delivery. So a further research is recommended to look upon the impact of material management on project delivery in terms of quality.

In addition, a larger industry wide sample would be suitable to expand upon the generalizability of what have been represented in this study. Especially the root causes of ineffective material management can be identified industry wide. Finally, mitigation methods for the identified root causes can be carried out and this could be valuable for the field professionals to improve the project delivery.

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**EVALUATING THE ROLES OF MATERIALS MANAGEMENT IN ENHANCING CONSTRUCTION PROJECT PERFORMANCE AMID ECONOMIC CHALLENGES**

Department of Building Technology,
Institute of Environmental Studies,
Kwara State Polytechnic,

Ilorin.

Dear Respondent,

I am a student of the Department of Building Technology, studying for Higher National Diploma (HND) at the above named institution. As part of the requirements for the award of Higher National Diploma in Building Technology, I am conducting a research study on "**Impact of Material Management on Project Delivery in Nigeria in Time of Economic Hardship**".

I hereby request some information from you that will help me in my research work. I promised that all materials, facts and information supplied will be treated in absolute confidence and that this exercise is purely for academic purposes.

Thanks for your anticipating cooperation.

*Yours faithfully*,

**SECTION A**

**Background and knowledge of the respondent**.

Please fill or Tick as appropriate ( )

1. Sex: Male ( ) Female ( )

2. Age Distribution: 20-30 ( ) 31-40 ( ) 41-50 ( ) Above 50 ( )

3. Job Position: Contractor ( ) Subcontractor ( )

4. Working Experience: 0-10 ( ) 15-20 ( ) 21-30 ( ) above 30 ( )

5. Academic Qualification: SSCE ( ) ND/NCE ( ) HND/BSC ( ) Others ( )

6. Type of Project Engaged in: Road construction ( ) Structures ( ) Water Related ( )

**SECTION B**

Please fill or Tick as appropriate ( )

7. What is the impact of material management on project delivery time in Nigeria?

a. Minimization of waste and rework ( )

b. Reduced Lead Time ( )

c. Enhanced Scheduling ( )

d. Reduced Project Time ( )

8. What is the impact of material management on project quality upon delivery in Nigeria?

a.Poor Construction ( )

b Project Delay ( )

c Affects project success and reputation ( )

d. Time lag ( )

9. What are the advantages of material management in project construction in Nigeria?

a. Improved Project Timelines ( )

b.Cost saving delivery of project ( )

c. Enhanced quality control ( )

d. Waste Reduction in Landfills ( )

10. what are the root causes of ineffective material management?

a. Poor planning and Forecasting ( )

b. inadequate Inventory management ( )

c. Supplier Unreliability ( )

d. Inadequate Quality control ( )

## TABLE OF CONTENTS

## DEDICATION

This project is wholeheartedly Dedicated to Almighty Allah, the most gracious and most merciful, for his love, guidance, and strength that have brought me this far. Without Him, none of this would have been possible.

I also dedicate this work to my wonderful Parents, Mr. And Mrs. Abdulwaheed, for their endless care, support, and prayers throughout my life. Your love has been my greatest motivation.

A special appreciation goes to my project supervisor for his support and encouragement during this research.

## ACKNOWLEDGEMENT

All thanks and praise go to Almighty Allah, the most gracious and most merciful, for granting me the strength, wisdom, and patience to successfully complete this research project and my higher national diploma program. His guidance has been my greatest support throughout this journey. His guidance has been my greatest support throughout this journey (Alhamdulillah).

I would like to express my sincere appreciation to my project supervisor, **HRH MK. OWOLABI** for his continuous support, guidance, and encouragement. His constructive advice, patience, and critical insights played a vital role in shaping this work, and I am truly grateful.

My heartfelt thanks go to my beloved parents, whose endless love, prayers, and sacrifices have been the foundation of my academic journey. I pray that almighty allah rewards you abundantly and grants you long life to reap the fruits of your labour. Amen.

To my wonderful siblings, thank you for your constant support, understanding, and encouragement throughout this journey. Your presence in my life means so much to me.

I also extend my deep appreciation to my friends, both in school and from childhood. Your companionship, motivation, and shared experiences have made this academic journey a memorable one. May we all succeed and come out in flying colors, In Shaa Allah.

Finally, I acknowledge all the lectures and staff of the department of building technology your knowledge, support and dedication have contributed immensely to my growth and learning, may Almighty Allah bless you all abundantly. Amen

**ABSTRACT**

*Material management is the system for planning and controlling to ensure that the right quality and quantity of materials and equipment are specified in a timely manner. Materials should be obtained at a reasonable cost, and be available for use when needed. The cost of materials represents a large proportion of the cost. A good management system for materials management will lead to benefits for construction. Cash flow has become crucial for the survival of any business, if materials are purchased early, capital may be tied up and interest charges incurred on the excess inventory of material. Material may deteriorate during storage or be stolen; also delays and extra expense may be incurred if materials required for particular activities are not available. Impact the strong effect or influence that something has on a situation or process. A negative, a positive or an adverse effect on a situation. Materials the elements, constituents, or substances of which something is composed or can be made. Management the way something is being handled, careful treatment, supervising skills, or those in charge. Project a series of task that needs to be completed to reach a specific out. A set of inputs and outputs required to achieve a particular goal. Any activity that as a beginning and an end.*

Evaluating the roles of material management in enhancing construction project performance amid economic challenges