ST. MARY'S UNVERSITY

SCHOOL OF GRADUATE STUDIES

MA IN PROJECT MANAGEMENT

EFFECT OF CONSTRUCTION MATERIAL MANAGEMENT ON PROJECT PERFORMANCE: (CASE STUDY: OF BAMACON ENGINEERING PLC)

BY

KALKIDAN MULU

FEBRUARY, 2021

ADDIS ABABA, ETHIOPIA

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(CASE STUDY: OF BAMACON ENGINEERING PLC)

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTER OF ART IN PROJECT MANAGEMENT.

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APPROVED BY BOARD OF EXAMINERS

Dean, Graduate Studies:

Name: _____ **Signature:** _____ **Date:** _____

Advisor:

Name: _____ **Signature:** _____ **Date:** _____

Internal Examiner

Name: _____ **Signature:** _____ **Date:** _____

External Examiner:

Name: _____ **Signature:** _____ **Date:** _____

DECLARATION

I, the undersigned, declare that this thesis is my original work, prepared under the guidance of Busha Temesgen (PHD). All sources of material used for the thesis have been duly acknowledged. I further confirm that the thesis has not been submitted either in part or in full to any other higher learning institutions for the purpose of earning any degree.

Kalkidan Mulu Asefa _____

Name Signature

St. Mary's University, Addis Ababa **FEBRUARY, 2021**

ENDORSEMET

This thesis has been submitted to St. Mary's University School of Graduate Studies for examination with my approval as university advisor.

Busha Temesgen(PHD) _____

Advisor Signature

St. Mary's University, Addis Ababa **FEBRUARY, 2021**

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ABSTRAT

This research project examined the contribution of material management on project performance of construction project. Specifically, the present research assessed the effect of material planning, material procurement, material handling, material logistic and stock and waste control on project performance. Both descriptive and multi regression analysis were adopted where qualitative and quantitative approach were applied. Data collection instruments that used were questionnaire. The target population was thirty sites. The sample size was ten sites with 60 questionnaires. Furthermore, information was analysed using Statistical Package for Social Sciences version 21.0. The descriptive analysis of material practices and project performance had the mean value of more than 3. On the multi regression analysis material planning, material logistics, material handling and stock and waste control have positive effect on project performance. But material procurement has negative effect on project performance. Regarding statistically material planning, procurement and stock and waste control are significant. On the other hand, material logistic and handling statistically insignificant. The company should give attention on material management practices more for better performance of projects.

Key Words: Material Management, Material Practices

CHAPTER ONE
INTRODUCTION

Today in Ethiopia the construction industry growing very fast other than other sectors. Most of top construction companies located in Addis Ababa. In the city there are some scattered materials seen in the construction site, delay of project and quality of the project is poor. The reasons given by the companies for the delay of the project is lack of material in the country and most of the companies import the raw materials from foreign countries.

In general, the aim of this study is to evaluate the effect of construction managerial management on project performance.

This chapter compasses Background of the study, Statement of the problem, Research questions, Objective of the study (General and specific objectives), Significant of the study, Scope of the study, limitation of the study, Organization of the study and definition of key terms.

1.1. Background of the Study

Construction industry is a huge sector which has great contribution for the development of the country. Ethiopia is one of Africa fastest growing, most vibrant economies. Enjoying double digit GDP growth year on year for the past decade, and with a quickly growing population, the nation is ready to become a regional leader in construction. Construction material is a critical element in the construction project as it contributes a major portion to the cost of projects. Construction material constitutes a major cost component in any construction project. The cost of material may be 50% to 70% of the total construction cost depending on type of project. Gulghane and Khandve, (2015). Due to its role as the major contributor to project cost, managing construction material becomes essential function in the construction project. Therefore, material management is an important element in project management.

According to Wanjogu, H, Iravo,M. ,Arani,W.,(2015) define Material Management as the procedure for planning, executing and controlling the field and office events in construction. The main objective of material management is to make sure that construction materials are always available at their point of use when required. Material management is the system for planning and overseeing all of the efforts that are mandatory to ensure that the precise quality quantity of materials is correctly specified in a timely order, gotten at the point of use when needed. A deprived material management can bring about increase in costs during construction.

Material management is the process of planning and controlling all necessary efforts to ensure that right quality and quantity of material and equipment are specified in timely manner, obtained at reasonable cost and available when needed. Caldas and Reyes, (2014). Without proper material management in contraction projects, construction projects suffer delays, cost overrun, construction waste and low productivity Z.Shehu, G.D.Holt, I.R.Endut, Akintoye, (2015).

Material management plays significant role in the construction industry. The material management is to ensure that the right quality and quantity of materials are appropriately selected, purchased, delivered and handled on site in a timely manner and at a reasonable cost. And most importantly are available at the point of use when required. Thus, Materials management is an important element in project management. Materials represent a major expense in construction, so minimizing procurement costs improves opportunities for reducing the overall project costs. W.Barry, F.Leite, W.J.O'Brien ,(2014) material management is important because the outcome of every construction projects relay on having all proper resources such as materials , labours , plants and equipment delivered to a site at appropriate time.

Poor materials management can result in increased costs during construction. Efficient management of materials can result in substantial savings in project costs. If materials are purchased too early, capital may be held up and interest charges incurred for the excess inventory of materials. Materials may deteriorate during storage or get stolen unless special care is taken. Delays and extra expense may be incurred if materials required for particular activities are unavailable. Therefore, there is a need for efficient materials management in order to control, productivity and cost in construction projects. Hemishkumar Patel and Jayeshkumar Pitroda, (2015).

This research will mainly focus on the effect of construction material management on project performance on company under study, Bamacon Engineering PLC. Although, different researchers studied the effect of material management on project performance, it appears there is lacking of detailed discussion especially about the effect of construction material management on project performance. Conversely, there is no prior similar research conducted on the construction industry in Ethiopia context. Moreover, the effect of material management needs to be explored to gain better insight and understanding towards improving projects performance through effective material management. Therefore, the purpose of this paper is to assess the effect of construction material management on project performance done by Bamacon Engineering PLC. Bamacon Engineering PLC one of the top construction

company, established as a grade VII construction firm in 2001 using the name of the owner and general manager as Girma Gelaw Building contractor, Bamacon Engineering registered with the ministry of infrastructure has grown to be a very competitive Grade I Building Contractor with favourable prospects for a role of excellence in the construction industry.

1.2. Statement of the problem

Material management is an integrated process of designing, constructing new structures or re modelling existing structures, using material more efficiently with a great importance of contributing to construction industry's performance improvement as well as solving material waste management problem. (Muleya and Kamalondo, (2017).

It is common to observe in Ethiopian the scattered equipment and assets out of the warehouse of the warehouse in the office compound that at risk of theft. A large number of stocks of materials are stacked in the store which is seriously exposed to dust. Sometimes, the interruption of operations is happened due to the lack of raw materials inventories and there is damage and spoilage of materials due improper placement. Without proper material management construction projects suffer delays, cost overrun, construction waste and low productivity. Among the factors that contribute to poor project performance is due to shortage of materials occur in construction projects. Meaning that, the materials are not available when needed. According to Tibebu Kebede, (2016) in the study of 'An Assessment of material management practise on construction sites; the case of Defence construction Enterprise' found that bulk procurement of materials for site, with monthly market survey before ordering is more common on the enterprise's construction project sites. The study established the following causes of material wastage on building construction sites; mishandling and work due to poor workmanship, inadequate storage facilities on site, choice of wrong construction work methodology, poor quality of material and delay in material supply so no. the study able to discover that the major factors for ineffective materials management was due to lack of stock and waste control system for materials, mishandling of material, incompetence estimators and issuing of materials for use. And lastly, the study suggested that material management should be practiced on all sites of the enterprise building construction projects. The limitation of the study more focused on the practices of material management only, it did not show how the material management practices affect project performance in terms of time, cost, productivity and waste.

Therefore, in order to fill the existing gap identifying the factors that affect project performance is very important in Bamacon Engineering PLC and similar construction

companies. Therefore, this study carried out to examine factors that affect project performance particularly in Bamacon Engineering PLC.

1.3. Research Questions

The studies intend to answers several key questions regarding the effect of material management on project performance in case of Bamacon Engineering PLC. The questions that will be answered in this study: -

1. What is the effect of construction materials planning on project performance?
2. What is the effect of construction materials procurement on project performance?
3. What is the effect of construction materials logistic on project performance?
4. What is the effect of construction materials handling on project performance?
5. What is the effect of construction materials stock and waste control on project performance?

1.4. Objective of the study

1.4.1. General objective of the study

The main objective of the research is to assess the effect of construction material management on project performance in Bamacon Engineering PLC.

1.4.2. Specific objective of the study

The specific objectives of the research are: -

1. To assess the effect of construction materials planning on project performance.
2. To determine effect of construction materials procurement on project performance.
3. To determine the effect of construction materials logistic on project performance
4. To assess the effect of construction materials handling on project performance.
5. To determine the effect of construction materials stock and waste control on project performance

1.5. Significance of the study

All research studies have their own aims and objectives they initially a chive and significances to provide in their end over. This study will 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 , if applied will go to an extent to provide new explanation to the topic and they

can get some information that might needed in their research and some of their question may possibly be answered by this research.

1.6. Scope of the study

This study focuses on the Effect of construction material management of project performance in Bamacon Engineering PLC project sites. The scope of the study was focus on two major areas; contextually and geographical areas. Contextually, material management has effect on project performance. There are dimensions of material management practises such as material management, material procurement, material handling, material stock & control and material logistics these are the independent variables and the dependent variable project performance dimension quality, cost, time, waste, productivity and quantity just to mention a few. However, in this study three dimensions of project performance used; time, cost, productivity and waste.

The geographical scope of the study is conducted only in Bamacon Engineering PLC. All the company's 30(thirty) projects are located in Addis Ababa. For this reason, the study limited to in Addis Ababa and the data collection will be limited to head offices and project sites. Therefore, it is limited since the study conducted only in Bamacon Engineering PLC, the results may not be used to generalized and apply to other construction company in the country.

1.7. Limitation of the study

This study only covers the effect of construction material management on project performance on cost, time and waste and productive. Each of the respondents is given the same questionnaires to answer. The results of this study will applicable only to the respondents of this study. The main source of data will be the questionnaire, which is prepared by the researcher.

1.8. Organization of the study

The study is organized in three chapters; the first Chapter is an introductory part of the study which introduces the overall study. This part contains background of the study, statement of the problem, research questions, and research objectives, significance of the study, scope of the study, limitation of the study, organization of the study and definition of key terms. Chapter two is concerned with definition and concept to be reviewed in order to enhance the knowledge about the area followed by Theoretical framework, Empirical Literature review

and Conceptual framework. Chapter three discusses the research design and methodologies are adopted for the study with relevance justifications. Chapter four discuss proposed time and budget.

1.9. Definitions of Key Terms

Material Management: is the process which integrates the flow of supplies into, through and out of an organization achieve a level of service which ensures that the right materials are available at the right place at the time in the right quantity and quality and at the right cost. (Md.Arfur Rahman ,2014)

Project: is a unique set of coordinated activities, with definite starting and finishing points, undertaken by individual or organization to meet specific objectives within defined schedule, cost and performance parameters. (Albert Lester, 2014)

Project Performance: project performance, seems easy to measure; just track time, cost and scope and it is done. Performance measurement during a project is to know how things are going so that we can have early warning of problems that might get in the way of achieving project objectives and so that we can manage expectations. (Meng, 2012).

Project Management: application of knowledge, skills, tools and techniques to project activities to meet project requirements. (Dr.Martin Barnes,2012)

CHAPTER TWO

REVIEW OF RELATED LITERATURE

This chapter provides on insight of, Theoretical Framework, Empirical Literature Review and Conceptual framework. This chapter covers topics related to concept of material management, Project performance & dimension, material management in construction industry and material management practice, theoretical framework; Material management in Construction industry and material management practices and Empirical Literature review of the effect of construction material management on project performance and cause of ineffective material management on construction project delivery and conceptual framework for the topic under the study.

2.1. Theoretical Review

2.1.1. Concept of Material Management

Material management is a planned process combining identification, planning purchasing, delivery, handling, storing, controlling and distributing with the purpose of ensuring the availability of sufficient quantities, appropriate quality and reasonable cost of construction materials for project need. Zairra and Narimah, (2017).

The goal of material management is to ensure that construction materials are available at their point of use when needed. Material management is the system for planning and controlling all of the efforts necessary to ensure that the correct quality and quantity of materials are properly specified in a timely manner, obtained at a reasonable cost and most importantly, available at the point of use when required. Hemishkumar Patel and Jayeshkumar Pitroda, (2015).

Material management involves the logistics of the materials components of a supply chain which involves the process of planning , implemeting and controlling of the movement and storage of raw materials, work in process inventory, and finished goods from poiint of origin to point of consumptin. The management of materials should be considered from the phases of the construction process and throughout the construction period. Generally, construction materials are corpulent , expensive and are supplied in large amounts to construction sites. Therfore, there is a need for excellent management system for handling materials.

2.1.2. Project Performance and dimension

Project performance is assessed through its product and project usage quality, timeliness, budget compliance and degree of customer satisfaction. Low and Ong (2014) evidenced that Managerial limitations, managerial time and management related costs, performance of managerial skills, risk management, management of human resources and incorporation in relation to the project success.

In evaluation of the performance of project, the time schedule contributes more to the assessment and relaying on the maturity in time management routines lead to the durability in project performance where time frame is not routinized, Punch, (2014). The timeframe is very important to achieve the project target. The phenomenon of not delaying in executing project is linked with the time schedule.

The quality of project information had positive effects on project success (Rashfa, 2014). Therefore, associated with the quality and technical obligation is limitation. The achievement of project in interior of time scheduled is seen as a motivating factor of project durability and performance. The plan of time is very pertinent to realize project goal and outcome in a specified period by taking into consideration the project fixed objectives (Walker, 2015). Performance refers to the determining and promotion of success and assessment output relying on the fixed objectives assigned to any project. In this context, performance refers to the individual or group fetching taking into consideration the cooperation toward positive outcome. Performance achievement is the process of long journey and the level of explanation of the method in which the degree of attainment take into account six integral elements like nature of skills, knowledge, identification, features and constant components (Gunduz , Nielsen & Ozsdemir,2013).

Another crucial dimension in project performance involves the level of customer satisfaction (Keith & Kling, 2016). A project that in the final analysis stimulate customer satisfaction would be evidenced to perform well. In monitoring the success of any project is profitable to the stakeholders and shareholders by facilitating them to approve the service obtained to safeguard managers by ameliorating service they provide to customer. Project performance is related to the end product objective in terms of success and realization the prerequisites as well as satisfaction of clients. Therefore, project success led to its sustainability and durability in terms of obtaining a competitive advantage, improvement of reputation for a fir, enhancing market share and attaining certain level of profitability (Kirkpatrick & Feeney,2015).

2.1.3. Materials Managment in Construction Industry

John (2013) observed that the relevance of material 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 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 material, transportation, storage, inventory control, quality control and inspection of materials, material handling, packaging, warehouse planning, accounting, scrap, surplus and obsolete materials disposal, finished goods safety and care are the function performed by materials management. The purpose of material management is to control the flow of material effectively.

2.1.4. Material Management Practices

Material management practices involve the planning , procurement , handling , stock and waste control, and logistics surrounding materials on construction projects. a good materials management enviroment enables proper materials handling on construction sites. In order to better understand materials management, the following process are discussed: planning, procurment , logistics, handling, stock and waste control.

2.1.4.1. Planning

The materials planning process covers setting up annd maintanining the records of each part used in each plant to determine target inventory levels, and delivery frequency (Tanko, Abdullah & Ramly, 2017). Effective managemet of materials record will help the flow of materials at the site in order to avoid several problems such as materials out of stock and materials that have not been delivered. It also provides guides to all the subsequent activities and this could have a great impact on the project plan.

2.1.4.2. Procurement

The objective of procuremet in material management is to provide quality materials at the right time and place , and at an agreed budget. Adeyinka et al (2014) states that procurment is about organizing the purchasing of materials and issuing delivery schedules to supplier and following up, to make sure that suppliers deliver on time.

2.1.4.3. Handling

proper protection during storage is often ignored, and this can result poor material quality and 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 pallents, not more that a certain safe height to prevent dampness and so on (Low & Ong, 2014). By adopting proper material handling and storage will help to keep the material intact and in good quality.

2.1.4.4. Stock and Waste Control

stock control ensure all items such as raw materials, processed materials , and components for assembly , consumables stores , general stores, maintenance materials and spares work in progress and finished products are available when required (Harris & Cofferm 2013). Waste can be reduced through the careful consideration of the need for minimisation and better reuse of materials in both the design and construction phases. Given these facts, there is need for materials storage on site to avoide wastes, loss and damage of materials which affect the operations on the construction project.

2.1.4.5. Logistics

This is a concept that emphasizes movement and it encompasses planning , implementing , and constrolling the flow and storage of all goods from raw materials to the finished product to meet customer requirement (Ogunde et al.,2017). Raw materials for construction are usually varied , bulky and heavy and required proper handling in the supplying process. The primary focus of the logistics in any construction project is to improve coordination and communication between project participations during the design and construction phases, particularly in the materials flow control process (Fleischman et al., 2014).

2.2. Emprical Literature Review

2.2.1. The Effect of Construction Material Management on Project Performance

The existing studies on construction project performance have briefly mentioned the effect of material management on project performance. Therefore, the studies showed that criteria of project performance affected due to material management.

The material management effect to project performance. Generally, the criteria of project performance are identified both from a positive and negative perspective effects. From the positive effects, effective material management has a positive impact on time optimization, cost saving, quality maximization, productivity improvement and waste minimization. On the other hand, ineffective materials have negative effects on project performance such as time

delay, cost overrun, deprived quality, loss of productivity and excessive waste generation. Therefore, they discussed the material management effect of project performance as follows:

The study carried out by Mat & Kasim et.al (2015) stated that material management is an important element in project management as materials contribute a major portion to project cost. It also plays a key role because of success of every construction project rely on having proper resources. Therefore, the aim of this paper is to identify the effects factors of material management on project performance. They gave conclusion: - the availability and sufficient materials and equipment have effect on time, quality, productivity and performance. Appropriate quality material has effect on time, cost and quality performance.

The study conducted by Hemishkumar Patel, Dr.Jayeshkumar Pitrode (2015) described that improper material management can consequence in increased costs throughout construction project. Efficient and effective management of material can result in considerable savings in project costs. Materials may deteriorate in store or get stolen if special attention is not taken. Delay and additional costs may be sustained if materials required for particular works are not available.

Another research done by Lenin Kumar el al. (2014) stated that a void created by the absence of proper material management on construction sites. Research has shown that construction materials accounts for 60-70% of the total cost in construction projects. Material mismanagement decrease the contractor's profit leading to huge loss, and leaving the project in big troubles, therefore, the proper management of this single largest component can improve the productivity and cost efficiency of a project and help ensure its timely completion. The results obtained from the ranking factors shows that the top five major is causes of cost overruns are design issues, market condition, store issues, contractor issues and external issues.

Moreover, Keitany Wayoike Salome et al. (2014) stated that material management is a tool to optimize performance in meeting customer service requirements at the same time adding to profitability by minimizing costs and making the best use of available resources. The main objective of the study was to assess the role of material management on organizational performance. Specifically, the study intended to assess how inventory control systems and lead time affect organizational performance. The rating showed that inventory control system played a vital role in organizational performance, and as such, organizations must ensure that inventor control system be highly involved in material management activities hence achieving higher organizational performance. The result also showed that the coefficient correlation between inventory control systems and organizational performance is 0.884.

2.2.2. Causes of ineffective Material Management

During the past years, various academics researchers have conducted studies investigating to find out the issues causing ineffective material management in construction project. Among these studies were:

Another research done by Gulghane & Khandve (2015) state that problematic management of materials are due to logistic , handling or in application , loss of materials because of improper supervision , waiting of materials to arrive in location due to inflation , material changes in buying or purchasing situation starting from the prepared cost estimation, bulk construction material, the shortage and changes of construction materials quality 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 , so on mentioned on his study.

A study done by Zaha Ahmed (2017) were identified on his study on, the top root cause of ineffective material management is lack of communication which, incomplete drawing and undefined scope regarding material identification mentioned. Regarding vendor selection the top root causes were matching price to competitors' price, availability of materials and lack of conformance to requirements and regarding construction phase the top root cause identified damage of material, re-handling material and no supplier's quality assurance. Therefore, the overall top three ineffective material management causes belonged to procurement and vendor selection phase.

2.3. Conceptual Framework

The conceptual framework establishes the link between construction material management practices and performance of construction project.

Material planning is the scientific method of planning and determining the requirements of consumables, raw materials, spare parts and other miscellaneous materials essential for the production plan implementation. Planning gives a definition of action as well as activities, targets of cost and time, and milestones of performance, which will bring about successful project implementation as well as project objective achievement. Telsang (2014)

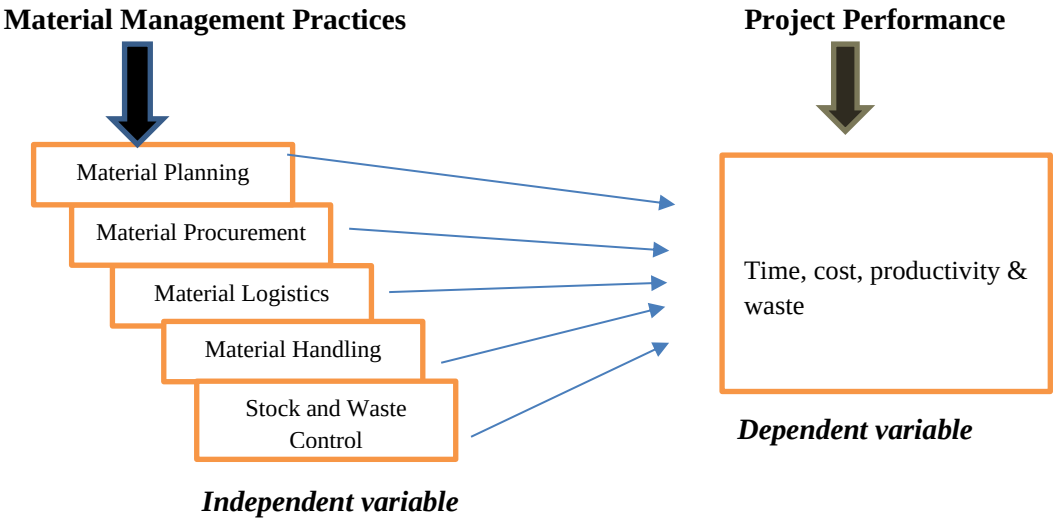
Material procurement refers as the purchasing process for goods and services. In construction, material procurement is the process by which materials required to construction a building selected, ordered, invoiced, paid for and delivered to the site.by minimizing the procurement cost of materials, the higher chance for reducing the overall project cost and

concurrently increasing company profit. On other hand on time material procurement reduces wasting time and reasonable changes reduces extra time adjustment of resources. A.R. Patil (2013).

Material logistics is the movement and comprises of planning, execution and follow up and storage of all materials from raw to the finished ones to attain the expectation of clients. (Safs et al ,2014). Lack of standard or poor-quality control in material management contributes to increase of construction cost. Handling and implementation stages is higher and it requires a material replacement. R.F. Aziz, (2013).

Material handling is the process of moving, protecting, storing, and controlling materials throughout the construction process. It includes the steps taken when dealing with construction materials from when they are delivered to the construction site until when they are disposed of. Dey (2014) states that delays in material supply was a major cause of time overrun of construction project. Thus, it would seem that materials delays are a major cause of delays in project.

Material waste control refers to the various schemes to manage and dispose of waste. Cheung (2013) stated that construction waste defined as the by -product generated and removed from construction, renovation and demolition work places or sites of building and civil engineering structure. Control of material wastage is very important in controlling the construction cost. The stored materials need to be monitored in order to time. Consequently, the work progress will be delayed. Therefore, the availability and sufficient quantity of materials affect the time performance. Karim & Ern (2014).



Conceptual framework of the study (**Source**: Zairra Mat Jusoh & Narimah Kasim, 2017)

CHAPTER THREE
RESEARCH DESIGN AND METHODOLOGY

3.1. Introduction

This chapter discusses the methods that are used in the collection and analysis of data to answer the primary and secondary research question of the study. It explains the research design, sampling techniques and a data collection method used; and describes how data collected from the research has been analysed. Both qualitative and quantitative research methods will be used in carrying out this research. However, the overall approach is qualitative because qualitative methods focus on the experience of people involved, and attempt to understand the reason behind certain behaviour description. The evaluation carries out using three systems of of data collection questionnaries. The questionnaries used to collect both qualitative and quantitative data..

3.2. Description of the study area

The construction industry plays an important role in the economy and the activities of the industry are vital to the achievement of national socio-economic development goals such as shelter, infrastructure and employment. Construction industry plays an important role in meeting the needs of society and enhancing quality of life. Construction has been an important player in many countries' economy, especially developing countries. The construction industry is becoming increasingly competitive and material management is now considered to be one of the frontiers for cost reduction to improve profitability and productivity, as construction materials constitute a major cost component in any construction project.

According to material management are the planning and controlling of all necessary effort to make planning and controlling of all necessary effort to make certain that the right quality and quantity of materials are appropriately specified on time, are obtained at a reasonable cost and are available when needed.

Therefore, the study area focused on effect of material management on project performance in case of Bamacon Engineering PLC

3.3. Research Approach

Research approach is a plan and procedure that consists of steps of broad assumptions to detailed methods of data collection , analysis , and interpretation. It is , therefore, based on the nature of the reaserch problem being addressed. Priya Chetty (2016).

The three common approaches to conducting research are quantitative, qualitative and mixed methods. Qualitative research is an approach for exploring and understanding the meaning individuals or groups ascribes to a social or human problem. The process of research involves emerging questions and procedures, data typically collected in the participant's setting, data analysis inductively building from particulars to general themes. Quantitative research on the other hand is an approach for testing objective theories by examining the relationship among variables. These variables, in turn, can be measured, typically on instruments, so that numbered data can be analysed using statistical procedures. Finally, mixed methods research is an approach to inquiry involving collecting both quantitative and qualitative data, integrating the two forms of data, and using district designs that may involve philosophical assumptions and theoretical frameworks. Creswell, (2014).

This research used both qualitative and quantitative approach (Mixed approach). But quantitative approach will be used more. A quantitative approach used more because the research tried to quantify the correlation between the independent variables material planning, material procurement, material handling, material stock & waste and material logistics) and dependent variable project performance (time, cost and productivity and waste).

3.4. Research Design

Research design is the overall plan for connecting the conceptual research problems to the pertinent and achievable empirical research. It is an inquiry which provides specific direction for procedures in research, Creswell, (2014).

There are three research designs; exploratory, descriptive and explanatory. Exploratory research design is a lot like exploration or detective work fuelled by curiosity; develop hypotheses that can explain the occurrence of specific phenomena. Descriptive research design aims to accurately and systematically describe a population, situation or phenomenon. Lastly, explanatory research design determines which variable might be causing certain behaviour, i.e., whether there is a cause-and-effect relationship between variables, explanatory research must be undertaken (Abhijeet Pratap,2018).

This study used explanatory research because it helps to identify the relationship between independent and dependent variables; which aims to examine the relationship between project performance as dependent variable and material management practices as independent variables. The findings of this study explained the relation of each independent variable with the dependent variable. Therefore, in this study explanatory research design used.

3.5. Population and Sample of the study

A population is a theoretically specified aggregation of survey elements. A survey population is aggregation of elements from which survey sample is actually selected. The total population or universal population for this study include all project sites of the company. In other words, the study interested assessing the effect of construction material management on project performance in Bamacon Engineering PLC.

To compute the effect of the independent variables on dependent variables in Bamacon Engineering PLC, a suitable population should be determined. In this study the total population size of the research is the number of project sites of the company. The overall numbers of projects sites are around 30 and all project sites are located in Addis Ababa.

3.6. Sampling Techniques

This study used probabilistic techniques, specifically simple random sampling. Sampling technique can either be probabilistic or non-probabilistic. In probabilistic sampling every unit in the population has a chance of being selected in the sample, and this probability can be accurately determined. The method can be simple random, systematic, stratified, and, multi stage sampling. Non probabilistic sampling is where some elements of the population have no chance of selection or their probability of selection cannot be accurately determined. Therefore, in this study from probabilistic techniques random sampling is going to be used. Random sampling is one such procedure that selects a sample of units from a population by chance, typically to facilitate generalization from the sample to population. Random sampling ensures that results obtained from your sample should approximate what would have been obtained if the entire population had been measured. In this study simple random sample used because the whole process is randomized, the random sample reflects the entire population and this allows the data to provide accurate insights into specfic subject matters. Therfore,The study used simple random sampling with excel sheet which is the most straightforward approach to get a random sample.

3.7. Sample Size

Sample size is the number of observations taken from a population through which statistical inference for the whole population are made. The concept of sampling from a larger population to determine how that population behaves, or is likely to behave, is one of the basic premises behind the science of applied statistic (Daniel Sims, 2016).

Using random sampling sample size of the study 10 project sites selected from among the whole 30 project sites. The researcher chooses 10 project sites as sample because, all the project sites are located in Addis Ababa. As shown below the table among 30 project sites using random sampling excel, 10 project sites chosen for sample size.

No.Site	Project Name	Random		Random	Project Name	NO
12	DH One Real Estate	0.072749047	1	0.947278	AMT	3
17	Metropolitan (No-01)	0.087939594	2	0.883957	Africa PLC	1
18	Metropolitan (No-03)	0.090448108	3	0.876072	AL-Ameterahimen	5
19	Moenco	0.091661089	4	0.866873	Nile Source PLC	16
11	Century Addis (Brass)	0.099623334	5	0.781827	Ato Birhanu W/Gebriel(HAZAI	6
7	W/ro Ayelech Mekonen	0.128116807	6	0.696763	Global Insurance Company S.C	28
29	WFP (World Food Program)	0.21229223	7	0.667315	Tsehay Insurance S.C	27
8	Bethlehem Trading PLC	0.234443851	8	0.661201	KMW Commercial Center PLC	30
20	Sur Construction PLC	0.239767385	9	0.659456	Friendship PLC	26
24	TF House Buliding	0.277214938	10	0.611454	Aschalew Belay	4
22	Shejer Real Estate	0.313486134				
9	Birra Coffee General Trading	0.341032963				
14	Good Life	0.353339912		***Therefore, the above top ten site selected (sam***		
21	Seid Yasin	0.356998385		***size) from the total population 30 sites.***		
13	GAF	0.430188777				
25	National Motor Corporation P	0.434557511				
2	Atefu Aberha	0.48294742				
15	KK PLC	0.493697444				
10	Century Addis (Atllas)	0.527080109				
23	SNAP	0.536852244				
4	Aschalew Belay	0.611453651				
26	Friendship PLC Phase-03	0.659455719				
30	KMW Commercial Center PL	0.661201301				
27	Tsehaye Insurance S.C	0.667315068				
28	Global Insurance Company S	0.696762811				
6	Ato Birhanu W/Gebriel(HAZ	0.781827233				
16	Nile Source PLC	0.866873468				
5	AL-Ameterahimen	0.876071694				
1	Africa PLC	0.88395678				
3	AMT	0.947277684				

Source: Field survey, (2021)

Therefore, using random sampling the researcher has identified a sample of 10 sites from population of 30 sites. 60 questionnaires were distributed to 10 sites.

3.8. Type of Data and Source

Both primary and secondary sources of data employed in the study. Primary data collected using questionnaire. Mostly the primary data will administer questionnaires which are distributed to the respondents; while secondary data collected from publication including: books, researches, journals and various materials. That will be relevance to this study.

3.9. Data Collection Instruments

Data collection instrument is the tools used by researchers to actually collect data in the research process. Data collection plays a very crucial role in the statistcal analysis. In research , there are different methods used to gather informaton, all which fall into two categories, i.e. primary and secondary data (Douglas,2015). As the same suggests, primary data is one which is collected for the first time by the researcher while secondary data is the data already collected or produced by others. Primary data sources include surveys , observations, experiments , questionnaire, personal interviwe etc. On the other contrary, secondarry data collecton sources are government publications, websites, books, journal articles, internal records etc.

In this study both primary and secondary sources of data used. The primary data generated and presented through a structure questionnarires. The questionnarres are open end and close end questons. On the other hand seondary data used from books, journal and articles so on.

3.10. Data Collection Procedures

The result study includes the primary data collected from respondents' specifically from Project Coordinator, Project Manager, Project Office Engineering, Site Engineering, Survey Engineering and General Forman. Collection of data carried out by self-administrative questionnaire. The questionnaire prepared in English.

3.11. Data Analysis

Data Analysis is the process of systematically applying statstical and/or logcal techniques to describe and illustrate, condense and recap, and evaluate data. According to Sandra Durcevic (2020) data nalysis is a process that relies on methods and techniques to taking raw data , mining for insights that are relevent . The collected data analyzed through Statistical Packaging for Social Sciences (SPSS). The analyzed data communicating and display in the form of verbally, graphically, chart and table.

3.11.1. Regression Analysis

Regression analysis gives information on the relationship between a response (dependent) variable and one or more (predictor) independent variables to the extent that information is contained in the data. The goal of regression analysis is to express the response variable as a function of the predictor variables. Erik Mooi, (2016).

One of the regression analysis techniques in this research used is multiple linear regression; it refers to a statistical technique that is used to predict the outcome of variable based on the value of two or more variables. The variable that predicted is known as the dependent variable, while the variables used to predict is know the value of the dependent variable are known as independent or explanatory variables.

In this research, findings from the data analysed presented using tables, charts and percentage.

3.12. Validity

Validity of research can be explained as an extent at which requirements of scientific research method have been followed during the process of generating research findings. Validity to be a compulsory requirement for all types of studies. According to (Pallant, 2011) states that it is the degree to which the results are truthful. So that it requires research instrument (questionnaire) to correctly measure the concepts under the study. One of the methods to know the validity of the research is pilot test. Therefore, in this study the questioners distributed to 2 project sites and ten research questionnaires were distributed. Among ten research questionnaires seven were completed but three questionnaires not completed or returned. Therefore, the pilot test questionnaires were not included in data analysis.

3.13. Reliability

The reliability refers to how consistently a method measure something. If the same result can be consistently achieved by using the same methods under the same circumstances, the measurement is considered reliable Fiona Middleton (2020). Reliability concerns the extent to which a measurement of a phenomenon provides stable and consist result. Reliability is also concerned with repeatability.

To measure reliability Cronbach's alpha test conducted. The Cronbach Alpha is a measure of reliability social and organizational science. It is applied to determine how reliable the items in questionnaire. If the Cronbach alpha below 0.5, it indicate that the items are inappropriate; Cronbach alpha is greater 0.5 it is acceptable, (Keith S.Taber, 2017). Therefore, the research conducted the Cronbach's alpha reliability test.

Table 3.1 Reliability Analysis

Dimensions	Number of Items	Cronbach's Alpha
Material Planning	3	.813
Material Procurement	3	.846
Material Logistics	3	.968
Material Handling	3	.673
Material Stock and Waste Control	3	.756
Project Performance	13	.504
Entire Scale	28	**0.635**

Source: Field survey, (2021)

All items which are 28 in number included in the questionnaire were statistically analysed to measure the internal consistency of the instrument using Cronbach's alpha. Based on the above reliability statistical analysis, it is interpreted consistency among the measurement items Alpha value .635 and t is greater than .50. So, the selected instrument can accurately measure the variables of the study.

3.14. Ethical Consideration

The participants in this study approach with full consent and informed to respond for questioners with confidence and understanding the purpose of the thesis; and the researcher firmly will assure that she will keep the information confidential and the data will be used only for intended purpose. The participants also will be informed that they will have freedom to withdraw from participation at any time without any unfavorable consequences, and they will not be harmed as a result of their participation or non- participation in the project, as a result the participation will be volunteer.

CHAPER FOUR

RESULTS AND DESCUSSION

This chapter presents the analysis of the data collection from respondent. The chapter intends to address the research questions using the data collected from five sites. The result of the survey was discussed by using questionnaire results. The study attempts to accomplish the objectives of the study and answer the research question.

A total of 60 questionnaires to ten sites which dealt with survey to assess the effect of construction material management on project performance in Bamacon Engineering PLC. However, 60 questionnaires were collected and practical responses (100% response rate).

The questionnaires contain variables which include issues such as evaluating construction material practices and components of the effect of construction material management of project performance. All items in questionnaire are arranged in the form of Likert items to capture the feelings of respondents in scale range from 1 to 5; 1) strongly disagree,2) disagree,3) partially agree,4) agree and 5) strongly agree. All the data has been analysed in SPSS so that the accuracy of the information is maintained.

4.1. General Information about Respondents

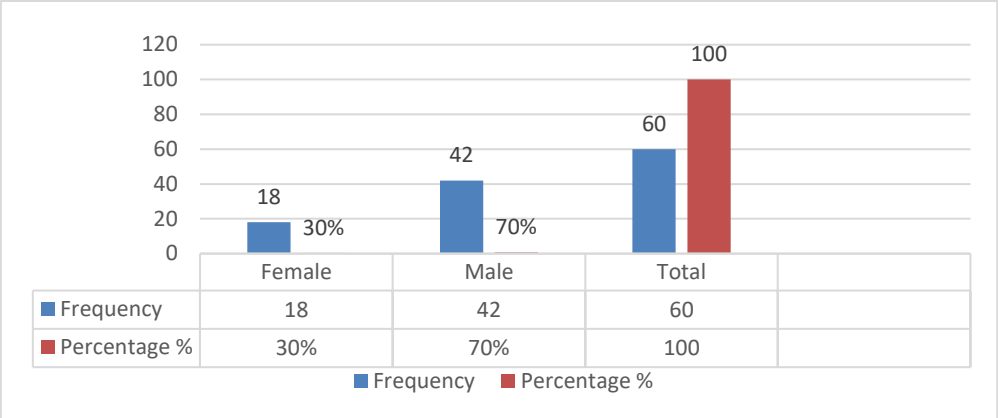
The information generated to address the stated research objectives from the respondents with diver's demographic characteristics. The first section of the questionnaires consists of the demographic information of the participants. The demographic variables about the respondents were summarized and described in different figures and tables. These variables included: working position, Gender, profession, experience and educational qualification.

The result of the returned questionnaire is presented in table 4.1. From the table; it gives the number of responses obtained. 100% response rate is considered adequate for analysis and conclusion of this type of research.

Table 4.1: Administered Questionnaires and Responses

Questionnaire	Frequency	Percentage %
Number of distributed	**60**	**100%**
Accepted responses	**60**	**100%**

Source: Field survey, (2021)

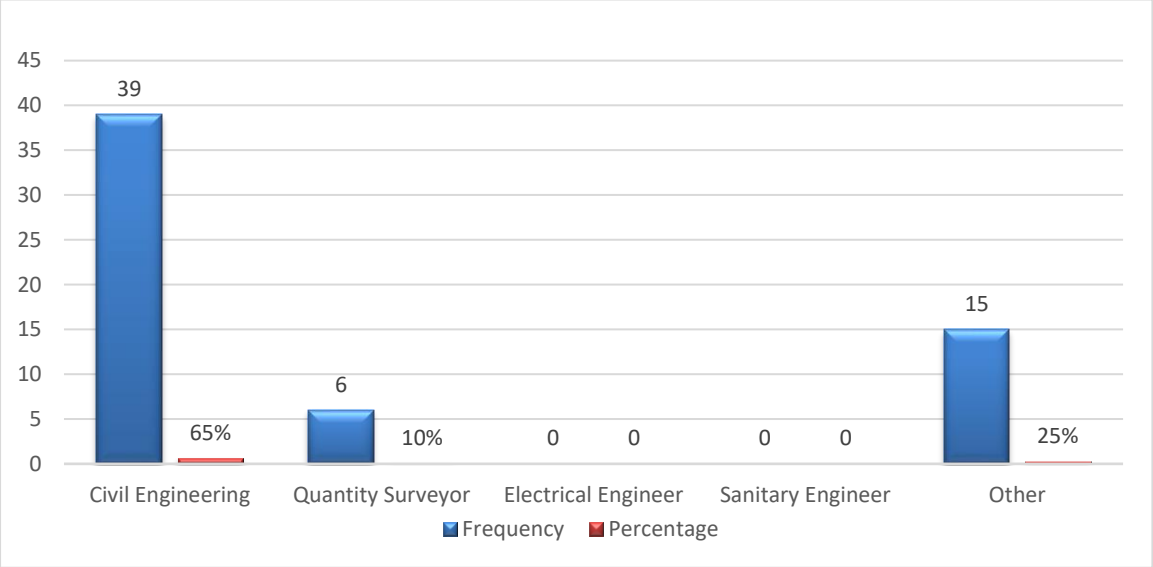


Source: Field survey, (2021)

Figure 4.1; Respondent's Sex

Figure 4.1 shows that from 60 respondents 30% are female and 70% male.

Figure 4.2; Profession of Respondent's



Source: Field Survey, (2021)

The respondent's profession is shown in figure 4.2 the highest construction of the respondents is Civil Engineering (65%), secondly is other profession (25%) and lastly Quantity Surveyor (10%).

Table 4.2: Year of working Experience

Year of Experience	Frequency	Percentage %
0-5	25	41.7%
6-10	20	33.3%
11-15	15	25%
16-20	-	-
Above 20	-	-

Source: Field Survey, (2021)

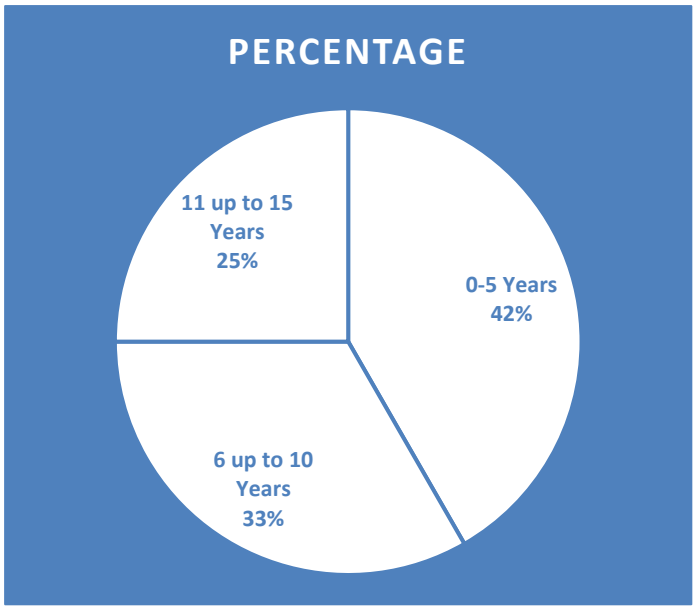
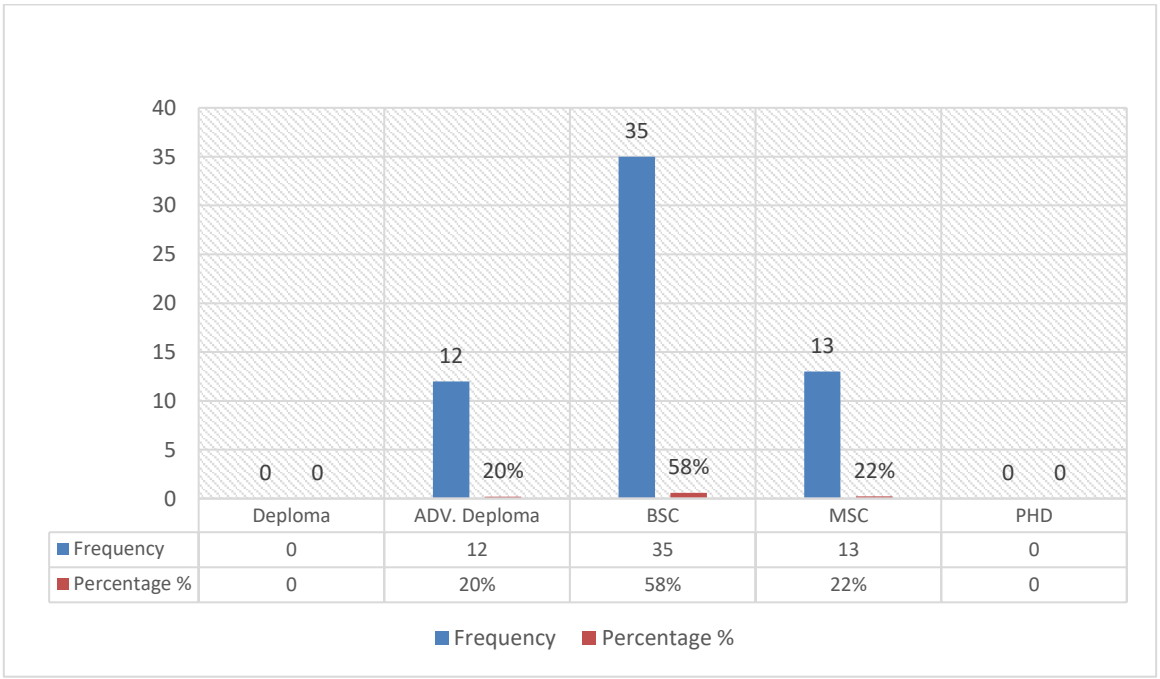


Figure 4.3: Experience of Respondents

Table 4.2 and figure 4.3 shows that 25 of them or 41.70% of the respondents have 0-5 years' experience, 20 of them or 33.3% respondents have 6-10 years and 15 of them or 25% respondents have 11-15 years experiences.

Figure 4.4: Educational Qualification of Respondents



Source: Field Survey, (2021)

Figure 4.3 shows that educational qualifications of respondents 12 of them or 20% have Advance Diploma, 35 of them or 58.3% have BSc Degree and 13 of them or 21.7% have MSC.

4.2. Data Analysis

A questionnaire with back ground of the respondents and twenty-eight questions was developed to answer the research questions. The first part of questions focuses on back ground information about the respondents of the company or five sites. The second part of the questionnaire comprises fifteen questions about the construction material practices and the other part of questionnaire comprises thirteen questions about the project performance. The results obtained through different regression analysis and descriptive analyses are presented as follows:

4.3. Descriptive Statistical Analysis

Table 4.3 Mean and Standard Deviation for Material Management Practices

Material Management Practices	N	Minimum	Maximum	Mean	Std. Deviation
Material Planning					
There is material planning process in the company	60	2	5	3.70	.788
There is better material planning to site to eliminate project delay.	60	2	5	3.50	1.033
There is efficient material planning to increase productivity	60	1	5	3.72	1.027
Material Procurement					
There is over payment and ordering for materials in the company.	60	1	5	3.07	1.071
The project manager ensures the purchasing of materials follows the standard requirement, time and quality.	60	1	5	2.92	1.183
The Procurement procedure has impact on the company material management.	60	2	5	3.85	1.071
Material Logistic					
There is coordination and communication between project participants during material flow process.	60	1	5	3.52	1.066
There is material supply delay due to material purchase before they required.	60	2	5	3.63	1.057
The company determine material type and quantities from the detailed design.	60	1	5	3.88	1.091
Material Handling					
There is appropriate handling of materials in the on site	60	1	5	3.22	1.059
Materials delivered to sites undamaged	60	2	4	3.52	.596
There is material handling system in the company.	60	2	5	3.97	.863
Stock and Waste					
The company stock and waste control is good.	60	1	5	3.10	1.217
There is appropriate storage location for stock near the site.	60	1	5	3.30	.908
Materials available when required to construction site.	60	1	5	3.55	.928
Valid N (listwise)	60				

Source: Field Survey, 2021

Table 4.3 represents the material management practices on Bamacon Engineering PLC construction project site. The result show that majority of construction professional believe that in terms of material planning; there is material planning process in the company with mean value (3.70), better material planning to site to eliminate project delay with mean value (3.50) and efficient material planning to increase productivity with mean value (3.72). In terms of material procurement; over payment and ordering in the company with mean value (3.07), project manager ensures the purchasing of material follows the standard requirements, time and quality with mean value (2.92) and the impact of procurement procedure on the company material management with mean value (3.85).Thirdly, material logistic; coordination and communication between participants with the mean value (3.52), supply delay due to material purchase before they required with mean value (3.63) and determine material type and quantities from the detailed design with value (3.88).On the other hand material handling; appropriate handling with mean value (3.22), deliver material undamaged with mean value (3.52) and material handling system with mean value (3.97). Finally, in stock and waste control; the control system with mean value (3.10), appropriate storage with mean value (3.30) and materials available when required with mean value (3.55).

Table 4.4 Mean and Standard Deviation for Project Performances

Project Performance	N	Minimum	Maximum	Mean	Std. Deviation
Time Performance					
Materials arrive on time on site	60	1	5	2.88	1.137
The project finished within the schedule due to available of materials	60	1	4	3.08	.962
There is problem on delay on project due to poor material management.	60	1	5	3.40	.960
Cost Performance					
There is increase of construction cost due to poor quality control in material management.	60	1	5	3.30	.926
There is extra expense cost on labour wage due to overstock material on site.	60	1	5	3.25	1.035
There is Timely delivery of materials by suppliers that reduces the rise of construction cost.	60	2	5	4.03	.863
Productivity and Waste Performance					
There is availability of material that motivate workers to improve work productivity	60	2	5	3.65	.840
There is inappropriate storage location which increases unproductive inputs due to workers longer time and effort to carry materials	60	2	5	3.90	.681
There is Efficient site layout for material movement that increases productivity while reduces material travel time	60	3	5	3.52	.725
There is material wastage due to lack of coordination among the workers on construction site	60	1	5	3.48	1.017
There is waste generation due to inappropriate material storage	60	1	5	3.50	1.081
There is Efficient material management practices that minimize waste generation throughout entire construction process.	60	2	5	4.05	.811
There are waste minimization strategies in the company	60	1	5	3.60	1.153
Valid N (listwise)	60				

Source: Field Survey, (2021)

From the above table it shows the result of project performance; time project performance shows; arrive on time with value (2.88), project finished within schedule with value (3.08) and delay on project due to poor material management with mean value (3.40). Secondly, cost project performance; increase of cost due to poor quality control with mean value (3.30), extra expense cost on labour wage due to overstock with mean value (3.25) and timely delivery of material by supplier with mean value (4.03). Finally, productivity and waste performance; availability of material motivate workers to improve work productivity with mean value (3.65), inappropriate storage location increases unproductive with mean value (3.90), efficient site layout for material movement increases productivity with mean value (3.52), material wastage due to lack of coordination with mean value (3.48), waste generation due to inappropriate with mean value (3.50), efficient material management practice with mean value (4.05) and waste minimization strategies with mean value (3.60).

4.4. The Current Status of Bamacon Engineering

The first tries assess the relationship between each of the independent variables /material practises (material planning, material procurement, material handling, material logistic and stick and waste control) to dependent variables project performance (time, cost and productivity and waste). To do this, the section will look at the effect of independent variables with dependent variable.

4.5. Multiple Regression Analysis

The regression model was applied to test how far the material management practices have effect on project performance. Coefficient of determination R is the measure of proportion of the variance of dependent variables about its mean about its mean that is explained by independent or predictor variables. It is conducted to investigate the effect of independent variable on the dependent variables and identify the relative significant influence; i.e., independent variables (material management practices) to dependent variables (project performance) in the organization. Higher value of R represents greater explanatory power of the regression equation.

The basic assumption tests for the model must be carried out. This is a compulsory precondition in explaining the relationship between dependent and independent or explanatory variables. Four major assumptions namely, Linearity Test, Homoscedasticity Test, Auto Correlation (Durbin Watson Test), and Normality Test checked and proved to met reasonably well. Each test is explained.

1. Linearity Test

The linearity of associations between the dependent and independent variables can be tested by looking at the P-P plot for the model. The closer the dots lie to the diagonal line, the closer to normal the residuals are distributed. As depicted in the below graph, the visual inspections of the P-P plot revealed that there exists linear relationship between the dependent and independent variables.

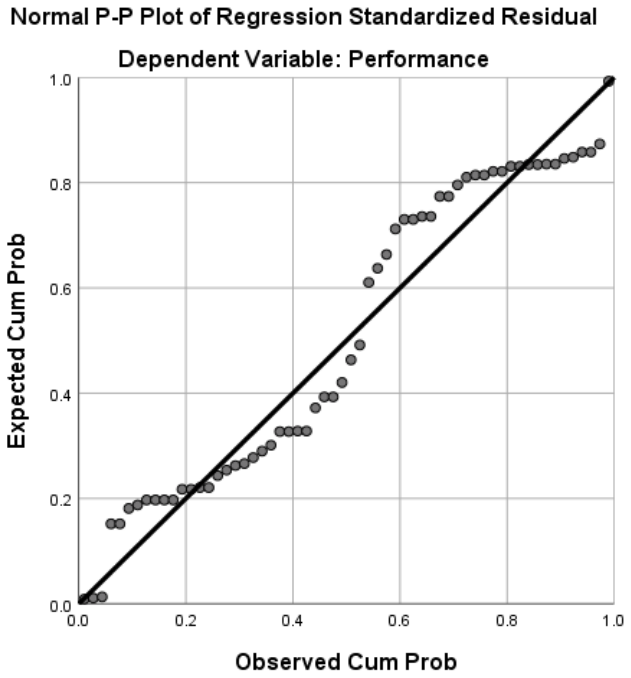


Figure 4.5: P- Plot Regression Standardized Residual

2. Homoscedasticity Test

The assumption of homoscedasticity refers to equal variance of errors across all levels of the independent variables (Osborn & Waters, 2002). This implies it requires even distribution of residual terms or homogeneity of error terms throughout the data. Homoscedasticity can be checked by visual examination of plot of the standardized residuals by the regression standardized predicated value (Osborne & Waters, 2002). If the error terms are distributed randomly with no certain pattern, the problem is not for analysis. The scatterplot in fig 4.2 shows that the standardized residuals in this research are distributed evenly which shows that no violation of homoscedasticity.

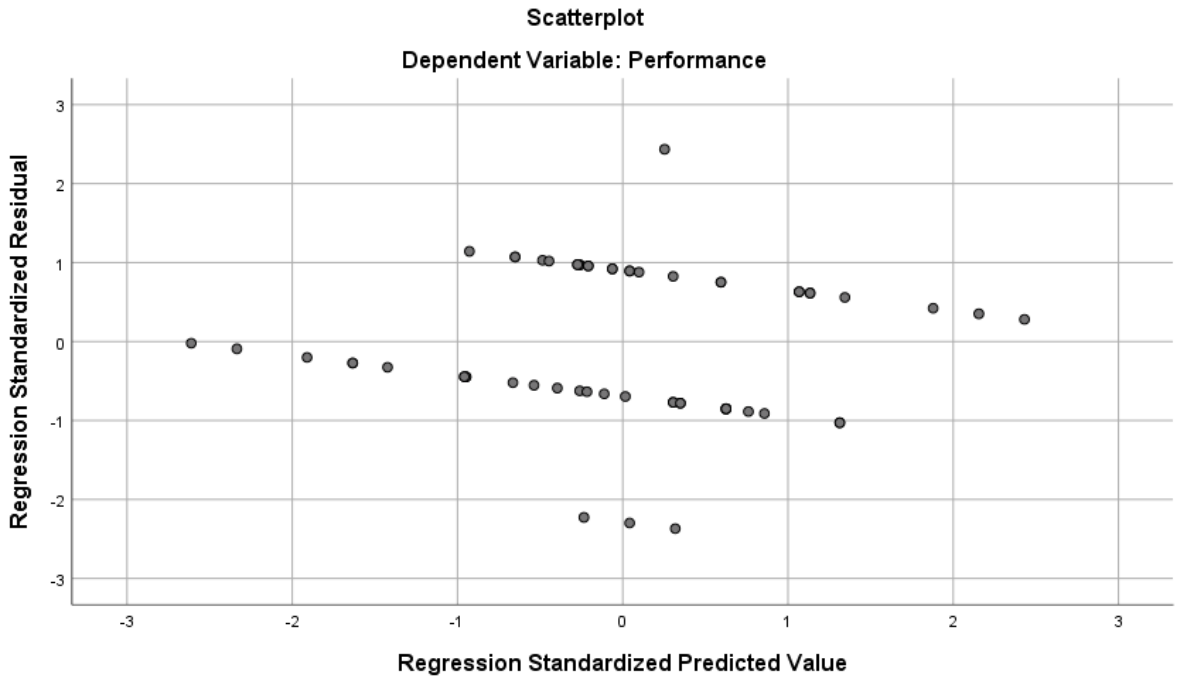


Figure 4.6: Scatterplot of standardized residuals

3. Auto Correlation (Durbin Watson Test)

Autocorrelation or independence of error refers to the assumption that error is independent of one another, implying that subjects are responding independently Stevens (2009). Durbin-Watson statistic can be used to test the assumption that our residuals are independent (or uncorrelated). This statistic can vary from 0 to 4. For this assumption to be met, the Durbin-Watson value needs to close to 2 (Field, 2006). Value below 1 and above 3 are problematic and causes for concern. To check this assumption, we need to look at the model summary box presented below.

Model	Std. Error of the Estimate	Durbin-Watson
1	.627	1.902

a. Predictors: (Constant), Stock & waste Control, Material Logistics, Material Planning, Materia Handling, Material Procurement

b. Dependent Variable: Project Performance

Table 4.5: Durbin Watson statistics

The above revels that the Durbin – Watson statistic showed that this assumption had met, as the obtained value was close to 2 (Durbin-Watson= 1.902

4. Multi – Collinearity Problem Test

Variables may move together in systematic ways when the data are the result of an uncontrolled experiment. Such variables are believed to have problems with collinearity or multi-collinearity raises, it will complicate the interpretation of the variables because it is more difficult to confirm the effect of any single variable, owning to their interrelationship.

The initial inspection of the Pearson Correlation Matrix for the regression models revealed that the correlations between the independent variables did not exceed 0.90. while checking, the independent variables showed significant relationship with the dependent variable. Also, the research checked that the correlation between each of independent variables are not too high.

Tolerance is the amount of variance in the individual variable not explained by other predictor variables. It varies from 0 to 1; a value close to 1 indicates that the other predictors do not explain the variance in that variable.

Model		Collinearity Statistics	
		Tolerance	VIF
1	(Constant)		
	Material Planning	.754	1.326
	Material Procurement	.775	1.290
	Material Logistics	.939	1.065
	Material Handling	.795	1.259
	Stock and Waste Control	.750	1.333

a. Dependent Variable: Project Performance

Table 4.6 Multi-Collinearity Test

For the assumption to be met we want VIF scores to be below 10, and tolerance scores to be above 0.2. Therefore, with regards to multicollinearity statistics shown above there was no multi-collinearity because VIF of all variables were less than 10, and tolerance score above 0.2.

4.5.1. The Effect of Construction Materials Management Practices on Project Performance

In this section the regression analysis result of in model summary, ANOVA and Coefficients discussed. In model summary the information about how two variables related with one another. The model consists of the predictor variables which used to try predicting the outcome variable (Project Performance). In this case, we have five predictor variables in the model: Material Planning, Material Handling, Material Logistic, Material Procurement and Material Stock and Control. On the model summary section R interpreted as any regular correlation coefficient. But it instead telling you the relationship between variable and all of the predictor combined. R.Square on the other hand contains the value we are most interested in, this value indicates the proportion of variation in the outcome variable (Project Performance) that can be explained by the model (i.e. Material Planning, Material Procurement, Material Logistic, Material Handling, and Material Stock and Waste). The second part the result presented on ANOVA tells us whether or not the model (Material Planning, Material Handling, Material Logistic, Material Procurement and Material Stock and Control) is significant predictor of the outcome variable (Project Performance). As the significance value is less than p=0.05, we can say that the regression model significantly predicts Project Performance. The last part is Coefficient tells us the extent to which the individual predictor variables contribute to the model. The sig column tells us whether the predictors significantly contributed to the model or not. The next beta coefficients for the model (the B values) tell us about the relationships between the outcome (Project Performance) and the five predictor variables (Material Planning, Material Handling, Material Logistic, Material Procurement and Material Stock and Control). As the predictor variables are positive, so are the relationships. Therefore, we are going to see the result of the findings one by one as follows below.

Table 4.7 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.605[a]	. 366	. 295	. 515

a. Predictors: (Constant), Stock and Waste Control, Material Logistics, Material Planning, Material Handling, Material Procurement

Source: Field Survey, 2021

Regression coefficient of R= .605 or 60.5% indicate that the relationship exists between independent variables and dependant variable. The coefficient of determination R^2 = 0.366

which show that 36.6% of variation in level of project performance explained by material management. The remaining 63.4% can be explained by other factors that are not in the model which may limit the project performance. The adjusted R-square the table shows that the dependent variable (project performance) is affected by 29.5% by independent variables (material management practices). It shows that construction material management is responsible for project performance in Bamacon Engineering PLC construction project sites.

Table 4.8 ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	8.126	6	1.354	5.106	.000b
	Residual	14.057	53	.265		
	Total	22.183	59			

a. Dependent Variable: Project Performance
b. Predictors: (Constant), Stock and Waste Control, Material Logistics, Material Planning, Material Handling, Material. Procurement

Source: Field Survey, 2021

The regression analysis explains the extent to which the independent variables predict the effect of material management practise. Test F shows the role of the independent variables to explain the evolution of the dependent variable. The value of test F (5.106 >2.402) in the ANOVA table, the model reaches statistical significance (sig=.000, $p < 0.05$) shows the regression mode is valid and can be used to analyse the dependent between variables. The independent variables will significantly explain the variance in dependent variable. Therefore, the regression model statistically significantly predicts the outcome variable (i.e., it is good fit for the data).

Table 4.9 Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.902	.828		-1.089	.281
	Material Planning	.244	.118	.323	2.065	.044
	Material Procurement	-.387	.142	-.534	-2.729	.009
	Material Logistics	.121	.072	.192	1.691	.097
	Material. Handling	.015	.123	.016	.121	.904
	Stock and Waste Control	.406	.132	.501	3.083	.003

a. Dependent Variable: Project Performance

Source: Field Survey, 2021

The above table revealed the value of beta which tells us that a certain improvement or problem on these variables will improve or decrease by the given values which is statistically significant. Therefore, the above regression model showed that the beta coefficient of material planning is .244 that means a change in one unit in material planning, the project performance changed unit of .244. The coefficient of material procurement is -.387 that means a change in one unit of material procurement, the project performance changed unit of -.387, material logistics is .121, material handling is .015 and stock and waste control is .406.

Therefore, project performance can be predicted by the following regression equation.

$Yi=b_0+b_1X_1+b_2X_2+b_3X_3+b_4X_4+b_5X_5$

Where, $b_{0,}$ = Constant, b_1 = material planning,

b_2= material procurement b_3=material logistic,

b_4= material handling b_5=material stock and waste

Project Performance*= -.902+.244(material planning) -.387(material procurement) +.121(material logistic) +.015(material handling) +-.406(stock & waste control)*

This implies that when all the variables of the study were to be held constant, the performance of the company would be at -0.902. A unit increase in material planning while other factors held constant would increase project performance by 0.244. A unit improvement in material procurement would decrease project performance by – 0.387. A unit increase in material logistics would increase project performance by 0.121. A unit increase in material handling would increase project performance by 0.015 and finally a unit change in stock and waste would increase project performance by 0.406. This is an indication of interdependence of the various variables directly influencing construction project performance. Form the formula, an improvement of from the formula a single variable will positively influence the performance of other factors others except, material procurement which the variable influences the performance negatively. Regression builds on the relationship between material planning, logistics, handling, stock and waste control; and it justifiable to argue that project success in construction companies is dependent on how theses project is aligned, except material procurement.

In view of significance at 0.05 level, the study documents the significance of each individual variables. For material planning, the p-value was 0.044, material procurement with p-value 0.009 and material stock and waste control with p-value 0.003 which is less than 0.05. But, material logistics the p-value was 0.097 and material handling the p-value was 0.904 which are insignificant. The finding by Okorocha (2017), Josephine N.Sila and Joyce Gakyobo

(2021) argued that the construction companies affected and their project performance is directly influenced by their material planning. Also Josephine N.Sila and Joyce Gakyobo (2021) argued that the construction company is affected and their success in executing their projects is directly influenced by procurement and stock and waste control. This has also been justified in the study.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMEDATIONS

This chapter is the final part of the study, which provides conclusion of the summary of major findings, recommendation of the study.

5.1. Summary of Findings

The study intended to investigate the effect of construction material management in Bamacon Engineering PLC by distributing questionnaire for selecting randomly 10 sites of the company. From the circulated questionnaires all 60 questionnaire were returned which is the response rate is 100% that is acceptable for data analysis and discussion of the research.

The background of the respondent's information of the company majority are males which account 42 (70%) of the total respondents. The profession of respondents mostly is civil engineering (65%), most of respondent's year working experience is 0-5 which is 41.7% and 58% are BSc degree holder.

The result of the descriptive analysis of material management practices indicated that material planning, material procurement, material logistics, material handling and stock and waste control have more than mean value of 3. And also, project performance has mean value greater than 3. Therefore, the result shows material management practice has effect on project performance.

The model summary of multi regression analysis revealed that $R^2 = 0.366$ which show that 36.6% of variation in level of project performance explained by material management. The remaining 63.4% can be explained by other factors that are not in the model which may limit the project performance. The adjusted R-square the table shows that the dependent variable (project performance) is affected by 29.5% by independent variables (material management practices). The regression coefficient result showed that A unit increase in material planning while other factors held constant would increase project performance by 0.244. A unit improvement in material procurement would decrease project performance by – 0.387. A unit increase in material logistics would increase project performance by 0.121. A unit increase in material handling would increase project performance by 0.015 and finally a unit change in stock and waste would increase project performance by 0.406. This is an indication of interdependence of the various variables directly influencing construction project performance and significant level of material planning, the p-value was 0.044, material

procurement with p-value 0.009 and material stock and waste control with p-value 0.003 which is less than 0.05. But, material logistics the p-value was 0.097 and material handling the p-value was 0.904 which are insignificant. The finding by Okorocha (2017), Josephine N.Sila and Joyce Gakyobo (2021) argued that the construction companies affected and their project performance is directly influenced by their material planning. Also Josephine N.Sila and Joyce Gakyobo (2021) argued that the construction company is affected and their success in executing their projects is directly influenced by procurement and stock and waste control. This has also been justified in the study. Finally, ANOVA result shows that the model significant in predicting project performance and it interpreted as F critical (5.106 > 2.402) , this signifies that the overall regression model was significant and value indicated 0.000 which is less than 0.05 therefore, it is statically significant.

5.2. Conclusions

From descriptive statistics analysis of material management practices of material planning, material procurement, material handling, material logistics and stock and waste control. And also, project performances are time performance, cost performance and productivity and waste performance have more than 3 mean values.

From multi regression analysis the effect of material management practices on project performance (time performance, on project cost performance and productivity and waste performance). Material planning and stock and waste control has positive and significant effect on project performance. Material procurement has negative but, significant effect on project performance. On other hand material logistics and handling have positive but, insignificant effect on project performance.

The ANOVA table showed that the independent variable (material planning, material procurement, material logistics, material handling and stock and waste control) statistically significantly predict the dependent variables (time, cost and productivity and waste performance), $p<0.05$ (i.e the regression model is a good fit of the data).

5.3. Recommendation

Based on the conclusion of the study the on-project performance the company should give more attention to material procurement to have better project performance. Secondly, even if material logistics and handling have positive effect but, they have statistically insignificant effect on project performance. So that the company should also give attention. This study only applicable to Bamacon Engineering PLC not to other companies. Therefore, there

should be further study. So, other researchers can study effect of material management practices on more dependent variables or project performance.

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APPENDIX

APPENDIX
ST. MARY'S UNVERSITY

SCHOOL OF GRATUATE STUDIES

DEPARTMENT OF PROJECT MANAGEMENT

Research Questionnaire

Dear Respondents,

I am a student of St. Marry University, School of Graduate Studies undertaking Master of Project Management. I am undertaking a research survey ***The Effect of Construction Material Management on Project Performance on the project sites of Bamacon Engineering PLC*** using Bamacon Engineering PLC as a case study.

As a key staff you are invited to participate in this survey. The information you provide in response to the items in the questionnaire will be used as part of the data needed for the study. All information you provide will kept in strict confidentiality, it will be used only for academic research and all respondents will remain anonymous to safeguard their privacy.

Your responses will make the paper interesting and its result will be significantly important. I would like to thank you in advance for the time you are willing to devote to fill out this questionnaire. If you have any further question, I can be reached at the address below.

Sincerely

Kalkidan Mulu
Email addresses: - moonmulu@gmail.com
Cell phone No. 0991-740571

Thank you very much

General instruction

- ❖ There is no need of writing your name
- ❖ In all cases where answers options are available please tick ( ) in the appropriate box

SECTION A: - Back ground information about the respondents please use ( ) in the relevant box for your response

1. Gender

Female: ☐ Male: ☐

2. Number of employees in your team/sites

0-10 : ☐ 0-100: ☐ 100-200: ☐ above 300: ☐

3. Profession

Civil Engineer: ☐ Quantity Surveyor: ☐ Electrical Engineer: ☐ Sanitary Engineer ☐

Other: _____

4. Experience

0-5 years: ☐ 6-10 years: ☐ 11-15 years: ☐ 16-20 years: ☐ above 20: ☐

5. Respondent's highest educational qualification

Diploma: ☐ Adv. Diploma: ☐ BSC: ☐ MSC: ☐ PHD: ☐

SECTION B: Evaluate the following construction materias practices

S\N	Measure	Responses				
		Strongly Disagree	**Disagree**	**Partially Agree**	**Agree**	**Strongly Agree**
	Construction Material Panning					
1	There is materia palaning process in the company.					
2	There is better material planning to site to eiminate project delay.					

3	There is effecient material planning to increase productivity.					
Construction Material Procurment						
4	There is over payment and ordering for materials in the company.					
5	The project manager ensures the purchasing of materials follows the standard requirement, time and quality.					
6	The Procurment procedure have impact on the company materia management.					
Construction Material Logistics						
7	There is coordination and comminication between project particpants during material flow process.					
8	There is material supply delay due to material purchase before they required.					
9	The company determine material type and quantities from the detailed design.					
Construction Material Handling						
10	There is appropriate handling of materials in the on site					
11	Materias delivered to sites undamaged					
12	There is material handlling system in the company.					
Stock and Waste Control						
13	The company stock and waste control is good.					

14	There is approprite storage location for stock near the site.					
15	Materials avaliable when required to construction site.					

SECTION C: Evaluate the following components of effect of construction material management of project perfrmance

S\N	**Measure**	**Responses**				
		Strongly Disagree	**Disagree**	**Partially Agree**	**Agree**	**Strongly Agree**
Time Project Performance						
1	Materials arrrive on time on site					
2	The project finished within the schedule due to avaliable of materials					
3	There is problem on delay on project due to poor material management.					
Cost Project Performance						
4	There is increase of construction cost due to poor quality control in material management.					
5	There is extra expense cost on labour wage due to overstock material on site.					
6	There is timely delivery of materials by supplers which reduces the rise of constructon cost.					
Productivity and Waste Project Performance						
7	There is availlability of material which motivate workers to improve work productivity					
8	There is inappropriate storage location which increases					

	unproductive inputs due to workers longer time and effort to carry materials					
9	There is Efficient site layout for material movement which increases productivity while reduces material travel time					
10	There is material wastage due to lack of coordination among the workers on construction site					
11	There is waste generation due to inappropriate material storage					
12	There is Efficient material management practice which minimize waste generation throughout entire construction process.					
13	There is waste mininimization strategies in the company					