ADDIS COLLEGE

DEPARTMENT OF CONSTRUCTION TECHNOLOGY MANAGEMENT

M.SC IN CONSTRUCTION TECHNOLOGY MANAGEMENT

The Effect of Construction Material Management on Project Performance: The Case of Addis Ababa Housing Projects

By

Fitsum Mulatu

A Thesis Submitted to Addis College, Department of construction technology management in Partial Fulfillment of the requirements for the degree of Master of Science in construction technology management

March, 2025

Addis Ababa, Ethiopia

ADDIS COLLEGE

DEPARTMENT OF CONSTRUCTION TECHNOLOGY MANAGEMENT

M.SC IN CONSTRUCTION TECHNOLOGY MANAGEMENT

The Effect of Construction Material Management on Project Performance: The Case of Addis Ababa Housing Projects

By

Fitsum Mulatu

Advisor: Degnachew Adugna (PhD)

A Thesis Submitted to Addis College, Department of construction technology management in Partial Fulfillment of the requirements for the degree of Master of Science in construction technology management

March, 2025

Addis Ababa, Ethiopia

Declaration

This is to declare that the thesis entitled "**The Effect of Construction Material Management on Project Performance: The Case of Addis Ababa Housing Projects**", submitted in partial fulfillment of the requirements for the degree of Master of Science in construction technology management under department of Construction Technology Management, Addis College , is a record of original work carried out by me and has never been submitted to this or any other institution to get any other degree or certificates. The assistance and help I received during the course of this investigation have been duly acknowledged.

_____	_____	_____
Fitsum Mulatu	Signature	Date

ADDIS COLLEGE

SCHOOL OF GRADUATE STUDIES

Department Of Construction Technology Management

Approval of Thesis for defense

I hereby certify that I have supervised, read, and evaluated this thesis titled "**The Effect of Construction Material Management on Project Performance: The Case of Addis Ababa Housing Projects**" prepared by **Fitsum Mulatu** under my guidance. I recommend the thesis to be submitted for oral defense.

_____	_____	_____
Advisor's name	Signature	Date

Letter of Certificate

As members of the board of examiners, we examined this thesis entitled "The Effect of Construction Material Management on Project Performance: The Case of Addis Ababa Housing Projects" By Fitsum Mulatu.

This thesis work is original and suitable for the submission in partial fulfilment of the requirements for the award of Master of Science in construction technology management.

Approval Board Committee:

_____	_____	_____
Research Advisor	Signature	Date
_____	_____	_____
Internal Examiner	Signature	Date
_____	_____	_____
External Examiner	Signature	Date
_____	_____	_____
Chair Person	Signature	Date
_____	_____	_____
School Dean	Signature	Date

Acknowledgment

I would like to express my heartfelt gratitude to the following individuals and organizations for their invaluable support and contributions to the success of this research paper.

First, my special gratitude goes to my advisor Degnachew Adugna (PhD) for his patience and guidance throughout the process of this thesis. I would also like to thank my family who assisted me in various ways. Last but not least, I extend my sincere appreciation to the entire staff members of Addis Ababa Housing project workers for providing me with the necessary data and information that enabled me to conduct this study. I am grateful for all respondent who spare their time to participate in my survey and provide me with their invaluable insights and feedback.

Abstract

The objectives of this project is analyze the effect of construction material management on the performance of housing projects. The research was conducted using a quantitative approach with descriptive and explanatory research design. In this research, a stratified sampling technique was used & a total of 60 questionnaires were given to construction professionals for this study, with 55 complete responses were gathered for analysis. The data was analyzed quantitatively using descriptive and explanatory statics method in SPSS—20. Overall, the study's findings demonstrated that the level of construction material management practice in Addis Ababa Housing project is found to be good (agree range) and from which Construction Material Logistics practice is higher whereas Construction Material Planning has lowest rate of practice. The study also found that construction material management practices have a strong and significant effect on the performance of housing in. The study also identified possible strategies that can enhance the effectiveness of construction project material management practice in housing projects. These solutions include digital inventory systems, improving communication and coordination among project stakeholders, enhancing project planning, prefabrication and modular construction techniques & based on regression analyses, 79.4% of the variance in performance of housing can be predicted by the construction material management practice. Therefore, construction material management practice has a positive and significant effect on the performance of housing. Finally, this research recommends to provide training and capacity building for construction workers and stakeholders on construction material management practices. Encourage the use of technology & Develop and implement standard operating procedures.

Keywords: construction projects, material management, performance, housing, and Addis Ababa Housing project

Contents

Declaration III
Approval of Thesis for defense IV
Letter of Certificate V
Acknowledgment VI
Abstract VII
List of Tables XI
List of Abbreviation and Acronym XII
CHAPTER ONE: INTRODUCTION 1
1.1 Introduction 1
1.2 Background of the study 1
1.3 Statement of the problem 3
1.4 Objective of the study 5
1.3.1 General Objective 5
1.3.2 Specific Objectives 5
1.5 Research Questions 6
1.6 Significance of the study 6
1.7 Scope of the study 7
1.7 Limitation of the study 7
1.8. Organization of the Study 8
CHAPTER TWO: LITERATURE REVIEW 9
2.1 Introduction 9
2.2 Conceptual Literature 9
2.2.1 Definition of Key Terms 9
2.3 Theoretical Review 11
2.3.1 Material Management on Construction Project 11
2.3.2 Materials Management Processes 12
2.3.3 Project Performance 16
2.4 Empirical Literature Review 18
2.4.1 Impact of construction materials management on the performance of projects 19
2.4.3 Impact of construction materials management on the performance of projects in Ethiopia 22
2.4.4 Strategies to improve the management of construction materials 22

2.5 Policy & strategies of construction materials management in Ethiopia 24
2.6 Best Practices of construction material management 25
2.6.1 Construction material management practice in developed Countries 25
2.6.2 Construction material management practice in developing Countries 28
2.7 Research Gap 30
2.8 Conceptual Framework 30
CHAPTER THREE: RESEARCH METHODOLOGY 32
3.1 Study Area 32
3.2 Research Approach & Research Design 33
3.2.1 Research Approach 33
3.2.1 Research Design 33
3.3 Sample and sampling design 33
3.3.1 Population 33
3.3.2 Sample 34
3.3.3 Sampling technique 34
3.4 Data types & Sources of Data 35
3.4 Method of data collection 35
3.6.1 Questionnaire 35
3.6 Data Analysis & Presentation 36
3.6.1 Methods of Data Analysis 36
3.7 Data Validity and Reliability 37
3.8. Ethical Consideration 38
CHAPTER FOUR: RESULTS AND DISCUSSIONS 39
4.1. Response Rate of Respondents and Demographic Characteristics 39
4.1.1 Response rate 39
4.1.2 Demographic Characteristics of the respondents & the Company 39
4.3.1 Respondent information 39
4.2 Practices of construction materials magement in the project 43
4.2.1 Descriptive Analysis 43
4.3.1 Construction material management practice 44
4.3.2 Performance 48
4.3 Effects of construction materias management practices on the performance of housing projects 49

4.4 Strategies to improve the construction material magement of AAHP projects 55
CHAPTER FIVE: CONCLUSIONS, AND RECOMMENDATIONS 59
5.1. Introduction 59
5.2 Summary of major findings 59
5.2 Conclusions 60
5.2. Recommendations 61
References 62
Appendix I – Data collection tools 67
Questionnaire for construction workers 68

List of Tables

Table 3.1: Cronbach's Alpha (Reliability analysis)..... 38
Table 4.1: Questionnaire survey response rate 39
Table 4.2: Respondent position..... 39
Table 4.3: Respondent's highest educational qualification 40
Table 4.4: Respondents work experience (years) 41
Table 4.5: Employees number in your team/sites..... 41
Table 4.6: Experience of the company on this construction project (in years)..... 41
Table 4.7: Type of organization you are working for? 42
Table 4.8: Construction Material Planning..... 44
Table 4.9: Construction Material Procurement..... 45
Table 4.10: Construction Material Logistics 45
Table 4.11: Construction Material Handling 46
Table 4.12: Stock and Waste Control 47
Table 4.13: Overall construction material management practice 47
Table 4.14: project performance..... 48
Table 4.15: Overall quality of housing 49
Table 4.16: correlation between CMM and performance of housing..... 51
Table 4.17: Model..... 52
Table 4.18: ANOVA..... 53
Table 4.19: Distribution of Coefficients..... 54

List of Abbreviation and Acronym

AAHP	Addis Ababa Housing Project
BIM	Building Information Modeling
CMPl	Construction Material Planning
CMPr	Construction Material Procurement
CMLo	Construction Material Logistics
CMH	Construction Material Handling
CPI	Cost performance Index
CTP	Construction Time Performance
GDP	Gross Domestic product
JIT	Just-in-time
PM	Project Management
PMI	Pennsylvania Project Management Institute.
PMBOK	Project management body of knowledge
PMP	Project Management Performance
PP	Project Productivity Performance
RFID	Radio frequency identification
SPSS	Statistical Package for Social Sciences
SWC	Stock and Waste Control
TP	Project Time Performance

CHAPTER ONE: INTRODUCTION

1.1 Introduction

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). In this section, the researcher presented introduction of the subject under study. To begin with, the researcher present background of the study and statement of the problem that drives this study. In addition, the researcher described the objectives and research question of the research. Finally, significance, scope and Limitation of the study are presented.

1.2 Background of the study

Construction industry plays an important role in social, economic & political development of a country. Construction is not only one of the major sectors of an economy but it is also the largest and accounts from 12% to 25% of the GNP of both developed & developing countries. 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.

Similar to the case with other developing countries, the Ethiopian construction industry shares many of the problems and challenges the industry is facing in other developing countries, perhaps with greater severity. However, materials management is a major problem in the Ethiopian construction industry that has important implications for the efficiency of industry due to lack of effective management and planning (Asmara,2015).

Ethiopia is one of Africa fastest growing, most vibrant economies. Enjoying double digit GDP growth year on year for the past decade (Kalkidan, 2021). Construction material is a critical element in the construction project as it contributes a major portion to the cost of projects.

Addis Ababa housing projects in Ethiopia have witnessed rapid urbanization and population growth, leading to an increased demand for residential infrastructure. However, the efficient management of construction materials in these projects has remained a significant challenge. Inadequate materials planning, procurement, storage, and distribution have resulted in project delays, cost overruns, and compromised quality. The lack of systematic materials management practices has hindered the timely completion of housing projects, impacting the overall development goals of the city.

Over time, efforts have been made to improve materials management in the Addis Ababa housing projects. Initially, the projects faced issues such as unreliable suppliers, inadequate storage facilities, and inefficient logistics systems. However, with the recognition of these challenges, stakeholders began implementing measures to enhance materials management practices. This included the establishment of standardized procurement processes, the introduction of inventory management systems, and the improvement of supply chain coordination. These interventions aimed to streamline the flow of materials and minimize delays, thereby improving project performance.

Despite the progress made, the current condition of materials management in the Addis Ababa housing projects still requires attention. Challenges persist, such as inconsistent availability of construction materials, unreliable suppliers, and inadequate storage infrastructure. These issues have a direct impact on project schedules, leading to delays and cost escalations. Additionally, the lack of transparency in procurement processes and limited coordination among stakeholders

further exacerbate the problems in materials management. To achieve the desired outcomes in the housing projects, it is crucial to assess the current state of materials management and identify areas for improvement.

Long et al (2004) remarked that performance problems arise in large construction projects due to many reasons such as: incompetent designers/contractors, poor estimation and change management, social and technological issues, site related issues and improper techniques and tools. Navon (2005) stated that the main performance problem can be divided into two groups: (a) unrealistic target setting (i.e., planning) or (b) causes originating from the actual construction (in many cases the causes for deviation originate from both sources).

This research will mainly focus on the impact of construction material management on project performance on Addis Ababa Housing construction Project. 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 Addis Ababa Housing Project constructions.

1.3 Statement of the problem

Similar to the case with other developing countries, the Ethiopian construction industry shares many of the problems and challenges the industry is facing in other developing countries, perhaps with greater severity. Materials management is a major problem in the Ethiopian construction industry that has important implications for the efficiency of industry due to lack of effective management and planning (Asmara, 2015).

In Addis Ababa housing projects, most of the projects problems and challenges regarding materials management. Some of the problems they are facing are manual based materials management which implying that it requires a huge human labor for such management. Moreover, it is time taking and difficult to update the addition and subtraction of materials.

One of the main problems related to performance in the construction industry is time and cost overruns. According to a study by Holm et al. (2002), "construction projects are prone to significant time and cost overruns, resulting in lower profitability and a negative impact on the industry's reputation." These overruns can be caused by a lack of planning, poor communication, and unexpected events such as weather conditions and supply chain disruptions.

It is also observed that there is gap in proper construction materials management. Most time construction workers such as daily labors & subcontractors resides without a task because of lack of certain construction materials. These results a delay in the projects and low performance measurement. Shortage of skills of manpower, poor supervision and poor site management, and breakdown of construction materials among others contribute to construction delays and low performance of Addis Ababa housing projects. The other problem regarding construction materials management are poor storage, lack of supply chain &poor planning of construction materials before consumption.

Lan (2008), opined that the rate at which materials have been squandered on site due to poor management is getting too rampant in our society and if not curbed, it can jeopardize the future of our construction industry. This is particularly true in view of the fact that mismanagement of construction resources (i.e. materials, plants and labor) affects the continuity and profit margin of such project and if not checked can lead to technical insolvency or bankruptcy . Therefore,

attention must be paid to how materials are been procured, stored and managed in order to achieve perfect work, effective handling of materials, right usage of materials and control of construction resources.

Other research carried out in Ethiopia had shown that construction materials constitute 57% of the total budget allocated for construction works (Addise, 2005). Therefore, efficient procurement and handling of material represent a key role in the successful completion of the work. It is important for the project manager to consider that there may be significant difference in the date that the material was requested or date when the purchase order was made, and the time at which the material will be delivered. These delays can occur if the contractor needs a large quantity of material that the supplier is not able to produce at that time or by any other factors beyond his control.

Therefore, attention must be paid to how materials are been procured, stored and managed in order to achieve perfect work, effective handling of materials, right usage of materials and control of construction resources.

1.4 Objective of the study

1.3.1 General Objective

The General Objective of this study is to investigate the effect of construction material management practices on the performance of housing projects run by the Addis Ababa Housing bureau.

1.3.2 Specific Objectives

1. To asses the practices of construction materials magement in Addis Ababa Housing Projects.
2. To asses the level of project performance of in Addis Ababa Housing Projects.

3. To investigate the effects of (Construction Material Planning, Construction Material Procurement, Construction Material Logistics, Construction Material Handling & Stock and Waste Control) on the performance of Addis Ababa Housing Projects.
4. To develop strategic tools that improve construction materials magement.

1.5 Research Questions

Based on the identified research problem & objective, the research questions are formulated as follows and the study will try to provide answers for the following major questions:

1. What is the level of construction material magement practice in AAHP?
2. What is the level of project performance in AAHP?
3. What is the effect of (Construction Material Planning, Construction Material Procurement, Construction Material Logistics, Construction Material Handling & Stock and Waste Control) on the performance of AAHP?
4. Which strategic tools are important to improve construction material magement of AAHP?

1.6 Significance of the study

This study will also be significant in analysis, and implementation of policies and strategies to ensure and improve construction material management practice in the construction site. From a policy standpoint, this research enables lawmakers, government agencies, and industrial organizations to assess existing regulations, policy frameworks, and guidelines related to construction material management.

In addition, from an academic point of view, this study can also be used as a guide to Addis College students and other researchers as reference for future study by showing gaps where other

possible future study can be conducted. By investigating and understanding factors that contribute to construction material management, researchers can advance knowledge and develop innovative theories, models, and tools that are applicable to diverse industries and settings. Such research provides vital insight for educators, practitioners, and decision-makers striving to better construction material management practice.

1.7 Scope of the study

1.7.1 Thematic scope: The research focuses on the Effect of construction material management practice in construction projects. Despite the fact that material management is a broad topic, the focus of this study is entirely on construction site material management.

1.7.2 Spatial scope: This research focused on assessing the effect of construction material management practice in Addis Ababa Housing projects which are located in different sub cities of Addis Ababa, Ethiopia. Addis Ababa will be chosen due to the availability of appropriate data and the researcher's convenience.

1.7.3 Temporal Scope: This research employed a cross-sectional research design, and its primary data collection involved the use of various methods such as structured questionnaires, interviews for two months in 2017 E.C. Review of secondary data, including relevant reports and statistical information took 6 months.

1.7 Limitation of the study

Critical limitations of the study include the following main points: Other significant elements that may have affected construction material management and dimension of performance were not taken into consideration due to the researcher's limited awareness of these aspects.

Additionally, the lack of time to collect and correctly evaluate the data limits the amount of data that can be collected. The research address only some public housing building construction projects and the finding of the result may not represent as a general representation in the construction industry.

1.8. Organization of the Study

The organization of this research were structured as follows: The following is the proposed structure for this research: Chapter One: Introduction - This first chapter covers the study's background, problem statement, research questions and objectives, limitations, significant of the study, and chapter outline. Chapter Two: Review of the Literature - This chapter reviews earlier studies conducted by different researchers in the construction sector. Textbooks, papers, journals, and dissertations on performance and the impace of building material management practice on housing performance review fall under this category. Chapter Three: Methodology - In order to accomplish the study's goals and objectives, the research approach used is described in this chapter. It goes on the research population, sampling strategy, administration of the tools, data gathering tools, data analysis methods, and model formation. Chapter Four: Analysis and Discussion - In this chapter, the data that was acquired is presented. It comprises a description of the research findings, an analysis of the results, and graphical and tabular results depiction. Chapter 5: Summary, conclusions, and suggestions - A review of the results, general conclusions, and last suggestions for additional research in the field are given in this concluding chapter.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter reviews materials management practices on construction projects. Firstly, it describes the definition of materials management, managing construction materials and the process of materials management. Secondly, it discusses the current problems that often occur with materials management practices and the approaches to address these problems, followed by a discussion of the implementation of current technologies, advantages and the limitations.

2.2 Conceptual Literature

2.2.1 Definition 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).

The Webster's dictionary defines materials as "the elements, constituents, or substances of which something is composed or can be made." Ballot (1971) defines materials as the physical materials that are purchased and used to produce the final product and does not suggest that materials are the final product. In other words, materials are the parts used to produce the final product.

According to Wanjogu, Iravo & Arani (2015) Material Management is 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. While Eduardo (2002) viewed materials management as 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, are obtained at a reasonable cost and most importantly are available at the point of use when required.

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 (Shehu, Holt, Endut, Akintoye, 2015).

2.3 Theoretical Review

2.3.1 Material Management on Construction Project

Construction material management has significantly evolved over the years. During the early stages of construction, materials were managed in a more manual and time-consuming manner. The process involved manual procurement, handling, and tracking of materials, often leading to inefficiencies and wastage. With the advent of industrialization, construction materials began to be produced in large quantities and varieties, necessitating better organization and management. However, it was not until the 20th century that formal methods of construction material management began to be developed and implemented, such as the just-in-time (JIT) system, which aimed to minimize waste by receiving materials only as they were needed in the production process (Koskela, 1992).

In the late 20th and early 21st century, the advent of computer technology brought about a significant revolution in construction material management. Computer-based systems enabled more efficient handling of construction materials, from procurement to disposal. This allowed for real-time tracking, forecasting, and optimization of material usage, leading to cost savings and reduction in project delays (Navon, 2005). Additionally, technologies such as Building Information Modeling (BIM) emerged, which allowed for better visualization, simulation, and management of construction materials throughout the project lifecycle (Eastman, et al., 2011).

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. According to Barry, Leite & O'Brien (2014) material management is important because the outcome of every construction projects relay on having all proper resources such as materials, labors, plants and equipment delivered to a site at appropriate time. The construction industry is the most significant industry in the economy and the successful measure with completion within time, budget, accordance with specification and satisfaction of stakeholders (Nguyen & Ogunlana, 2004). Construction projects are complex, with many organizations involved such as clients or owners, architects, engineers, contractors, suppliers and vendors (seller). This includes the heterogeneous and often complex process of producing unique, large and immovable products with a supply of the resources (money, equipment, material, and labor).

Construction is the process of physically erecting the project and using construction equipment, materials, supplies, supervision, and management necessary to accomplish the work (Clough & Sears, 2000).As projects grow in scale, complexity, materials management becomes more difficult, frequently requiring the use of appropriate tools, and techniques to ensure, amongst other things, that materials are delivered on time, stock levels are well managed, the construction schedule is not compromised, and that wastage is minimized.

2.3.2 Materials Management Processes

Materials management processes involve the planning, procurement, handling, stock and waste control, and logistics surrounding materials on construction projects. A good materials management environment enables proper materials handling on construction sites. In order to better understand materials management the following processes are discussed: planning, procurement, logistics, handling, stock and waste control, storage of materials.

Planning

The process of planning construction methods has been defined as "understanding what has to be built, then establishing the right method, in the most economical way to meet the client's requirements" (Illingworth, 1993). The materials planning process covers setting up and maintaining the records of each part used in each plant to determine target inventory levels, and delivery frequency (Payne, Cliclsoin, and Rcavill, 2006). As a result, an excellent management of the 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.

Stukhart (1995) mentioned that material planning would provide guides to all the Subsequent activities and that this could have a great impact on the project plan. The materials planning process covers the set up and maintenance of records and determines the target inventory levels, and delivery frequency Payne et al. (2006).Planning of access and routing of materials within a construction site has an important implication for the development of an effective materials management strategy (Faniran and Caban, (1998); Ogunlana, Promkuntong, Jeark(1996) particularly in terms of increasing productivity and profit, and facilitating the timely completion of construction projects (Wong and Norman, 1997). The objective of efficient materials planning is, to increase productivity and profit of the company, and facilitate the completion of construction projects. Thus, better planning of raw materials on site can help to eliminate project delays and reduces activity times, resulting in better service.

Chandler (2008) said schedule is a list in a diagrammatic presentation indicating requirement of resources. And aid used in the ordering of material is schedule. Materials gratuity will be required to be taken off from the drawing and must show:-quantity required to be fixed; waste allowed in the estimate; gratuity to be ordered; date of delivery ; cost includes in the estimate.

Procurement

The term procurement encompasses a wide range of activities that includes purchasing of equipment, materials, labour and services required for construction and implementation of a project (Barrie and Paulson, 2002). Purchasing materials from the best source, at the right price and with timely delivery are challenges of many construction companies. Therefore, a control strategy is needed during materials procurement to achieve the targeted objectives. All requests for quotations and purchases must be initiated through a properly authorized requisitioning procedure normally controlled by the Project Manager. The Project Manager must ensure that the purchasing of materials follows the standard requirement, time and quality.

The objective of procurement in materials management is to provide quality materials at the right time and place, and at an agreed budget. Payne et al. (2006) stated that procurement is about organizing the purchasing of materials and issuing delivery schedules to suppliers and following-up, to make sure that suppliers deliver on time.

According to Lamer (2007), purchasing is one of the basics functions common to all type of business enterprise. These functions are basic because no business can operate without them all business are administered or managed by coordinating and integrating those six functions:- Creation, the idea of design function; Finance, the capital acquisition records function; Personnel, the human resources and labour relation function; Purchasing, the buying of required equipment, material, and services; Conversion, the changing of material to economic goods & Distribution, the selling or marketing of goods produced.

Logistics

Logistics is a concept that emphasizes movement and i t encompasses planning, implementing, and controlling the flow and storage of all goods from raw materials to the finished product to meet customer requirements (Stukhart, 1995). Raw materials for construction are usually varied, bulky and heavy and required proper handling in the supplying process. Consequently, the construction industry requires active movement of materials from the suppliers to the production area in both the factory and the work site. The primary focus of the logistics concept in construction projects is to improve coordination and communication between project participations during the design and construction phases, particularly in the materials flow control process (Pheng and Chuan, 2001).

The primary focus of the logistics concept in construction projects is to improve coordination and communication between project participations during the design and construction phases, particularly in the materials flow control process Agapiou, Clausen, Flanagan, Norman and Notman (1998). They also mentioned that Problems arise in the materials flow control process which includes delays of materials supply, due to some materials purchased just before they are required and waste of materials during storage, handling and transporting when procured in large quantities without complying with the production needs on site. The previous research suggested that, the routing of materials is one of the main causes which affect cost and time during construction projects (Varghese and O'Connor, 1995).

Handling

This involves handling, storing, and controlling of the construction materials. Therefore, materials handling provides movement to ensure that materials are located and that a systematic approach is required in designing the system. Handling of materials is the flow component that provides for their movement and placement.

The importance of appropriate handling of materials is highlighted by the fact that they are expensive and engage critical decisions. Due to the frequency of handling materials there are quality considerations when designing a materials handling system. The select ion of the material handling equipment is an important function as i t can enhance the production process, provide effective utilization of man power, increase production and improve system flexibility (Chandler, 2002).

Stock and Waste Control

Delivery of the bulk of the construction materials requires proper management of the stock control. Stock control is a technique to ensure all items such as raw materials, processed materials, components for assembly, consumables stores, general stores, maintenance materials and spares work in progress and finished products are available when required (Prabu and Baker, 2006).

The cause of waste in construction projects indicates that waste can arise at any stage of the construction process from inception, right through the design, construction and operation of the built facility. Therefore, waste can be reduced through the careful consideration of the need for minimization and better reuse of materials in both the design and construction phases (Dainty and Brooke, 2004).

2.3.3 Project Performance

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).

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).

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 firm, enhancing market share and attaining certain level of profitability (Kirkpatrick & Feeney, 2015)

2.4 Empirical Literature Review

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 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 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.

2.4.1 Impact of construction materials management on the performance of projects

Several studies in developed countries have found effective materials management to positively influence project performance. Advanced technologies like RFID and barcoding aided materials

tracking and improved productivity in construction projects in developed nations (Goodrum et al., 2006).

Goodrum et al. (2006) studied 40 construction projects in the United States to evaluate the relationship between materials management practices and project performance indicators like cost and schedule. The researchers found that projects employing effective procurement planning, inventory control techniques and just-in-time delivery approaches experienced significantly fewer delays and cost overruns compared to those with ad-hoc materials management processes. They also reported reduced project delays and cost overruns with proper procurement and inventory planning of materials.

A study by London and Kenley (2001) focused on industrial construction projects in the UK and Australia to quantify the benefits of lean materials management practices. Adoption of strategies like minimizing on-site inventories, reducing materials waste and optimizing procurement costs was observed to positively influence project objectives related to cost, schedule and productivity. Similar benefits of just-in-time delivery, minimized waste and optimized costs were reported in studies from the UK and Australia (; Lu & Kumar, 2003).

Holmström et al. (2002) conducted case studies and pilot implementations using auto-ID technologies like RFID and barcoding for real-time tracking of construction materials on projects in Sweden and Finland. Evaluation of the projects demonstrated improved productivity, lower errors and greater visibility of materials information enabled by advanced identification solutions.

In Germany, Kreye et al. (2015) surveyed construction managers to understand the impact of digital technologies for materials ordering, delivery and inventory on performance indicators.

Results showed faster ordering times, lesser lost or damaged materials, and overall cost savings attributed to BIM-integrated materials management systems.

Theodoju and Evangelinos (2016) analyzed post-occupancy data from 5 hospital infrastructure projects in Australia to gauge influence of materials pre-assembly, vendor managed inventory and subs assembly on schedule, defects and safety outcomes. Statistically significant enhancements were reported from streamlined, off-site centric materials processes.

Research from developing countries reports more challenges in materials management due to shortage of skilled manpower, infrastructure and technology adoption (Ofori, 2012). Projects in India experienced rework, variation orders and reduced efficiency due to unplanned procurement, delayed supplies and spoilage of materials (Sharma & Kumar, 2017). They found high incidences of rework, variation orders and decreased efficiency attributable to unplanned procurement activities and late deliveries.

A study in Nigeria found that over 50% of project time was lost in materials management activities due to inefficient processes and lack of standardization (Okoroh et al., 2016). However, with proper planning tools, store management practices and communication systems, developing nations like Thailand and Brazil showed improvements in project schedule control and cost savings (Fornari et al., 2018).

Tay and Ooi (2001) investigated how adoption of planning and control tools like MRP and JIT influenced materials management in high rise building projects in Malaysia. Their findings suggested better schedule adherence and lower materials costs with application of such techniques.

2.4.3 Impact of construction materials management on the performance of projects in Ethiopia

In Ethiopia, the construction industry contributes significantly to the economy but faces challenges in project delivery (Dibadu, 2015). Several studies have reported cost overruns and delays caused due to poor materials planning, procurement irregularities and lack of warehousing facilities (Shiferaw, 2016; Hadush, 2018). Construction firms in Ethiopia have low adoption of modem materials management techniques due to skilled manpower shortage and inadequate supply chain infrastructure (Yitayew & Haile, 2016). While Ethiopia aims to fast track its infrastructural development, effective materials management practices customized for the local context need to be implemented to boost project success rates (Nigussie et al., 2021).

Shiferaw (2016) specifically analyzed cost overruns plaguing road construction projects in Ethiopia. Results attributed 30-40% of overruns to deficient materials planning, purchase delays and inventory storage difficulties on sites. Using questionnaire surveys, Hadush (2018) collected perspectives of construction professionals on critical success factors for Ethiopian projects. Effective materials management emerged as a top requirement but current implementation was found to be weak.

2.4.4 Strategies to improve the management of construction materials

The United States construction industry can improve materials management through increased use of prefabrication and modularization. Prefabricated components manufactured off-site can reduce material waste by 5-10% compared to traditional construction (Tam et al, 2007). Centralizing fabrication also allows for tighter quality control and inventory management.

In the United Kingdom, adopting just-in-time (JIT) delivery systems has shown promise for reducing excess inventory and delivery costs. A case study of a UK construction firm found 20%

lower material inventory levels after implementing JIT procurement and logistics (Sozen et al, 2002). Closely coordinating orders and deliveries to match project schedules minimizes storage needs.

Germany's construction sector has benefitted from implementing advanced tracking technologies like RFID tagging. Tracking material orders, deliveries, and on-site inventories provides transparency that helps prevent losses. A study of an RFID system at a German construction site reduced material losses by 30% (Ergen et al, 2007). RFID tracking can also prevent theft and unauthorized use of supplies.

In Japan, offering specialized training programs for construction personnel has improved on-site materials management. A 30-hour course on workflow, inventory, procurement, and handling methods reduced material waste by 18% among trained contractors (Kubassova et al, 2019). Standardizing techniques through education prevents improper practices that lead to excessive waste.

Partnering with suppliers has allowed Australian builders to improve material delivery coordination. A construction firm collaborating closely with suppliers cut logistics costs by 24% by sharing demand forecasts and synchronizing orders and deliveries (Wong et al, 2009). Supply chain integration provides benefits through all phases from purchasing to delivery.

In India, implementing materials management software has improved tracking and planning in construction projects. A study of 20 Indian firms found 10-15% reductions in material costs after implementing inventory management systems (Jain et al, 2013). Digital management provides real-time data to prevent stock-outs and over ordering.

To address excessive material waste in Nigeria's construction industry, training programs have been launched to teach proper materials handling. A 5-day training program reduced wood waste by 30% by instructing workers on correct storage, use, and disposal methods (Idoro, 2008). Education is key to changing inefficient practices.

Adopting prefabrication and modular construction has risen in Malaysia to improve quality and reduce waste. A public housing project using precast components lowered material costs by 20% compared to conventional construction (Chiang et al, 2006). Prefabrication allows better standardization and less site mishandling.

Partnering with suppliers has become a common materials management strategy in Thailand's construction industry. A study found subcontractors able to cut material lead times by 50% when working closely with vendors on procurement planning (Wong et al, 2018). Supply chain collaboration optimizes the material purchasing process.

Yitayew and Haile (2016) examined level of modern materials management adoption in the local construction industry. They identified bottlenecks such as skills shortage, limited supply chain infrastructure and manual processes impeding best practices. Nigussie et al. (2021) emphasized the need for customized materials management solutions that suit domestic project contexts in Ethiopia's infrastructure and development agenda. Improvement initiatives must address unique local issues around resources, processes and technology absorption.

2.5 Policy & strategies of construction materials management in Ethiopia

Literature reviewed in relation regarding local practice is limited. However it is not focused directly on the professionals' perspective, there was a survey which was done at

Bahirdar University on the title that construction materials management on project sites of Bahirdar town (Wubishet ,2013)

The survey results show that contactors, in general, are interested in using many tools of managing construction materials. However, most contractors did not actually apply some tools and techniques of construction materials management such as: Creating database for materials categories, local suppliers, international suppliers, and materials cost. Providing a list of materials in project, providing material cards at site store, and recording the received materials on site.

Even the few contractors who used the above-mentioned tools and techniques, they applied these tools either without recording at all or with recording in an unsystematic way without using manual or computerized forms. Most contracting companies manage construction materials using non computerized forms. Shortage of suitable construction materials management software is considered the main obstacle to computerize materials management processes. Another important factor is lack of qualified persons in using computerized construction materials management packages. There is a consensus amongst contractors on the importance of using a computerized construction materials management system.

2.6 Best Practices of construction material management

2.6.1 Construction material management practice in developed Countries

2.6.1.1 Japan

Japan has a well-established construction material management system that focuses on reducing waste and recycling materials. All construction materials are tracked from delivery to usage and

disposal. Residual materials are sorted into recyclable and waste categories. Wood, steel, and concrete scraps are recycled for reuse in other construction projects (Sakai et al. 2015). Contractors are required to submit detailed material utilization plans and reports to ensure minimal waste (Ojima et al. 2016). These plans optimize material procurement, cutting, and usage to maximize efficiency (Ojima et al. 2016). As a result, Japan's construction waste recycling rate is over 90% (Sakai et al. 2015).

2.6.1.2 United Kingdom

The United Kingdom takes a collaborative approach to construction material management involving all key stakeholders. Clients, contractors, material suppliers, and government agencies work together through the Considerate Constructors Scheme to minimize material waste, reuse resources, and reduce overall environmental impacts. Specialized material management plans outline logistics, procurement strategies, and waste reduction targets for each project. Material suppliers provide traceability and data analytics tools to track materials throughout the construction life cycle. The UK government also provides financial incentives and policy support for green construction initiatives (Mu, et.al 2017).

2.6.1.3 Germany

Germany's material management system focuses on utilizing industrial by products and recycled materials for construction inputs. More than 70% of construction aggregates used in Germany come from recycled sources like demolished concrete and asphalt. Innovative technology allows for high-quality recycling of materials like glass and polymers for construction applications. Strict government regulations promote the use of recycled and secondary materials by requiring contractors to meet recycling quotas and sourcing a certain percentage of materials from

secondary sources. These policies have helped Germany achieve a construction waste recycling rate over 80% (Grich et al. 2018).

2.6.1.4 Sweden

Sweden aims to be a zero-waste economy by 2030 and its construction industry is playing a leading role. All major construction projects incorporate resource efficiency and circular economy principles from the early design stage. Digital tools are widely used to optimize material selection, design, and fabrication to minimize material waste. Construction material takeback programs collect nearly all remaining waste materials for recycling and reuse within the industry. Sweden also has a well-developed market for recycled construction materials, providing economic incentives for waste recovery and minimization. As a result, Sweden's construction waste recycling rate exceeds 85% (NordTest Report 2015).

2.6.1.5 Canada

Canada's construction industry exhibits some best practices for material management but still has considerable room for improvement. Material management plans focusing on waste reduction and recycling are increasingly common on large projects. Education and training programs are raising awareness around the importance of resource efficiency among construction professionals. However, advances have been hampered by a lack of government incentives, voluntary reporting systems, and industry-wide collaboration around sustainable material management. Moving forward, key priorities for Canada include strengthening policy frameworks, developing markets for recycled construction materials, and promoting technology adoption for traceability and optimization (Akinade et al. 2017).

2.6.2 Construction material management practice in developing Countries

2.6.2.1 China

China has made great strides in improving construction material management. Strict regulations require demolition waste recycling rates of at least 90% for large projects. Material tracking systems help contractors meet quotas and optimize material utilization. The Chinese government also promotes research into new recycling technologies and alternative construction materials. However, enforcement of regulations remains weak and incentives for waste reduction are insufficient. Overall, China recycles about 60-70% of construction waste (Yang et al. 2019).

2.6.2.2 India

The Indian government has mandated construction waste management plans for all projects above 20,000 square meters. However, implementation of these plans remains poor due to a lack of enforcement, skilled labor, and high recycling costs. Most construction waste in India ends up in landfills, which are already nearing capacity. The government is now promoting public-private partnerships to develop recycling facilities and provide financial incentives for waste recovery. If properly implemented, these initiatives could significantly improve India's construction waste recycling rate of around 20-30% (Jain et al. 2018).

2.6.2.3 Brazil

Brazil has among the highest construction waste generation rates in the world due to rapid urbanization. However, less than 5% of this waste is currently recycled. Government policies focus mainly on proper waste disposal rather than recycling or waste reduction. Construction companies show little interest in investing in material management systems due to a lack of demand from clients and government incentives. Moving forward, Brazil will need stricter

regulations, policies rewarding recycling, and programs educating construction professionals (d Silva et al. 2018).

2.6.2.4 Egypt

Egypt faces several challenges in managing its growing construction waste streams. Existing policies mainly focus on waste disposal and landfilling rather than reduction and recycling. Education and awareness among construction professionals is also limited, inhibiting the adoption of material management best practices. The Egyptian government has started promoting private sector partnerships to develop recycling facilities and provide financial incentives for waste recovery. However, more holistic policies targeting the entire construction value chain will ultimately be needed to significantly improve Egypt's construction waste management system (Masoud & El Haggar, 2018).

2.6.2.5 South Africa

South Africa has relatively advanced policies and regulations for construction waste management. Mandatory waste management plans, landfill taxes and recycling targets are in place for large projects. However, enforcement has been inadequate and the recycling industry remains underdeveloped. As a result, less than 30% of construction waste in South Africa is currently recycled, with most going to landfills. Moving forward, policymakers are aiming to reduce construction waste generation through procurement reforms, incentive programs, and public-private initiatives focused on developing South Africa's recycling capacity (Ormsby, 2016).

2.7 Research Gap

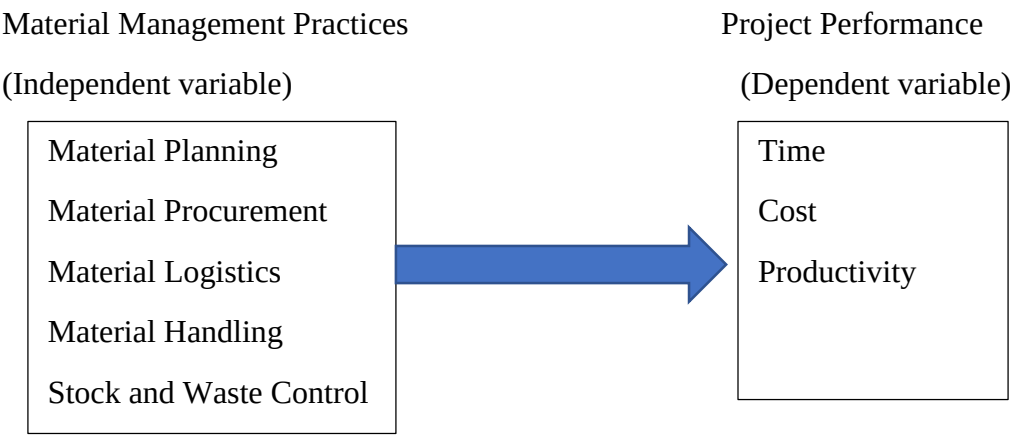
Effective construction material management is vital for ensuring the timely and successful completion of construction projects. However, there is limited empirical research on the impacts of construction material management practices on overall project performance, especially in developing country contexts like Ethiopia (Kalkidan, 2021).

While some studies have analyzed the material procurement and inventory control aspects (Tibebu, 2016), few studies have holistically examined how broader construction material management processes relate to key project outcomes such as cost, schedule, quality and safety. Factors like supply chain reliability, inventory control, materials handling, and waste management may have significant impacts but remain understudied in this setting. By addressing this research gap, scholars and practitioners can develop more effective construction material management strategies and policies tailored to the developing country context. This can improve the performance and outcomes of public housing and infrastructure projects that are critical for enabling urban development and enhancing living standards.

This research gap is particularly pronounced when it comes to the case of public housing development projects in Addis Ababa, Ethiopia. As the capital city undertakes large-scale affordable housing projects to meet the needs of its rapidly growing population, there is inadequate context-specific research on how construction material management issues affect public housing project performance.

2.8 Conceptual Framework

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

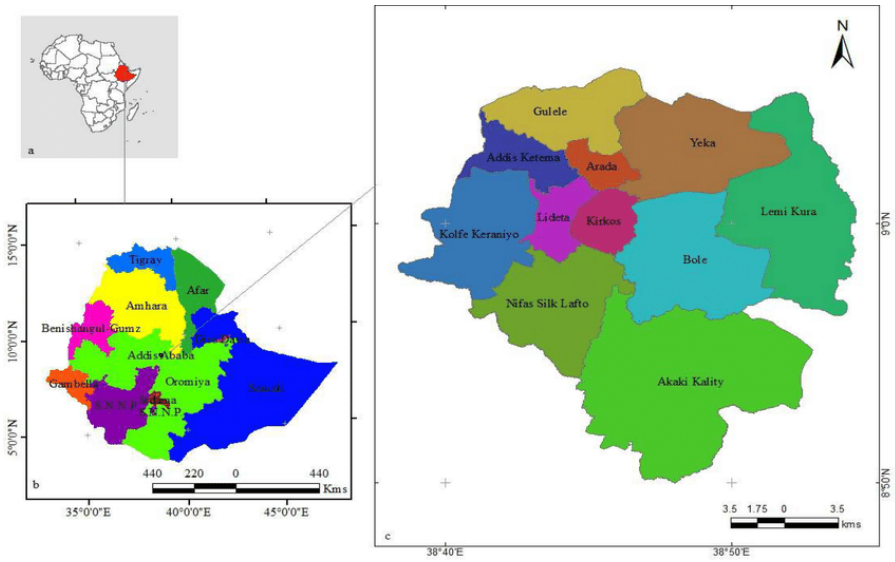


Conceptual framework of the study (Source: Zairra Mat Jusoh & Narimah Kasim, 2017)

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Study Area

The study was conducted in Addis Ababa at different housing projects which are run by the Addis Ababa Housing Project office. Currently, there are ten (10) projects under AAH Projects office which are undertaken.



3.2 Research Approach & Research Design

3.2.1 Research Approach

This study employed a quantitative data collection and analysis techniques. This approach provided a numerical understanding of the effect of construction material management on performance of the projects.

Quantitative research is the study of phenomena by collecting and analyzing quantitative data using mathematical methods (especially statistics). Quantitative research is controlled, objective, and product-oriented and aims to measure the dynamics of some situation, issue, or phenomenon. Developing and employing mathematical models, theories, and hypotheses about phenomena is the goal of quantitative research. (Barczak, 2015).

3.2.1 Research Design

In this research, both a descriptive & explanatory research designs were used. The study is descriptive in that it seeks to describe the practice of construction material management in AAH projects. Thus, giving an in-depth understanding of the reality of construction material management practice. Descriptive research will attempt to recognize and identify characteristic information of a certain issue or problem. This research attempts to identify phenomena as it exists naturally. Where, how much, how many, what or who are suitable questions to ask.

3.3 Sample and sampling design

3.3.1 Population

The study population was different housing projects which are owned by AAHP in different parts of Addis Ababa. The study population will include various workers in these AAHP construction building. These includes Project managers, site engineers, office engineers, Formen, office managers, store keepers, procurement and logistics workers & other relevant workers who

can witness the practice of construction material management & project performance in the projects. Currently, there are ten (10) projects under AAH Projects.

3.3.2 Sample

3.3.2.1 Sample unit

The sample for this research are those who are involved in Housing construction work in Addis Ababd. These workers includes Project managers, site engineers, office engineers & Forman's.

3.3.2.2 Sample frame

The sample frame of this research includes, Project manager, site engineer, office engineer, Forman's. Currently, there are 4 active construction site projects under the AAHP. The unit of analysis is project based.

3.3.2.1 Sampling size

There are ten (10) projects under Addis Ababa Housing Projects. From these 10 projects the 4 different projects which are found in Ayat 49 Mazoriya were selected. The reason that only four project selection was due to the availability of active projects. Following the selection of the sample projects, and all the workers that are connected with construction material management were sampled for this research. Based on the data from Addis Ababa Housing Projects office, there are about fifteen possible respondents from each project. Therefore, there will be a total of 60 respondents for this research.

3.3.3 Sampling technique

In this research, a stratified sampling technique was used. This is because there are 10 different strata (projects) that are undertaken under Addis Ababa Housing Projects office. These projects were selected based on the convenience of the researcher to collect reliable data.

3.4 Data types & Sources of Data

Both primary and secondary Sources of data were employed in this study. Primary sources of data were collected directly from the research sample by using questionnaire survey and interview. The primary data sources for this research are the public building construction projects in Addis Ababa: - in the case of Lemi kura sub-city AAH project construction office (the client), contractors, and consultants who are working on the projects.

Secondary sources are data's which are collected by other persons and found out relevance for this research. Secondary sources will be different manuals, guidelines, thesis papers and journals which used for evaluating different contractual claims. Secondary Sources of data were collected through records, literature review and other relevant sources regarding construction site safety management practice.

3.4Method of data collection

3.6.1 Questionnaire

Questionnaires were developed ahead of time and distributed to respondents after revised based on advisor's comments. The questionnaires were distributed to workers of Addis Ababa Housing Projects office to collect demographic data & data on construction material management practices & project performance.

Primary and secondary sources were both provide data for this research. A combination of field observations and questionnaires were used to collect primary data. Following the collection of data, statistical tools like tables and percentages were used to analyze and understand the data. Structured questionnaires containing both closed-ended and open-ended questions were utilized to gather primary data. These surveys were created with the goals of the study in mind. The

objective is to gather detailed and precise information from the respondents in order to support the accomplishment of the study's objectives.

3.6 Data Analysis & Presentation

The researcher decoded the gathered data into SPSS and analyzed the data using different data analyzing methods such as statistical and verbal description after collecting questionnaires from various AAH projects. The findings of the questionnaire were also be analyzed in descriptive analysis, such as frequency and mean of each factor, and also the correlation between the two variables. The researcher utilized IBM SPSS STATISTICS 20 to analyze the data.

3.6.1 Methods of Data Analysis

After gathering questionnaires from numerous offices, the researcher translated the collected data into SPSS and examined the data using various data analysis techniques, including statistical and verbal description. Descriptive analysis was also used to examine the questionnaire results, including the frequency and mean of each factor as well as the relationship between housing quality and building project management techniques. To evaluate the data, the researcher used IBM SPSS STATISTICS 20 program.

To study the effect of construction project management practice & quality of housing, Regression Analysis models were used. Regression analysis is a widely used statistical technique to assess the relationship between a dependent variable (construction material management practice) and one or more independent variables (performance). Multiple regression analysis allows for the inclusion of project management practice as independent variables to determine their impact on quality of housing. Multiple regression analysis is a statistical technique used to examine the relationship between a dependent variable and multiple independent variables.

The analyzed data were presented using tables, graphs and charts.

3.7 Data Validity and Reliability

The appropriate attention to data collecting and sampling, along with careful consideration to the design of the study questionnaire and research methodology, was ensured the validity and reliability of the research. To evaluate the safety management techniques employed, a thorough literature review of both international journals and safety manuals produced by international organizations were done. Following data analysis, the research findings were also be contrasted with previous findings.

The term validity pertains to the degree of credibility or plausibility of a given study. The question that the researcher created to bolster the claim that the techniques are actually measuring the abstract ideas that they are supposed to test is known as the validity question. The ability of the study design to precisely address the research questions is referred to as internal validity. The ability to extrapolate results and draw conclusions from the sample to the study population is known as external validity.

Surveys contained a range of questions on the knowledge of various leadership philosophies and how they affect worker performance in order to attain internal validity. Additionally, the material obtained for the literature study forms the basis of the questions. By distributing the questionnaires consistently, internal validity is further ensured. The researcher personally gave each of responders a questionnaire. To ensure clarity and ease of comprehension, the questions were written in straightforward language. The responders would receive precise instructions. Lastly, the researcher had specialists with specialized experience in leadership analyze the questionnaires.

In addition, to test the internal reliability of the questionnaire, Cronbach's alpha test were used.

Table 1: Cronbach's Alpha (Reliability analysis)

Independent Variables		
	Cronbach's Alpha	N of Items
Construction materials management	.885	15
Dependent Variable		
	Cronbach's Alpha	N of Items
Performance	.887	9

According to the above table, all variables have good Reliability because the result obtained from Cronbach's Alpha test is > 0.70 which are in acceptable range.

3.8. Ethical Consideration

The researcher tried to reduce bias in this study by adopting a standard data collection technique and scale based on previous research and literature. Before turning it in to the researcher, research participants were required to fill out the questionnaire completely. The confidentiality of the research participants was safeguarded by utilizing a code for all surveys, and all of the sources for this study were identified, and the researcher was also paraphrase other earlier literatures rather than directly quoting them. In order to guarantee respondents' anonymity and confidentiality and that the data gathered from them won't be shared with a third party, a covering letter was added to the questionnaire.

CHAPTER FOUR: RESULTS AND DISCUSSIONS

4.1. Response Rate of Respondents and Demographic Characteristics

4.1.1 Response rate

The purpose of this study was to analyze the Effect of Construction Material Management on Project Performance. Selected workers in the Addis Ababa Housing Projects construction firm polled for information. For this study, 60 copies of the questionnaire were distributed to the different workers in in the construction firm. Accordingly, out of the 60 questionnaires, 5(8.3%) remain unreturned & but the remaining 55 (91.7%) were completed and returned. Hence, the response rate was 91.7%. As a result, 55 surveys that were totally completed and returned were the participant of the analysis. Mugenda (1999) states that a response rate of fifty percent is considered appropriate, sixty percent is good, and more than seventy percent is regarded extremely positively; hence, a response rate of ninety percent is exceptional. Following appropriate screening of the fully filled and returned surveys, data were entered into SPSS (version 20) for analysis.

Table 4.1: *Questionnaire survey response rate*

No	Respondents	Number of sample size	Response	Response Rate (percentage)
1		60	55	91.7%

(Source: Own Survey, 2025)

4.1.2 Demographic Characteristics of the respondents & the Company

4.3.1 Respondent information

Table 4.2: Respondent position

Respondent position (Work status)

		Frequency	Percent
	Project manager	11	20.0
	Office Engineer	15	27.3
	Site Engineer	15	27.3
	Forman	14	25.5
	Total	55	100.0

(Source: Own survey, 2025)

According table 4.2, 27.3 percent of responders are Site Engineer, 27.3 percent are Office Engineer, 25.5 percent are forman, and the remaining 20 % are Project manager, who are the first witnesses to most construction site construction material management practice & perfomance of housing. Because it is evident that the responder has a significant impact on the study questionnaire, the researcher made an effort to keep the number of project managers, engineers (from junior to site & project manager), and office engineers comparable.

Table 2.3: Respondent's highest educational qualification

Respondent's highest educational qualification			
		Frequency	Percent
Valid	Diploma	5	9.1
	Degree	21	38.2
	MSc/MA	23	41.8
	PhD	6	10.9
	Total	55	100.0

(Source: Own survey, 2025)

The table above shows that the respondents have a variety of educational backgrounds, ranging from diplomas to degrees and beyond. The majority of people are MSc/MA holders, with 23 (41.8%), and 21 (38.2%) having first Degree. As a result, the bulk of the responders were MSc/MA holders, according to their compositions. This presents a chance to gather precise answers to the research questions.

Table 4.4: Respondents work experience (years)

Respondents work experience (years)			
		Frequency	Percent
Valid	0 -3 years	9	16.4
	3-6 years	6	10.9
	6-10 years	14	25.5
	10-15 years	17	30.9
	>15 years	9	16.4
	Total	55	100.0

(Source: Own survey, 2025)

As indicated in the above table, that the majority of respondents 17 (30.9%) have a work experience between 10-15 years, 14 (25.5%) for 6-10 years of experience, 9 (16.4%) between 0 - 3 years & the remaining 6 (10.9%) have 3-6 years of experience. Since majority 52.7 % of the respondents have stayed in the office for more than six year, their feedback was valuable.

Table 4.5: Employees number in your team/sites

Number of employees in your team/sites			
		Frequency	Percent
Valid	1-25	14	25.5
	25-50	15	27.3
	50-100	18	32.7
	>100	8	14.5
	Total	55	100.0

(Source: Own survey, 2025)

According to the data gathered, the majority of construction sites—32.7%—have between 50-100 personnel, with the remaining sites—52.7%—having more than 50 workers.

Table 4.6: Experience of the company on this construction project (in years)

Experience of the company on this construction project (in years)

		Frequency	Percent
Valid	0-1	5	9.1
	1-3	15	27.3
	3-5	15	27.3
	>5	20	36.4
	Total	55	100.0

(Source: Own survey, 2025)

According to the above table, 36.4% of respondents spotted that the companies had five or more years of experience working on this construction project, 27.3% had b/n 1-3 & 3-5 years of experience each, and the remaining 9.1% below one year of experience working on these building project. The majority of the businesses have been operating for more than three years. Given that the study's participating companies have extensive experience in the chosen field of construction, it stands to reason that the information provided may be crucial to the study's goals.

Table 4.7: Type of organization you are working for?

Type of organization you are working for?			
		Frequency	Percent
Valid	Client (government)	26	47.3
	Contractor	18	32.7
	Consultant	11	20.0
	Total	55	100.0

(Source: Own survey, 2025)

Based on the type of organization the respondents working, Most of them 26(47.3%) are work in the Client (government). Contractor constitutes 18(32.7%). This could help the researcher to gather the actual construction management practice from the worker (performer). The rest respondents were from Consultant 11 (20.0%) side.

4.2 Practices of construction materials magement in the project.

4.2.1 Descriptive Analysis

In order to show how much the respondents agreed with their implications for the company, descriptive data in the form of mean and standard deviation were provided in this section. A five-point Likert scale was used to quantify the respondents' reactions to the variables listed below: 1 represented strongly disagree, 2 disagree, 3 neutral, 4 agree, and 5 strongly agree. To make the interpretation process simpler and more understandable, the scales were reassigned as follows for interpreting the mean results.

This formula, which uses five-point scales and is derived from Vidchea (2005), calculates the interval for breaking the range while measuring each variable as (5−1)/5 = 0.8. Items with mean scores falling between these ranges are classified as strongly agreed (4.20–5.00); agreed (3.40–4.09); neutral (2.60–3.39); disagree (1.08–2.59); and strongly disagree (1.00–1.79). The SPSS software was used to process the data from the questionnaires and determine the frequency, mean, and standard deviation (Descriptive statistics).

The quality of housing in building construction projects is hampered by several variables. This section provides an explanation of the descriptive statistics that were computed utilizing the variables that influence the public building's housing quality in the Bereket condominium. The following tables display the results of the central tendency and dispersion measures that were produced from the sample of respondents that came from the consultant and contractor. Tables show the variables' means and standard deviations. The average score shows how many respondents agreed with the provided notion. More respondents agreed with the provided idea, as shown by a higher mean score, and vice versa. Conversely, the standard deviation shows how

much the answers differed from one another. The higher the standard deviations are the more variation in the responses of respondents.

4.3.1 Construction material management practice

The practices of construction material management is categorized as Construction Material Planning, Construction Material Procurement, Construction Material Logistics, Construction Material Handling and Stock and Waste Control. The corresponding results for each of these results are presented in Tables 4.8, Tables 4.9, Tables 4.10, Tables 4.11, & Tables 4.12 respectively.

Table 4.8: Construction Material Planning

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
There is material planning process in the company.	55	2	5	3.62	.561
There is better material planning in the site to eliminate project delay.	55	1	5	3.75	.865
There is efficient material planning to increase productivity.	55	1	5	3.96	.838
Construction Material Planning	55	1.67	4.67	3.7758	.61214

(Source: Own survey, 2025)

As it is disclosed in Table 4.8 the aggregate Construction Material Planning factor has a medium mean value of 3.77 and standard deviation of .61214. All the Construction Material Planning factor elements have a mean value which spans from 3.62 to 3.96. The item with the highest mean value, “There is efficient material planning to increase productivity.," is 3. 96, and its matching standard deviation is .838. The item with the lowest mean value, "There is material planning process in the company." has a standard deviation of .561, and its mean value is 3.62. This shows that material planning process in the company are not systematically identified and addressed in the projects.

Table4.9: ***Construction Material Procurement***

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
There is no over payment and ordering for materials in the company.	55	1	5	3.78	.956
The project manager ensures the purchasing of materials follows the standard requirement, time and quality.	55	2	5	4.00	.839
The Procurement procedure have impact on the company material management.	55	3	5	4.07	.604
Construction Material Procurement	55	2.00	4.67	3.9515	.60999

(Source: Own survey, 2025)

Therefore, from here it can be seen that among the Construction Material Procurement factors The Procurement procedure have impact on the company material management (mean 4.07) and The project manager ensures the purchasing of materials follows the standard requirement, time and quality (mean 4.00) were the major factors that are practiced in the construction site. All of the items under Communication are found in agree range. This shows that good and proper Material Procurement level is in good way.

Table 4.10: *Construction Material Logistics*

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
There is coordination and communication between project participants during material flow process.	55	1	5	3.91	.888
There is no material supply delay due to material purchase before they required.	55	1	5	4.07	.900
The company determine	55	1	5	4.02	.913

material type and quantities from the detailed design.					
Construction Material Logistics	55	1.33	4.67	4.0000	.66975

(Source: Own survey, 2025)

According to the Construction Material Logistics results shown in table 4.10, the items fall into the agree range, which is higher than 3.91 for items such as: The company determine material type and quantities from the detailed design. (mean 4.02 and SD .913), and Supplier selection criteria are clearly outlined There is no material supply delay due to material purchase before they required (mean 4.07 and SD 0.900). The aggregate Construction Material Logistics factor in agree range and has (mean 4.000 and SD .66975).

Table 4.11: Construction Material Handling

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
There is appropriate handling of materials in the on site	55	2	5	4.00	.903
Materials are delivered to sites undamaged	55	1	5	3.96	.838
There is appropriate material handling system in the company.	55	2	5	3.93	.858
Construction Material Handling	55	2.00	5.00	3.9636	.64684

(Source: Own survey, 2025)

To assess Construction Material Handling, the above three items were used. According to the result whether appropriate handling of materials in the onsite, Materials are delivered to sites undamaged & appropriate material handling system in the company, AAHP professionals

practice good amount of Construction Material Handling. All the mean score of the items are ranging from 3.93 to 4.0.

Table 4.12: ***Stock and Waste Control***

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
The company stock and waste control is good.	55	1	5	3.84	.977
There is appropriate storage location for stock near the site.	55	3	5	3.95	.405
Materials are available when required to construction site.	55	1.00	5.00	4.0364	.79264
Stock and Waste Control	55	2.00	4.67	3.9394	.55218

(Source: Own survey, 2025)

The aforementioned Table 4.12 displays the mean value of 3.9394 and standard deviation of .55218 for the aggregate Stock and Waste Control factor. The mean value of each Stock and Waste Control item falls between 3.84 and 4.03. Every item is in the agree range. The item with the highest mean value, " Materials are available when required to construction site.," has a standard deviation of .79264 and a mean of 4.0364. The item with the lowest mean value, “The company stock and waste control is good," is 3.84, with a standard deviation of .977.

Table 4.13: *Overall construction material management practice*

Descriptive Statistics		
	Mean	Std. Deviation
Construction Material Planning	3.7758	.61214
Construction Material Procurement	3.9515	.60999
Construction Material Logistics	4.0000	.66975
Construction Material Handling	3.9636	.64684
Stock and Waste Control	3.9394	.55218
Overall construction material	3.9261	.50977

management		

(Source: Own survey, 2025)

From the combined result shown on above table 4.13, the major construction material management practice were Construction Material Logistics (mean 4.0000and SD .66975), Construction Material Handling (mean 3.9636and SD .64684) and Construction Material Procurement (mean 3.9515and SD .60999) respectively. This shows that these three components are practice better than the other construction material management practice. Whereas Construction Material Planning (mean 3.7758) & Stock and Waste Control (mean 3.9394) have lower rate of practice in this public construction projects.

4.3.2 Performance

Table 4.14: project performance

Descriptive Statistics			
	N	Mean	Std. Deviation
Project Time Performance			
Materials arrive on time on site	55	3.89	0.809
The project finished within the schedule due to available of materials	55	4.05	0.870
There is no delay on project due to poor material management.	55	4.02	1.027
TP	55	3.9879	0.68782
Project Cost Performance			
There is low construction cost due to high quality control in material management.	55	3.91	0.967
There is appropriate cost expense on labor wage due to overstock material on site.	55	4.05	0.931
There is timely delivery of materials by suppliers which reduces the rise of construction cost.	55	3.91	1.023
CP	55	3.9576	0.79363
Project Productivity Performance			
There is availability of material which motivate	55	3.89	1.117

workers to improve work productivity			
There is waste minimization strategies in the company	55	3.93	1.052
The company determine material type and quantities from the detailed design.	55	4.16	1.151
PP	55	3.9939	0.85945

(Source: Own survey, 2025)

This table 4.14 shows the three project performance of the Addis Ababa housing projects. All the performance dimensions are found to be higher than 3.95 mean. This shows that the performance is good and found in agree range. Project Productivity Performance is the highest dimensions with a general mean of 3.9939. Following Productivity Performance, Project Time Performance has a mean value of 3.9879. However, Project Cost Performance has the lowest dimension. The overall descriptive result implies that the mean score of the project performance is 3.9798 which is found in agree range. Therefore, most of the respondents agrees that the performance of the housing project is good.

Table 4.15: Overall quality of housing

Descriptive Statistics			
	N	Mean	Std. Deviation
Project Time Performance	55	3.9879	0.68782
Project Cost Performance	55	3.9576	0.79363
Project Productivity Performance	55	3.9939	0.85945
Performance	**55**	**3.9798**	**0.72391**

(Source: Own survey, 2025)

4.3 Effects of construction materias management practices on the performance of housing projects

Correlation analysis examines the relationships between variables and provides information about the direction and strength of those relationships. Correlation coefficients take values

between -1 and 1 ranging from being negatively correlated (-1) to uncorrelated (0) to favorably correlated (+). The relationship's direction is indicated by the correlation coefficient's sign. The absolute value reflects the strength of the correlation. Dancey and Reidy (2004) posit that a correlation result of 0 signifies no correlation, a result ranging from 0.1 to 0.3 denotes a weak correlation, a result between 0.4 and 0.6 displays a moderate correlation, a result ranging from 0.7 to 0.9 denotes a strong correlation, and a result equal to 1 denotes perfect correlation.

The present study aims to evaluate the correlation between the performance of housing and the following characteristics of construction material management practices: Construction Material Planning, Construction Material Procurement, Construction Material Logistics, Construction Material Handling & Stock and Waste Control. The correlation metrics data indicate that each of the independent variables, specifically; Construction Material Planning (r =.731), Construction Material Procurement (r = .788), Construction Material Logistics (r = .712), Construction Material Handling = .681, and Stock and Waste Control = .633, are positively and strongly related with the dependent variable (performance) at p value <0.01.

Though to differing degrees, there is a positive relationship between the practice characteristics of construction material management and the performance of housing. Considering this, Construction Material Procurement has a greater correlation coefficient value (r =.788) than the other variables, indicating a strong association with housing performance. The performance of housing has the least link with Stock and Waste Control. The analysis's conclusion is that housing performance increases with improved construction material management practices in the areas of Construction Material Planning, Construction Material Procurement, Construction Material Logistics, Construction Material Handling & Stock and Waste Control.

The correlation analysis related to the impact of construction materials management on the performance of the project. Is presented in Table 4.16.

Table 4.16: correlation between CMM and performance of housing

Correlations							
		CMPl	CMPr	CMLo	CMH	SWC	Perform
CMPl	Pearson Correlation	1	.637**	.537**	.587**	.623**	.731**
	Sig. (2-tailed)		.000	.000	.000	.000	.000
	N	55	55	55	55	55	55
CMPr	Pearson Correlation	.637**	1	.559**	.559**	.590**	.788**
	Sig. (2-tailed)	.000		.000	.000	.000	.000
	N	55	55	55	55	55	55
CMLo	Pearson Correlation	.537**	.559**	1	.584**	.762**	.712**
	Sig. (2-tailed)	.000	.000		.000	.000	.000
	N	55	55	55	55	55	55
CMH	Pearson Correlation	.587**	.559**	.584**	1	.576**	.681**
	Sig. (2-tailed)	.000	.000	.000		.000	.000
	N	55	55	55	55	55	55
SWC	Pearson Correlation	.623**	.590**	.762**	.576**	1	.633**
	Sig. (2-tailed)	.000	.000	.000	.000		.000
	N	55	55	55	55	55	55
Perform	Pearson Correlation	.731**	.788**	.712**	.681**	.633**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	
	N	55	55	55	55	55	55
**. Correlation is significant at the 0.01 level (2-tailed).							

(Source: Own survey, 2025)

4.3.3.2 Multiple Regression Analysis

Regression analysis was conducted to assess the Effect of construction material management practice dimensions on the performance of housing. The most popular and extensively used method for examining the association between a single continuous dependent variable and numerous continuous categorical independent variables is multiple regression (George et al., 2003). Multiple regression analysis was used in this study to investigate the Effect of construction management practices on house quality. The multiple regression analysis findings are shown in the following table. In this case, the squared multiple correlation coefficients (R2) indicate how much of the variance in the dependent variable (Performance) can be accounted for by the model. Once the four outliers were eliminated from the data, the regression model was created.

Table 4.17: Model

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.891[a]	.794	.773	.34488
a. Predictors: (Constant), SWC, CMH, CMPr, CMPl, CMLo				

(Source: Own survey, 2025)

The results for changes between the independent and dependent variables are displayed in the table. The best measure of how well the independent variables explain fluctuations in the dependent variable, according to this study's assumptions, is R2. The coefficient of determination, or R2, illustrates the relationship between construction material management techniques and housing performance.

This model summary shows the effect of independent variable to dependent variables. This effect is explained by R Squared. R Square is the coefficient of determinant which is the proportion of

variance (%) in the dependent variable that can explained by the independent variable. According to Moore et.al, (2013) rule of thumb explains the value of R Square is < 0.3 the effect of independent variable is very weak size, An effect is often regarded as weak or low if the R-squared value is 0.3 < r < 0.5; moderate effect if the R-squared value is 0.5 < r < 0.7 Last but not least, the R Square value of r > 0.7 indicates a typically strong influence.

Table 18 demonstrates that the independent variables in the model (Construction Material Planning, Construction Material Procurement, Construction Material Logistics, Construction Material Handling & Stock and Waste Control) could account for approximately 79.4% of the variance in the dependent variable, the performance of housing. The model's R2 value is .794. According to this, changes in the independent variables account for 79.4% of the change in the dependent variable, housing Performance, while other factors account for 20.6% of the change.

Table 4.18: ***ANOVA***

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	22.470	5	4.494	37.785	.000[b]
	Residual	5.828	49	.119		
	Total	28.299	54			
a. Dependent Variable: Perform						
b. Predictors: (Constant), SWC, CMH, CMPr, CMPl, CMLo						

(Source: Own survey, 2025)

The results in the table above demonstrate that the F statistic was 37 and that the data was significant at the 5% confidence level, or p = 0.000. This indicates that there is a substantial explanation for the variance in Performance provided by construction material management practices.

Distribution of Coefficients

Each independent variable's specific contribution to variations in the dependent variable is measured in the coefficients table below. The coefficient Betas for one of the predictors serve as a representation of this.

Table 4.19: Distribution of Coefficients

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.686	.372		-1.842	.072
	CMPl	.320	.112	.270	2.853	.006
	CMPr	.486	.109	.409	4.465	.000
	CMLo	.366	.114	.339	3.223	.002
	CMH	.194	.100	.173	1.942	.058
	SWC	-.175	.145	-.134	-1.212	.231
a. Dependent Variable: Perform						

(Source: Own survey, 2025)

Construction Material Planning has a positive and significant Effect on housing Performance, as indicated by the findings of the coefficient distribution, which show that the beta coefficient value of the project is 0.270 with a significant value of 0.006, lower than 0.05. With a beta coefficient value of .409 and a significant value of .000, of which lower than 0.05, Construction Material Procurement has a positive and significant Effect on housing Performance. Construction Material Logistics has a positive and significant Effect on housing Performance, as indicated by its beta coefficient value of .339 and significant value of .002.

The beta coefficient value of Construction Material Handling is .173, and its significant value is .058, higher than 0.05, indicating that Construction Material Handling has a positive and insignificant Effect on housing Performance. Stock and Waste Control has a negative and

insignificant Effect on housing Performance, as evidenced by its beta coefficient value of -.134 and significant value of .231, both of which are higher than 0.05.

Performance. = -.686+ 0.270 CMPl + 0.409 CMPr + 0.339 CMLo + 0.173 CMH - 0.134 SWC +e

Where: -

(CMPl =Construction Material Planning, CMPr =Construction Material Procurement, CMLo =Construction Material Logistics, CMH =Construction Material Handling & SWC =Stock and Waste Control & e; Error Term**)**

4.4 Strategies to improve the construction material magement of AAHP projects

Based on the above findings, this study presents the following potential strategies which could help construction companies manage construction materials in a proper way, including:

Possible strategies which could help improve the construction material management of AAHP projects include proper planning, strict supervision, better workmanship, Wastage minimize. And training of construction workers. The contractors should be responsible to assign qualified professionals, like labor for the work, the client should ensure that the material purchased are of good quality, at the end, there should be a proper acceptance procedure, and may be it would be difficult to engage other independent professionals in addition to the consultant during the running contract. The skilled labors should be empaneled by the contractors under the same qualification & experience. Checking and evaluating the contractor and consultant that work on the housing projects, so build and consult the overall design and construction work.

1. Accurate Inventory Management – this can happen through implementing a robust inventory system: Use software or a digital platform to track inventory levels in real time. This will help avoid shortages or overstocking and allow for better control over materials. Moreover, the use of barcoding technology can help to automate material tracking with barcodes or RFID tags, which can help in real-time tracking of materials, reduce human error, and ensure faster audits.

2. Detailed Material Planning and Procurement – this can be done by using material forecasting and planning. This can help estimate the materials needed at the start of the project, considering project size, timeline, and available storage space. Ensure that. procurement is aligned with project phases to avoid stockpiling or delays. Furthermore, Just-in-time procurement help to order materials in a timely manner to meet the construction schedule, reducing storage costs and the risk of materials deteriorating or being damaged while on-sijte.

3. Supplier Relationship Management – this can be done through building strong relationships with suppliers. This can also be done by developing long-term relationships with suppliers to ensure reliable delivery schedules, quality materials, and possible discounts. This can also help mitigate issues such as supply chain delays. In addition, negotiate favorable terms to sSeek deals that allow flexible delivery schedules, payment terms, and bulk purchasing to reduce material costs.

Effective communication and collaboration tools also play a vital role in improving material management. Workers benefit from platforms like mobile apps or project management software that enable seamless communication between teams, suppliers, and managers. For example, if a worker notices a shortage of bricks or cement, they can immediately report it

through the app, and the issue can be resolved before it impacts the schedule. This transparency fosters a sense of teamwork and ensures that everyone is on the same page, reducing misunderstandings and conflicts on-site.

4. Waste Minimization – this can happen through monitoring material consumption that regularly track and analyze material usage to identify potential overuse or wasteful practices. Besides, recycling and reuse helps to encourage the recycling of materials and the reuse of leftover materials wherever possible. This reduces waste and lowers overall material costs. Furthermore, training staff on proper handling helps to manage construction materials through educating workers about proper handling and storage techniques to prevent damage during transportation, storage, and installation.

5. Technology Integration – this can be implemented through using construction management software to implement software tools like BIM (Building Information Modeling) to track and plan material needs throughout the project lifecycle. BIM can provide accurate 3D representations of the project, which helps with material optimization.

Effective material management is crucial for ensuring smooth project execution and minimizing delays. One strategic tool that significantly improves material management is the use of digital inventory systems. These systems allow workers to track materials in real-time, reducing the time spent searching for supplies and preventing shortages or overstocking. For instance, when workers can access a digital dashboard showing the exact location and quantity of materials, they can plan their tasks more efficiently, avoiding unnecessary downtime. This not only boosts productivity but also reduces frustration on-site, creating a more organized and stress-free work environment.

Another important tool is prefabrication and modular construction techniques. From a worker's standpoint, prefabricated materials arrive on-site ready to install, which reduces the time spent cutting, measuring, or assembling materials manually. This approach minimizes waste and ensures that workers have the right materials at the right time, allowing them to focus on their core tasks without interruptions. Additionally, prefabrication often leads to better quality control, as materials are manufactured in controlled environments, reducing the likelihood of defects and rework, which can be demoralizing for workers.

6. Regular Audits and Reporting – this can be considered as a good strategy to manage construction materials by performing regular audits. This will help conduct periodic material audits to compare actual material usage against estimates. This helps identify discrepancies, and plan corrective actions to avoid cost overruns or material shortages. Moreover, creating detailed reports helps to track project progress and performance.

By combining these strategies, construction companies can enhance efficiency, reduce waste, improve material availability, and ultimately lower project costs. Proper material management is key to delivering construction projects on time and within budget.

CHAPTER FIVE: CONCLUSIONS, AND RECOMMENDATIONS

5.1. Introduction

This is the study's final chapter, summarizing the findings and results from the data analysis reported in Chapter four is the primary goal of this section. This chapter also presents an overview of conclusions, recommendations, and future study direction.

5.2 Summary of major findings

From the combined result of construction material management practice, Construction Material Logistics (mean 4.0000and SD .66975), Construction Material Handling (mean 3.9636and SD .64684) and Construction Material Procurement (mean 3.9515and SD .60999) respectively. This shows that these three components are practice better than the other construction material management practice. Whereas Construction Material Planning (mean 3.7758) & Stock and Waste Control (mean 3.9394) have lower rate of practice in this public construction projects.

The housing performance dimensions demonstrates that; Project Productivity Performance is the highest dimensions with a general mean of 3.9939. Following Productivity Performance, Project Time Performance has a mean value of 3.9879. However, Project Cost Performance has the lowest dimension. The overall descriptive result implies that the mean score of the project performance is 3.9798 which is found in agree range.

All construction material management methods have a strong and significant relationship with housing Performance, according to correlation coefficient statistics; that is, a result between 0.68 and 0.78 indicates a moderate correlation, and significant relationships between variables were also found. Despite varying in strength, all independent factors generally show a positive connection with dependent variables at $p = 0.01$. The results of the correlation metrics show that the dependent variable (performance) is positively and strongly related to

all of the independent variables specifically; Construction Material Planning (r =.731), Construction Material Procurement (r = .788), Construction Material Logistics (r = .712), Construction Material Handling = .681, and Stock and Waste Control = .633.

Regression analysis shows that the construction material management technique may predict 79.4% of the variance in Performance. Thus, the performance of housing is positively and significantly impacted by construction material management practices.

5.2 Conclusions

Both the questionnaire and the reviewed literature assisted in providing answers to all research questions as well as meeting the general and specific objectives listed in section 1.3 of the study's introduction. The following conclusions on the three research objectives were drawn in light of the study's earlier findings;

The level of construction material management practice in Addis Ababa Housing project is found to be good (agree range) and from which Construction Material Logistics practice is higher whereas Construction Material Planning has lowest rate of practice. The study also found that construction material management practices have a strong and significant impact on the performance of housing in AAHP. The study's findings suggest that effective construction material management can enhance the performance of housing in terms of time, cost and productivity.

In conclusion, the study identified possible solutions that can enhance the effectiveness of construction material management practice in housing projects. These solutions include digital inventory systems, improving communication and coordination among project stakeholders, enhancing project planning, prefabrication and modular construction techniques.

Overall, the study contributes to the existing body of knowledge on construction material management and housing performance. The findings provide valuable insights for policymakers, construction professionals, and researchers seeking to enhance the performance of housing in developing countries. The study's conclusions emphasize the importance of effective material management practices in ensuring consistent productivity and performance across mass housing projects, which can help address the housing crisis in Addis Ababa and other cities facing similar challenges.

5.2. Recommendations

Based on the findings & identified problems on project performance and construction material management of the study, the researcher forwards the following recommendations.

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 handling & waste control have positive effect but, they hav statistically insignificant effect on project performance. So that the contractors that are working in AAHP should also give attention by:

Provide training and capacity building: To improve the level of construction material management practice, project managers should provide training and capacity building for construction workers and stakeholders on construction material management practices.

Develop and implement standard operating procedures: The study found that there are no standard operating procedures for construction material management practices. To address this gap, the government and construction industry stakeholders should develop and implement standard operating procedures for construction material management practices.

Encourage the use of technology: the use of technology can improve construction material management practices. To encourage the use of technology, project managers should invest in construction management software.

References

Akinade, O. O., Oyedele, L. O., Bilal, M., Ajayi, S. O., Alaka, H. A., Owolabi, H. A., & Kadiri, K. O. (2017). Waste management: Potential concerns for construction professionals in meeting low-carbon targets in the UK construction industry. Resources, Conservation and Recycling, 116, 158–172.

Asmara S. (2015). Managing and Minimizing Wastage of construction Materials on selected public building projects in Addis Ababa'

Addise, D. (2005). Handiling of concrete Making materials in Ethiopia construction industry Technology and Management)

Barry, W., Leite, F., & O'Brien, W. J. (2014). Identification of late deliverables and their true effects on industrial construction projects. In Construction Research Congress 2014: Construction in a Global Network (pp. 2296-2305).

Caldas C.H. and Reyes P.M. (2014): Practice Periodical on Structural Design and Construction, Vol 20, pp.1-8.

Chandler E.T. (2002): The Planning of Storage and Management on Site, Special Correspondence, London.

Chiang, Y. H., Chan, E. H., & Lok, L. K. (2006). Prefabrication and barriers to entry—a case study of public housing and institutional buildings in Hong Kong. Habitat international, 30(3), 482-499.

D Silva, W. P., d Melo Filho, I., Monteiro, C. T., & Lima, E. L. M. (2018). Construction and demolition waste management in Brazil: Current situation and challenges. Resources, Conservation and Recycling, 129, 193–203.

Eastman, C., Teicholz, P., Sacks, R., & Liston, K. (2011). BIM Handbook: A Guide to Building Information Modeling for Owners, Managers, Designers, Engineers and Contractors. Wiley.

Eduardo L (2002): "Material waste in building industry: Main causes and prevention", Journal of Construction Engineering and management, Vol 12, No.4, July 2002

Ergen, E., Akinci, B., & Sacks, R. (2007). Tracking and locating components in a precast storage yard utilizing radio frequency identification technology and GPS. Automation in construction, 16(3), 354-367.

Grich, K., Fellner, J., & Brunner, P. H. (2018). Material efficiency and yield in construction and demolition waste recycling. Journal of Cleaner Production, 172, 3328–3337.

Gulghane, A.A. & Khandve, P.V. (2015). Management for construction and control of construction Waste in construction Industry: A Review. International Journal of Engineering Research and Application, Vol 5, April, pp.59-64.

Idoro, G. I. (2008). Effect of mechanisation on occupational health and safety performance in the Nigerian construction industry. Journal of Construction in Developing Countries, 13(2), 27-45.

Jain, A., Vanjani, P., & Ahirrao, R. N. (2018). Construction waste management practices in India. Recycling, 3(3), 20.

Kalkidan, M. (2021). Effect of Construction Material Management On Project Performance: (Case Study: Of Bamacon Engineering Plc).

Koskela, L. (1992). Application of the new production philosophy to construction. Stanford, CA: Stanford University.

Kubassova, R., Sødal, S., & Drevland, F. (2019). Literature review of material waste in construction industry. IOP Conference Series: Materials Science and Engineering, 603(5), 052043.

Lan C. (2008): Materials Management on Building site, 1st Edition, London, The construction Press Lancaster.

Masoud, M. A., & El Haggar, S. (2018). Assessment of construction and demolition waste management in a developing country: An Egyptian experience. Construction Innovation, 18(3), 418–440.

Mohammed, B. (2004). Causes of Contractors' Failure in Saudi Arabia, Construction Contracting.

Mu, R., Wang, J., & Zuo, J. (2017). Current status and significance of UK considerate constructors scheme and its affordability in China. IOP Conference Series: Materials Science and Engineering, 254(2), 022051.

Navon, R. (2005). Automated project performance control of construction projects. Automation in Construction, 14(4), 467-476.

NordTest Report (2015). Resource efficient and clean est Nordic building and construction cluster. Nordic Innovation Publication 2015

Ojima, T., Yamamoto, H., Mohamed, F., Kobayashi, Y., & Kawai, T. (2016). Material flow analysis of construction and demolition waste in Japan. Journal of Industrial Ecology, 20(2), 421–433.

Ormsby, R. (2016). Construction waste management: reviewing current practice post-1990 in South Africa. WIT Transactions on Ecology and the Environment, 205, 9-18.

Sakai, S., Yoshida, H., Hiratsuka, J., Vandecasteele, C., Kawai, T., Takaoka, M., & Nakamura, T. (2015). Current state and issues of construction and demolition waste management and recycling practices in Japan. Resources, Conservation and Recycling, 101, 117–128.

Shaban, S. S. A. (2008). Factors affecting the performance of construction projects in the gaza strip. Unpublished Msc Thesis. The Islamic University of Gaza. Palestine.

Shehu Z., G.D.Holt, I.R.Endut, Akintoye (2015), Built Environment Project and Asset Management, Volume 5, pp, 52-68

Sozen, Z., Kucuk, A., & Bas, M. (2002). Application of just-in-time philosophy to the Turkish construction industry. 12th Annual Conference of the International Group for Lean Construction, Gramado, Brazil.

Tam, V. W., Tam, C. M., Zeng, S. X., & Ng, W. C. (2007). Towards adoption of prefabrication in construction. Building and environment, 42(10), 3642-3654.

Wanjogu, H, Iravo,M. and Arani,W.,(2015): Factors Affecting Material Management : Survey of Small and Medium sized Manufacturing Firms in Area Nairobi, Kenya, Vol, 2(69), pp 689-708.

Wong, W. K., Cheung, S. O., Yiu, T. W., & Pang, H. Y. (2018). A framework for material logistics planning to support contractors in adopting prefabrication in construction. Automation in Construction, 88, 38-52.

Yang, Y., Wang, J. Y., & Yuan, H. (2019). Assessment of construction and demolition waste generation and recycling performance in China. Resources, Conservation and Recycling, 150, 104412.

Appendix I – Data collection tools

ADDIS COLLEGE

DEPARTMENT OF CONSTRUCTION TECHNOLOGY MANAGEMENT

M.SC IN CONSTRUCTION TECHNOLOGY MANAGEMENT

The Effect of Construction Material Management on Project Performance: The Case of Addis Ababa Housing Projects

My name is Fitsum Mulatu. I am currently a graduate student at Addis College Department of Construction Technology Management. This M.SC thesis research questionnaire is designed to assess the the Effect of Construction Material Management on Project Performance: The Case of Addis Ababa Housing Projects.

To achieve this objective, the study requires the gathering of data related to Construction Material Management on Project Performance currently used in the construction of housing projects. The collected data will be used for academic purpose only and all information and feedbacks will be kept strictly confidential.

I, therefore, kindly requesting your valuable feedback, thanking you in advance for giving me time from your busy schedule. Please complete the questionnaire by giving details or ticking boxes as appropriate.

Thank you,

Fitsum Mulatu

Phone: 0911406877

Email:

Questionnaire for construction workers

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. Respondent position (Work status):

Project manager☐ Office Engineer☐ Site Engineer☐ Forman ☐

2. Respondent's highest educational qualification

Diploma ☐ Degree ☐ MSc/MA ☐ PhD ☐

3. Respondents work experience (years)

0 -3 years ☐ 3-6 ☐ 6-10 ☐ 10-15 ☐ >15 ☐

4. Contractor Category: BC ☐ GC ☐

5. Construction grade: _____

6. Number of employees in your team/sites

1-25 ☐ 25-50 ☐ 50-100 ☐ >100 ☐

7. Experience of the company on this construction project (in years)

0-1 ☐ 1-3 ☐ 3-5 ☐ >5 ☐

8. Type of organization you are working for?

Client (government) ☐ Contractor ☐ Consultant ☐

SECTION B: Evaluate the following construction materias management practices

Please rate your level of agreement with the following statements:

Where, (1= Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, 5= Strongly Agree)

No	**Measures**	1	2	3	4	5
Construction Material Planning						
1	There is material planning process in the company.					
2	There is better material planning in the site to eliminate project delay.					
3	There is efficient material planning to increase productivity.					
Construction Material Procurement						
4	There is no 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 Procurement procedure have impact on the					

	company material management.					
Construction Material Logistics						
7	There is coordination and communication between project participants during material flow process.					
8	There is no 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	Materials are delivered to sites undamaged					
12	There is appropriate material handling system in the company.					
Stock and Waste Control						
13	The company stock and waste control is good.					
14	There is appropriate storage location for stock near the site.					
15	Materials are available when required to construction site.					

SECTION C: Evaluate the following components of project performance

Rank your response: 1= very low, 2= Low, 3= Medium, 4= High and 5= Very High

No	**Measures**	1	2	3	4	5
Project Time Performance						
1	Materials arrive on time on site					
2	The project finished within the schedule due to available of materials					
3	There is no delay on project due to poor material management.					

Project Cost Performance						
4	There is low construction cost due to high quality control in material management.					
5	There is appropriate cost expense on labor wage due to overstock material on site.					
6	There is timely delivery of materials by suppliers which reduces the rise of construction cost.					
Project Productivity Performance						
7	There is availability of material which motivate workers to improve work productivity					
8	There is waste minimization strategies in the company					
9	The company determine material type and quantities from the detailed design.					

SECTION D: What are the strategic tools that improve construction material magement of AAHP?_____

_____

_____

_____