

**Effects of Materials Management on Performance of
Construction Project: In the Case of Addis Ababa Housing
Development Project Office**

*A Thesis Submitted to the School of Graduate Studies of Jimma University in
Partial Fulfillment of the Requirements for the Award of the Degree of Master
of Business Administration (MBA)*

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ABSTRACT

Materials management is a tool to optimize performance of construction projects in meeting customer satisfaction in terms of timely project delivery, quality and minimizing the construction costs in every phase of a construction project. The main aim of this research paper is to examine the current material management practice, and its impact on the performance of building construction projects, specifically; in the Addis Ababa Housing development project office. A researcher extracted 51 factors which affect both performance of construction project, and material management practices of the project office, from an extensive literature review. Based on the extracted factors, research instruments were developed and distributed to 100 respondents by using purposive or judgmental sampling techniques. The data that was collected through primary and secondary data sources, by using mixed research design approach were analyzed using descriptive; explanatory and linear regression statistical, by using Statistical Package for Social Scientist (SPSS). Accordingly; the survey findings revealed the top ten factors that affect performance of construction projects; and the top seven factors that affect materials management practice of the project office. The study also measures the relationship between dependent and independent variables by using multiple regression models. Finally; the study concluded that poor materials management practice in the building construction has a significant impact on the performance of construction projects. So; the practitioners and policy makers should put in place a well-designed tracking system and software technology for proper management of construction materials to alleviate those challenges that are relevant in this study.

Keywords: *Materials, materials management, performance, construction project*

DECLARATION

I declare the research report entitled “The Effect of Material Management on Performance of Construction Project : In case of Addis Ababa Housing Development Project Office” submitted to Research and Postgraduate Studies’ Office of Business and Economics College is Original and it has not been submitted previously in part or full to any University.

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Researcher’s Name

Date

Signature

CERTIFICATE OF ORIGINALITY

We certify that the Research Report entitled “Effect of Material Management on Performance of Construction Project” in Addis Ababa Housing Development Project Office was done by Mr. Desta Bekele for the partial fulfillment of Master’s Degree under our supervision of Business Administration of Jimma University.

Signature

1. Main Adviser’s Name

Date

Signature

2. Co-Advisor’s Name

Date

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Acronym

ABC	Analysis-Outstandingly important; Average importance; and relatively Unimportant
BOQ	Bill of Quantity
CII	Construction Industry Institute (CII)
ENA	Ethiopian News Agency
EOQ	Economic Order Quantity (EOQ)
FIFO	First in First Out.
GDP	Growth and transformation plan
JIT	Just-in-Time
KCC Ltd	Kenya Cooperative Creameries Limited
MoWUD	Ministry of Works and Urban Development
PASDEP	Plan for Accelerated and Sustained Developments to End Poverty
PDA	Personal Digital Assistant
RFID	Radio Frequency Identification,
5Rs	Right Quality ,Right Quantity, Right Time, Right Source and Right Price
SPSS	Statistical Package for Social Science
VMI	Vendor Managed Inventory (VMI)

CHAPTER ONE

1. INTRODUCTION

Under this chapter the researcher has been tried to include background of the study which clearly describe the overview of the study; statement of the problem: under this topic the researcher tried to express the rationale behind for this study; research questions; general and specific objective of the study that has been expressed the over direction that the researcher wants to address in study; significance of the study-value added of the study in Ethiopian Construction Industry; scope of the study and limitation of the study- specific area the study and challenges faced during the research process.

1.1 Background of the Study

Material management is defined as the process to provide the right material at the right place at right time in the right quantity to minimize the cost of a project. The goal of material management is to ensure that the materials are available at their point of use when needed, hence; efficient procurement of material represents a key role in the successful completion of the work (Seyoum, 2015).

Material management is concerned with the planning, identification, procuring, storage, receiving and distribution of materials (Ashwini R. Patil, 2013). The materials management in Ethiopian construction industry, especially on public building construction projects in Addis Ababa is done usually by experience and using traditional methods. It is also viable that lack of proper construction materials management systems in the country contributes to the high construction cost, poor quality of construction and delays of construction projects in Ethiopia.

Material management is related to planning, procuring, storing and providing the appropriate material of right quality, right quality at right place in right time and obtained at a reasonable cost, at the point of use when required. So as to coordinate and schedule construction project

activity in an integrative way for undertaking construction projects. The objective of this study was to assess the effect of material management on the performance of construction projects in the Addis Ababa Housing development project office. Having this main objective, the study is also aimed to examine the existing material management practice of the project office, and the relationship between independent and dependent variables.

Due to the fact that inappropriate Construction materials management has a significant impact on performance of construction projects, Construction materials management is generally recognized to be the integrated coordination of materials takeoff, purchasing, expediting, receiving, warehousing, proper utilization and disposal. When these functions are not properly managed, shortages required material, surpluses material, and cash flow problems are likely to occur, and costly labor delays result when the required quantity and quality of Construction materials are not available when needed. Because, efficient use and proper material management have an important influence on a company's profit and can avoid delay in construction projects (Aditya & Pande, 2015).

This study has a significant contribution to construction industry, in providing relevant and research based information for different stakeholders and practitioners, policy makers, to improve material management practices, and key challenges that exist in business environment, specifically on building construction projects that have been constructing in 17 project site by Addis Ababa Housing Development project office. Despite the construction industry's significant contribution to the economy of the countries and its critical role in countries economic development, the performance of the construction industry remains generally low, and the development of the construction industry in specifically; in Ethiopia lags far behind other industries due to the problem of efficiency. Efficiency in terms of construction quality, cost and time, capacity of key stockholders and poor Construction materials management, and

adequate manpower, according to the quarter report of year 2019 “Construction Works Regulatory Authority (Zewdu & Aregaw, 2015).

Construction industry is an industry, which is involved in the planning, execution and evaluation of all types of civil works. The industry plays an important role in social, economic & political development of a country specifically; in Ethiopia. In Ethiopia construction industry has been developing tremendously since 2001, according to, (BBC, 28 Aug 2019) construction is booming in Ethiopia, accounting for 18% of the country's GDP for the financial year 2017-2018. Recent studies by (Zewdu & Aregaw, 2015) indicated that the GDP contribution of the industry has been raised to 5.6% and approaches to the sub Saharan average (6%). Beyond its contribution to the nation, the industry is also the 6th major contributor of the content infrastructure stock following South Africa, Egypt, Morocco, Algeria and Nigeria. That is why the government has allocated 60% of the capital budget for the construction industry annually (ENA, 2019).

Similar to the case with other developing countries, Ethiopian construction industry shares many of the problems and challenges of the construction industry that has been facing in other developing countries, perhaps with greater severity. As a result of the problem, projects tend to be delayed and oftentimes do not get completed within budget. In general, the construction industry in developing countries failed to meet expectations of governments, clients and society as a whole (Yimam, 2011).so that, improving the performance of the industry ought to be a priority action.

This clearly illustrates the need to develop an effective constructions materials management system in Ethiopian construction projects, to ensure that the projects are completed with good quality and within the schedule (Seyoum, 2015). Hence; Construction materials constitute a major cost component in any construction project, which is from the total cost project

cost more than 50% is material cost (Ashwini R. Patil, 2013). Therefore, the proper management of construction material can improve the productivity and cost efficiency of a project and helps to ensure timely completion of the project, hence; construction projects are affected by several factors that have a high impact on the efficiency of the workforce by reducing their overall productivity.

1.2 Statement of the Problem

Nowadays in Ethiopia construction industries are booming due to implementing major infrastructure projects together with many public buildings, commercial building and housing development programmes. Construction projects in Ethiopia are parts of the country's development initiative and economic growth of a country. To this end; construction industry is the highest recipient of government budget in terms of government development program. Consequently, public construction projects consume an average annual rate of nearly 60% of the government's capital budget, according to (MoUDC, 2012).

However; due to the occurrence of a high number of complex construction projects, construction firms focus on getting work done while neglecting the management of materials. The negligence of poor material management contributes to several negative consequences such as breaking of materials dissatisfaction by the client and reduction in the productivity of workers, material wastage, high project cost and delay in the progress of work at hand, which affects the maximization of limited resources. Likewise; it is common to observe the scattered equipment & assets out of the warehouse of the office compound that are at risk of theft and corruption.

A large number of stocks of materials are stacked in the store which is seriously exposed to dust. Sometimes, the interruption of operations happens due to the lack of raw materials inventories and there is damage and spoilage of materials due improper placement. The

materials that are broken and need maintenance are located in the different corners of the warehouse compound covered with dust. Items are not stacked in a proper way so that they are not easily accessible when needed for withdrawal or for execution (Waldie, 2018).

And also Ethiopia, all materials purchased are not fully used during construction and this indicates that the left over may remain as waste that may not be accounted for improper control of materials during different stages of construction has caused waste and associated environmental problems (Seyoum, 2015). To this end; Ethiopia loses about one billion birr per year from the construction industry sector due to misuse, corruption and bad practices, according to, Ministry of Urban Planning and Construction reported by (ENA, 2019). |

The existing papers only briefly mentioned that material management influences project performance with limited exploration and empirical study specifically related to the relationship of material management on project performance (Gulghane & Khandve, 2015). It appears there is a lack of detailed discussion especially about the effect of material management on project performance. So far, many researches were conducted on the current problem of material management and factors that affect construction industries in developing countries by different researchers. However, inspired by its importance, little or no research has been done in the study area on the effects of material management on performance of construction projects specifically in Ethiopia. On the other hand area of material management is the most often overlooked by the construction players and academicians (Donvavi & Flanagan, 2009), having this fact into consideration, a researcher is motivated to deal with the effect of material management on performance of construction project, in the case of Addis Ababa Housing Development Project Office.

1.3 Research Questions

The research is aimed at addressing the following basic research questions:

1. What are factor that effects performance of construction project in Addis Ababa Housing Development Project Office?
2. What are the current material management practices in building construction projects in Addis Ababa Housing Development Project office?

1.4 Objective

1.4.1 General Objective

The general objective of the study is to examine the effect of material management on performance of construction project in Addis Ababa Housing Development Project Office.

1.4.2 Specific Objective

This study specifically aimed at achieving the following objectives:-

- To assess the current material management practices of Addis Ababa Housing Development project office.
- To measure the relationship between two or more variables the study area
- To examine factor that affects performance of construction project in the case of Addis Ababa Housing Development project office.

1.5 Significance of the Study

This research will provide relevant and research based information for practitioner; police maker and other stakeholders like; clients, contractors, consultants and regulators So that police maker and practitioner develop well designed material management system to improve and standardize material management practices, to make decisions that reduces or eliminates the potential failures and repetitions of errors, and aware the challenges that hamper the construction industry from continuous growth in Addis Ababa Housing Development Project office. The study also creates an opportunity for researchers and other stakeholders to conduct further research on construction material management.

1.6 Scope of the Study

Despite the complexity and the existing problem in construction industries and material management practices problem in Ethiopia, this topic do not deal with all aspects of construction project performance in the project office hence, the paper will only focus on the effects of material management on performance of construction project in Addis Ababa Housing Development Office, specifically; on Addis Ababa Housing Development Office building construction projects in 17 project site. The study also examined factors that affect materials management practices, like; planning, procurement, logistics, handling, stocking and wasting, and availability of material. Which are elements of independent variable and construction projects performance as dependent variables (level of customer satisfaction; productivity, cost efficiency etc.). The time and date will set according to the convenience for the interviewees. The time frame allocated to conduct the research was from January 31, 2020 to 20 June 2020.

1.7. Organization of the Thesis

The thesis will be organized into five chapters. The first chapter introduces the research topic, which consists of the research background, research problem, research questions, research objectives, scope, significance and organization of the thesis. The second chapter focuses on the review of theoretical empirical literature and conceptual framework.. The third chapter discusses the research design and methodology, as well as ethical issues considered in the study. The fourth chapter presents data analysis; presentation and discussion. Chapter five presents a summary of the major findings, conclusion and recommendation. It also suggests an area for future research to be considered by other researcher.

CHAPTER TWO

2. LITERATURE REVIEW

The review has three sections: Section 1 presents theoretical review of material management; section 2 presents a review of the essential empirical evidence, section 3 presents a review of conceptual framework of the study, review of material management process, Material Management problem of business Enterprises. Lastly, a review of performance measurement will be presented. Materials may deteriorate during storage or get stolen unless special care is taken. Delays and extras expenses may be incurred if materials required for particular activities are unavailable. (Vyas, Patel, & Chetna, 2011).

2.1 Theoretical Literature

Materials management is a total concept involving an organizational structure unifying into a single responsibility, the systematic flow and control of materials from identification of the need through delivery to customers. It includes purchasing, production planning and scheduling, incoming traffic, inventory control, receiving and stores`. (National Association of Purchasing Management, USA). The materials management system attempts 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. Materials management is "the function responsible for the coordination of planning, sourcing, purchasing, moving, storing, preserving and controlling materials in an optimum manner so as to provide a predetermined service to the customer at minimum cost." (Gopalakrishnan & Sundaresan, Jan 1, 1977). The main focus of materials management is to procure right materials in the right quality, of right quantity, at the right time, bought from the right source and at right prices.

Having recognized the importance of the materials management function, let us now see why an integrated approach is necessary. Various functions served by materials management include the materials planning, purchasing, receiving, stores, inventory control, scrap and surplus disposal. If some of these functions are separately handled, there is a chance of a conflict of interests. Materials represent a major expense in construction, so minimizing procurement costs improves opportunities for reducing the overall project costs. Poor materials management can result in increased costs during construction. Efficient management of materials can result in substantial savings in project costs.

A construction in simple words is a process of constructing something by humans for one purpose or another. It may be a road, bridge, a dam, a private residence, an airport, a commercial building, office etc. According to Wikipedia, construction is a process that consists of the building or assembling of infrastructure. Construction is the recruitment and utilization of capital, specialized personnel, materials, and equipment on a specific site in accordance with drawings, specifications, and contract documents prepared to serve the purposes of a client.

(EL-Rayes & Khaled, 2010), has presented the critical planning decision of material supply and material storage on construction sites. The proposed model has been divided into two main models such as supply logistic and site logistics. Supply logistic model attention on planning on material supply which includes the ordering cost, carrying cost and shortage cost; and site logistics model attention on site layout planning for material storage areas including construction temporary facilities. They have been well represented in how to minimize the ordering cost, carrying cost and shortage cost. Ordering cost is a combination of purchasing cost and delivering cost. Purchasing cost decreases with the increase of order quantities because of the saving of supplier administration cost and the provision of discount rates. Site logistic models represent the optimize layout cost by material handling cost, relocation cost and travel cost in construction areas which could be minimized by proper layout planning.

A construction project is commonly acknowledged as successful, when it is completed on schedule and within the agreed budget, with the highest quality and in the safest manner, in accordance with the specifications and to stakeholders' satisfaction. Functionality, profitability to contractors, absence of claims and court proceeding and "fitness for purpose" for occupiers have also been used as measures of project success, (Takim & Akintoye, 2002). For any public or private construction firms, upgrading the project performance can be taken as one of their main objectives. This can be achieved by reducing cost, finishing projects on schedule and increasing quality. Public construction projects in Ethiopia are parts of the country's development initiative. It shares a considerable amount of the country's scarce financial resources.

In Ethiopia, the construction industry is the highest recipient of government budget in terms of government development programs. Consequently, public construction projects consume an average annual rate of nearly 60% of the government's capital (MoWUD, 2005/2006 and 2009/2010). (Zheng, Tong, & Sun, 2015), has been presented as a philosophy of Construction materials supply chain under vendor managed inventory (VMI). In the VMI model the information flow such as builder provides market information and demand to the chosen suppliers, suppliers are responsible for refilling inventory in the storerooms prearranged by the builder and the demand forecast feedback sent to the builder, and both parties make the decision in order and maintain mutual coordination and cooperation. So; theoretical framework would be set up to achieve the objectives of this study.

2.1.1 Materials management

(Patel & Vyas, 2011)) say materials management is a process for planning, executing and controlling field and office activities in construction. (Madhavi, Mathew, & Sasidharan, 2013), says materials management is a management system that is required in planning and controlling the quality & quantity of the material, punctual equipment placement, good price and the right quantity as required. Material management is a management system that integrates purchasing, shipping and material control from suppliers. (Ashwini R. Patil, 2013), say “Material management is defined as the process to provide the right material at the right place at the right time in the right quantity so as to minimize the cost of project”.

The main objectives of materials management are to buy at the lowest price, maintain a low inventory, maintain continuity of supply, develop reliable alternate sources of supply, minimize the overall cost of acquisition, develop and maintain good supplier relationships, achieve a high degree of cooperation and coordination with user departments. However, some issues have been identified while performing materials management, such as high cost, incorrect bills of materials, shipping errors, receiving errors and quality problems.

In order to improve the efficiency and accuracy of materials management and reduce costs, many models and tools are proposed, such as the ERP system and ABC classification method. ERP is business management software that allows an organization to use a system of integrated applications to manage the business. (Tarantilis, Kiranoudis, & Theodorakopoulos, 2008), developed a web-based ERP system for materials management and it is a cost effective and high efficient way to manage materials. (Kelle & Akbulut, 2005), found that ERP system (**Enterprise resource planning**) plays a crucial role for material management in information sharing, cooperation and cost optimization.

2.1.2 ABC classification

According to (Wei, 2009), ABC classification system is to group items according to annual sales in an attempt to identify the small number of items that will account for most of the sales and they are the most important elements to control for effective inventory management. ABC classification process is to group items into three categories: A - outstandingly important; B - average importance; C - relatively unimportant as a basis for a control scheme. Each category should be handled in a different way with more attention to category A category, less to B and C category. ABC classification helps to manage the entire volume and assign relative priority to the right category.

2.2. Empirical Review

(Mansfield, Ugwu, & Doran, 1994) Identified 16 major factors that caused delays and cost overruns in Nigeria. A questionnaire survey was carried out with contractors, consultants and client organizations in Nigeria. They presented that the causes of delay and cost overruns in Nigerian construction projects were attributed to finance and payment arrangements, poor contract management, shortages in materials, inaccurate estimation, and overall price fluctuations.

(Abdalla & Battaineh, 2000) Identified 16 major factors that caused delays and cost overruns in Nigeria. A questionnaire survey was carried out with contractors, consultants and client organizations in Nigeria. They presented that the causes of delay and cost overruns in Nigerian construction projects were attributed to finance and payment arrangements, poor contract management, shortages in materials, inaccurate estimation, and overall price fluctuations.

(Iyer & Jha, 2005), did a research on factors affecting cost performance evidence from Indian construction projects and found out that the project manager's competence and top management support are found to contribute significantly in enhancing the quality performance of a construction project.

(Assaf & Al-Hejji, 2006) Identified 56 main causes of delay in Saudi large building construction projects and their relative importance. Based on the contractors surveyed the most important delay factors were: preparation and approval of shop drawings, delays in contractor's progress, payment by owners and design changes. From the view of the architects and engineers the cash problems during construction, the relationship between subcontractors and the slow decision making process of the owner were the main causes of delay. However, the owners agreed that the design errors, labor shortages and inadequate labor skills were important delay factors. ((Le-Hoai, Lee, & Lee, 2008) Studied problems related to delays and cost overruns during construction phase and they identified that the cause for construction delays and cost overruns in overall context are poor site management and supervision, poor project management assistance, financial difficulties of owner, financial difficulties of contractor and design changes are the five most frequent, severe and important causes.

(Fetene, 2008), did a study on causes and effects of cost overrun on public building construction projects in Ethiopia. From the results it was found that 67 out of 70 public building construction projects suffered cost overrun. (Shaban, April, 2008) in his thesis on factors affecting the performance of construction projects in the Gaza Strip, found out that the most important factors agreed by the owners, consultants and contractors were: average delay because of closure and materials shortage, availability of resources as planned through project duration, leadership skills for project manager, escalation of material prices, availability of personals with high experience and qualification and quality of equipment and raw materials in project.

(Ogbadu, 2009), made a research to increase the profit through proper management of materials. For that, ninety four (94) copies of questionnaires were distributed out of which eighty six (86) were filled and used for the research. All eighty-six respondents approved that the delivery of poor quality raw materials is a hitch of materials management. He came to the conclusion that the inefficiencies, breakdown and shut down of the plant decrease the profitability. Establishing good relationships with suppliers of spare parts for minimizing losses arising from frequent breakdown improves profitability.

(Bui & F.Ling, 2010), in the study that was carried out in Vietnam on factors affecting construction project outcomes discovered that major enablers that lead to project success are foreign experts' involvement in the project, government officials inspecting the project and very close supervision when new construction techniques are employed. A factor which leads to poor performance is the lack of accurate data on soil, weather, and traffic conditions.

(Gbadura & Oke, 2010), examined project management leadership styles of Nigerian quantity surveyors, on the general note, Nigerian quantity surveyors were found to be autocratic using Jerrell/Slevin measuring instrument while in the opinion of Nigerian construction professionals; they are more of task oriented in discharging their duties as construction project managers. Previous empirical studies on the subject under study or related studies confirm a significant positive relationship existing between effective materials management and firm's profitability.

(Patel & Vyas, 2011), made a study to find voids absence of proper materials management on construction sites. The research was carried out in Ahmedabad. He has done careful study from material indent to material usage. Since each step was managed, the voids could be identified. He concluded that, team coordination between stakeholder, proper control, tracking and monitoring of the system, awareness and accountability, efficient MIS integration will end in better results.

(Amusan, 2011) Studied factors affecting construction cost performance in Nigerian construction sites. It was discovered from the analysis that factors such as contractor's inexperience, inadequate planning, inflation, incessant variation order, and change in project design were critical to causing cost overrun, while project complexity, shortening of project period and fraudulent practices are also responsible.

(Nyangilo, 2012) did an assessment of the organization structure and leadership effects on construction projects' performance in Kenya, he found out that lack of appropriate project organization structures, poor management systems and leadership are the major causes of poor project performance. (Okorochoa, 2012), had done research to find out the factors affecting material management. For that he had selected a case study of selected building sites, in IMO state, Nigeria. Usage of right materials in the right place at the right time is important for effective execution of a building project. Data collected were analyzed by statistical analysis through multiple regressions. The research concluded that Material management leads to effective cost control, to improve the quality and time execution of their projects and reduces failure of a project. (Georgekutty & Mathew, 2012), had undergone literature review to find out the causes for incompleteness of the project. A questionnaire survey was conducted in Kerala. From the research, the main delay or incompleteness of the project could be solved by proper pre-planning and scrutinizing material procurement frequently to cut off the exceeding of project cost.

Case study was carried out by (Madhavi, Mathew, & Sasidharan, 2013) in material management in construction sites. The objective of the study was to understand all the problems occurring in the company because of improper application of material management. Analysis was done on site and management, Inventory controlling, purchasing procedures, Procurement and Tracking and cost. Stocks were analyzed by FIFO (First in First Out method). Cost estimation was done by ABC analysis. From the analysis, data was driven and new appropriate

technological implications were introduced like RFID (Radio Frequency Identification), PDA (Personal Digital Assistant) which helped us in proper scheduling and financial control.

In Nigeria brewing firms, (Nwosu, 2014) examines the impact of materials management. Among total staff strength 4,648 of Nigeria Breweries and Guinness Nigeria PLCs, sample size of 368 was selected to check the profitability of the firm. Z-statistics was applied for test of hypotheses and found that materials procurement, materials storage, materials inventory, interdepartmental collaboration has a significant effect on the profitability of brewing firms. Based on the above findings, the study therefore concludes that effective materials management is indispensable to brewing firms in making profits.

(Olusakin & Akindip, 2014), made a study on the role of raw material management in production operations. The author was conscious about the inefficiency in raw material management and the alternate solutions to overcome the problem. He found the relationship between raw material and Inventory management to solve the crisis. From this he had concluded that the inefficiency was due to illiterate and non-experts involvement in management, mishandling of materials and inability to use proper inventory models in the site, due to the managers involved in the management process.

The role of material management in organizational performance was analyzed by (JerutoKeitany, Daniel, & Richu, 2014) in Kenya. For that the author had chosen a case study of New Kenya Cooperative Creameries Limited. A sample of 49 respondents was selected from 56 employees of New KCC Ltd. Data were collected through questionnaires from seven departments such as Purchasing, Quality Control, Warehouse/store, and Human Resource Development, Finance and audit and Physical Distribution departments. The data was evaluated through descriptive statistics such as mean, median, standard deviation and percentages. Results showed that there was an increase in organizational performance due to

inventory control system involvement. Additional results showed that lead time was highly significant by acquiring and delivering the needed materials within the shortest time.

The benefits of material management to the organization were clearly explained by (Nair, Sharma, & Singh Oberoi, 2014) through his paper. The author also explained that the objectives of the material management to be regular uninterrupted supply of raw-materials maintain a high inventory turnover, provide economy in purchasing and minimizing waste, and minimize the overall cost of acquisition and to maintain high degree of cooperation and coordination with user departments. He concluded that major benefits of material management were excessive investment in stocks will be avoided, there will not be stoppage of work because of lack of materials, productivity will be improved, Inventory losses will be minimized and the wastages are minimized.

(Zeb, Malik, Nauman, Hanif, & Amin, 2015), made a questionnaire survey based on his previous research, for which he has collected data for about 20 years. The survey was made in Pakistan and he interviewed the contractors and the subcontractors of the site. He has selected 5 factors which are limited storage on site, difficulty to store, conflicts between laborers, difficulty in work progress due to improper storage of materials and complexity in coordination of subcontractors on site. He had concluded from that research that an increase in space for material storage, communication of sub-contractors and the handling of materials will help to complete the project on time. He added that proper tracking of work progress and material management will give better results.

An empirical case study of material management in Residential projects was done by (Anup, Wilfred, Deepak, Shivaram, & Khan, 2015). This study was made to find out the problems occurring due to the improper material management. Due to these problems, there will be a rise in cost of the project. So he had undergone ABC analysis and S curve analysis. ABC analysis

gives a complete study of the quantity of material utilized. S curve analysis was helpful in finding the deviations in the project. The deviation from the scheduled project is found by S curve analysis and suitable measures were taken (Keith, Vitasek, & Kling, 2016) has made a study on material management using a real time residential project. The author had an opinion that the cost of the project increases mainly due to the improper material management.

Delay in the completion of a construction project is one of the biggest problems facing the construction industry and can be a major problem for construction's project participants leading to costly disputes and adverse relationships amongst project participants. Delays occur in every construction project and the significance of these delays varies considerably from project to project. Many researchers have studied the causes of project delays in the public construction industry. The findings of such studies have been reviewed for this research.

2.2.1 Overview of Material Management

Construction materials constitute a major cost component in any construction project. The goal of material management is to ensure that the materials are available at their point of use when needed hence, efficient procurement of material represents a key role in the successful completion of the work. Materials management is a critical component of the construction industry. As such, organizations need to understand the effects of proper materials management techniques on the effectiveness of project execution. Extensive literature and reports deplore the lack of efficiency and productivity in the construction industry. Too often, construction projects suffer from delays, budget overruns, and claims. A properly implemented materials management program can achieve the timely flow of materials and equipment to the jobsite, and thus facilitate improved work face planning, increased labor productivity, better schedules, and lower project costs (Aditya & Pande, 2015).

The International Federation of purchasing and Material management defines material management as a total concept having its definite organization to plan and control all types of materials, its supply, and its flow from raw stage to finished stage so as to deliver the product to customer as per its requirement in time. (Gopalakrishnan P. , 2006), visualize material management from integrated perspective as they postulate materials management as the function responsible for the coordination of planning, sourcing, purchasing, storing and controlling materials in an optimum manner so as to provide a predetermined service to the customer at a minimum cost. The basic priority of material management according to (Jacobs, Chase, & Aquilano, 2009) is to ensure that the right item is bought and made available to the manufacturing operations at the right time, at the right place and at the lowest cost.

According to (Arnold & Chapman, 2004), materials management can define as an organizing function responsible for planning and controlling the materials flow. This means that the materials management is a planned procedure that involves from the initial purchasing, delivery, handling and minimization of waste of the material with the purpose to ensuring the quality, quantity and time of the requirement should meet accordingly. Material management are the activities involved to plan, control, purchase, expedite, transport, store, and issue in order to achieve an efficient flow of materials and that the required materials are bought in the required quantities, time, quality and at an acceptable price (Stukhart, 2007).

The purpose of material management is to ensure that the right materials are in the right place, in the right quantities when needed. It is concerned with planning, organizing and controlling the flow of materials from their initial purchase through internal operations to the service point through distribution. It is concerned with minimizing the cost of materials in organizations without hampering the operation and efficiency of the organizations. In most cases more than 60% of the total expenditure of an organization or a typical manufacturing organization is spent

on materials. Here the magnitude of expenditure on materials in developing countries can be even more than the developed countries (Aditya & Pande, 2015).

2.2.2 Materials Management in Construction Projects

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

2.2.3 Goals of Material Management

(Cavinato, 1999), states that the objectives of a material management system should include lowest final cost, optimum quality, assurance of supply, and lowest administrative costs. By buying products at the lowest possible costs, operating costs can be reduced and profits can be increased. Proper handling and storage of materials can reduce the total cost of materials; therefore the materials manager should ensure that materials are handled properly and stored in the most adequate places. Quality is a very important aspect that the materials manager has to keep in mind. When specifications require a high quality product, quality could become the most important objective.

Suppliers play an important role in any organization. Many companies rely greatly on outside suppliers for the materials needed for production. Good relations with suppliers might be decisive for a company to be in business. Companies that have good relations with suppliers

could be more successful in attracting customers than companies that have bad relations with suppliers. When a company has good relations with its suppliers it could benefit from cost reductions, cooperative environment from the employees of the supplier, and willingness to help with materials ordered and orders pending. When a company has a bad relation with their suppliers it might be possible that it experiences late deliveries or wrong materials delivered. This will have an impact in the total cost of the product, possibly increasing the total costs, and delaying the completion of the final product. Materials acquisition from the procurement time until it is received in the field can have a significant impact on the schedule of a construction project.

2.2.4 Importance of Materials Management to Construction Projects

Efficient management of materials plays a key role in the successful completion of a project. The cost represented by materials fluctuates and may comprise between 20-70% of the total project cost and sometimes more,(Gulghane & Khandve, 2015) Sustainable materials management can have numerous benefits.

An effective material management system can bring many benefits for a company. Previous studies by the Construction Industry Institute (CII) concluded that labor productivity could be improved by six percent and can produce 4-6% in additional savings (Ashwini R. Patil, 2013). Among these benefits: reducing the overall costs of materials, better handling of materials; have better relations with suppliers, reduction of materials surplus, reduce storage of materials on site, labor savings, stock reduction, purchase savings and better cash flow management are some of the importance of construction materials management

2.3 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. The typical tasks associated with a material management system are: - planning, Procurement and purchasing, Expediting, Materials planning, Materials handling, Distribution, Cost control, Inventory management / Receiving/ Warehousing and Transportation. Planning is the most commonly used basis for planning things out for the project is the BOQ prepared by the client.

The planning should be revised as frequently as possible in order to monitor whether work is progressing as planned. Purchasing and procurement deals with the acquisition of materials to be used in the operations, the primary function of purchasing and procurement is to get the materials at the lowest cost possible, but keeping in mind quality requirements. The purpose of materials planning is to procure the materials for the dates when they are needed, storage facilities, and handling requirements. The primary function of materials handling is to manage the flow of materials in the organization.

Materials represent a major expense in construction, so minimizing procurement cost improves opportunities for reducing the overall project cost such as efficient material planning, buying or purchasing, procuring and receiving, storing and inventory control, stock and waste control, supply and distribution of material, quality assurance, good supplier and customer relationship, improved departmental efficiency, reduce the cost of project, time saving, achieve economy in project to fulfill all these purposes, it is necessary to establish harmony and good coordination between all the employees of material management department and this department should have good coordination with the other departments of the organization to serve all production centers. Material delivery delays have negative impacts on the success of the construction

project. It has also been made to propose techniques and solutions to prevent such problems in materials for construction projects. Delays are costly and often result in disputes and claims. So, the need to apply new techniques as JIT in order to improve the current situation. The main aim of JIT materials management system in construction projects is to optimize materials delivery timing and to minimize inventory quantities. This gives a positive sign that Just-in-Time can assure construction fluidity in terms of managing materials procurement processes in construction projects.

The main goal of JIT materials management system in construction projects is to optimize materials delivery timing and to minimize inventory quantities. Inventory or storage on site are exposed into certain deficiencies such as protecting it against theft, damage, and weather, and failing to provide space for materials. The implementation of JIT in construction requires commitment from staff and crew involved in the construction in terms that all parties from the planning and site should collaborate together and participate in the decision making process. The successful implementation of JIT is dependent on the suppliers' flexibility, users' stability, total management and employee commitment as well as teamwork. (Chalam, Lakshmi, & Prof. G. V., 2016). Materials management practices on building project are categorized practices to five processes (Gulghane & Khandve, 2015), planning, purchasing, and transportation, handling and waste control. (Ocheoha & Moselhi, 2013), also identify practices such as just in time, Economic order quantity, warehousing management as part of materials management practices that should be taken seriously. A good materials management environment enables proper materials handling on construction sites.

2.3.1 Planning:

Material planning is the initial process that needs to be carried out accurately in order to provide guide to all the subsequent activities. According to (Gulghane & Khandve, 2015), material planning includes quantifying, ordering and scheduling. The materials planning process covers the set up maintenance of records and determines the target levels and delivery frequency.

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 (Tanko, Abdullah, & Ramly, 2017). Effective 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.

In construction scheduling is concerned with the regulation of the flow of construction units through their preconceived plans of operations, material. Scheduling involve the establishment of time tables for the ordering of all materials requirement for maintaining the flow of materials must be schedule to coincide with the flow of all construction of activities involved in the actual construction of each project (Albert, 2014).

2.3.2 Testing

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

2.3.3 Procurement

Procurement is not only about appointing contractors and preparing contract, but is also very much a starting point in the process of delivery (Mead & Gruneberg, 2013). Activities included in the procurement process range from purchasing of equipment, materials, labor and services required for construction and implementation of a project (Kasim, Anumba, & Dainty, 2005). Another author has defined procurement as identifying and analyzing user requirements and type of purchase, selecting suppliers, negotiating contracts, acting as liaison between the supplier and the user, and evaluating and forging strategic alliances with suppliers; hence, effective procurement can significantly enhance the competitive advantage of a project (Morris & Pinto, 2007). Many authors have suggested that choosing best option of procurement can help to reduce the impact of uncertainties such as late deliveries, substandard raw material qualities, resource constraints and so on (Morris & Pinto, 2007). Therefore to successfully deliver a project it is not about adopting a procurement system with best practice tactic to fix all problems, but to embrace an approach that has the best-fit tactic that gets the job done most efficiently (Keith, Vitasek, & Kling, 2016).

2.3.4 Logistics

Logistic is defined as concept that includes movement and it may encompass planning implementing and controlling flow and storage of all goods from raw materials to the finished product to meet customer requirements (Kasim, Anumba, & Dainty, 2005). For smoothly handling the materials, space need to be carefully allocated for material handling equipment, access roads, warehouses, workshop, and laydown materials in the construction site (Pellicer & et, 2013). Planning these tasks accurately can help to formulate an efficient construction site layout that can provide easy access and routing of materials within the construction site.

Moreover introducing slopes in the construction site can ease the circulation of materials because of the gravity effect. To control access and to increase the security of the site, setup wall or fence can be considered as a requirement for the construction site. Optimum forecasting for material movement (Mahdjoubi & Yang, 2001) and planning of access and routing of materials within construction site (Faniran & Caban, 1998) are factors that need to be taken consideration during logistics process for effective material management.

2.3.5 Handling

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

2.3.6 Stock and Waste Control

Material waste is a significant factor in construction cost, (Calkins, 2009), states material waste is 9% by weight in the Dutch construction industry and 20-30% of purchased materials in the Brazilian construction industry. Material wastes are caused by several sources such as design, procurement, material handling, and operation and so on. (Shen, Tam, Tam, & Drew, 2004), defined building material wastages as the difference between the value of materials delivered

and accepted on site. Moreover material waste has been recognized as a major problem in the construction industry and it can also implicate inefficiency in project delivery. Adopting a proper stock control will help to increase the productivity and also can be one of the way to improve waste control in the construction site.

By introducing minimizing strategies to reuse materials in both design and construction phase can be a mean to reduce waste (Dainty & Brooke, 2004). Some authors simplify these stages into distinctive phases. As a matter of fact one of the research done by (Manteau, 2007) on the material management practices in Ghana explains that the current material management phases in Ghanaian construction industry are bidding phase, sourcing phase, material procurement phase, construction phase and post construction phase. Therefore; it is very evident that in various countries these processes are carried out in different ways. There can be many factors that might influence these processes such as culture, work environment, belief and so on. Moreover different groups have learnt to deal with uncertainty in different ways, often because they find themselves faced with different levels of uncertainty. Therefore; already established material management processes that are being practiced by other countries can be used to identify the processes that are being practiced and those that are neglected in the Maldives construction industry.

2.4 Major Principles of Purchasing

Some of the major principles of purchasing are: Right Quality. Right Quantity; Right Time; Right Source; Right Price and. Right Place.

Right Quality: According to Oxford College of procurement and supply (College, n.d.) (www.Oxfordcollegeprocurementandsupply.com)” Quality traditionally referred to the quality of the product or service ordered and the standards required”. Although the quality of the product or service is relevant, today’s approach considers greater aspects of quality

including the need for Total Quality Management (TQM). The philosophy behind quality it promotes the theory that quality should permeate every area of an organization and its supply chain. Modern theory behind the five rights of procurement supports this view and opens up a wide range of areas that need to be considered.

Right Quantity: is the quantity that may be purchased at a time with the minimum total cost and which obviates shortage of materials. Ensuring and maintaining a regular flow of materials for carrying the production activity is the vital aim of any purchase organization. Excess purchases should be avoided, it results in overstocking and capital is unnecessarily blocked and inventory carrying cost goes up. The purchaser must buy the materials in the right quantity to ensure that there is no stoppage of production or no extra stock piling. Normally, the inventory control wing of purchase (stores) department, fixes up the economic order quantity (EOQ), i.e., the quantity which should be purchased at a time to get the maximum benefit at minimum total cost. This requirement is mentioned in the purchase order and it is necessary to see that the materials are delivered, (Article shared by Malik Shawa1; www.youarticlelibrary.com-Materialmanagement).

Article shared by (Dobler & Burt, 1996) Along with the economic order quantity, there are two more concepts, viz.; bulk order quantity and arbitrary order quantity which needs to be understood. Bulk Order Quantity is the quantity which is larger than the economic order quantity. Bulk order quantity ensures various economies of price, lesser operational cost in the purchase department. Arbitrary Order Quantity is the outcome of the weaknesses of economic order quantity and bulk order quantity. Due to varying market conditions, it is not advisable to always strictly adhere to the economic and bulk order quantities. Certain factors viz.; uncertain order from the market, uncertain financial position, uncertain production schedule and uncertain lead time are responsible for the adoption of arbitrary order quantity on the part of the purchase manager.

Right Time: For determining the right time, the purchase manager should have lead time information for all products and analyze its components for reducing the same. Lead time is the total time elapsed between the recognition of the need of an item till the item arrives and is provided for use. This covers the entire duration of the materials cycle and consists of pre-contractual administrative lead time, manufacturing and transporting lead time and inspection lead time. Since the inventory increases with higher lead time, it is desirable to analyze each component of the lead time so as to reduce the first and third components which are controllable. While determining the purchases, the buyer has to consider emergency situations like floods, strikes, etc. He should have 'contingency plans' when force major clauses become operative, for instance, the material is not available due to strike, lock-out, floods, and earthquakes, (Chary, 2007).

Right Source: Selecting the right source for the purchase of materials is an important consideration in the purchase procedure. The right source for the procurement of materials is that supplier who can supply the material of right quality as ordered, in right quantity as ordered, at a right time at which the materials were required to be supplied, at an agreed price with the supplier, who is in a position to honor the commitment without much follow-up, who has necessary financial resources and adequate man-power to handle the order and who is well established with higher reputation and proven business integrity.

The source of material should be located within a reasonable distance from the buyer's organization. This will minimize the delivery delays, higher transportation charges and improve the personal contact between the buyer and the supplier and enable better aftersales service etc. As far as possible the middlemen and brokers should be avoided in the purchase of materials. A direct liaison should be established with the supplier. It would be helpful in improving the quality of the material in future. While selecting the supplier certain factors must be kept in mind, viz., location of the supplier, warehousing facilities available with the supplier,

relations of the employers with the labor, credit worthiness of the supplier, size of the supplier's firm and quality control observed by the employer etc. A personal visit to prospective supplier's premises will be helpful in assessing the capabilities of the supplier.

Right Price: Determination of right price is a difficult task. It is the main object of any organization to procure the material items at the right price. It is that price which brings the best ultimate value of the money invested in purchasing the materials. Deciding the right price of a product depends on variety of factors, viz.; quality, delivery time and ultimate life of the material, demand and supply curve, extent of competition, government restrictions, after sales services, discount offered, and terms of purchase etc. It may be pointed out here that the determination of proper price depends not only on market knowledge but also a clear understanding of the pricing process.

The buyer should keep in touch himself with the above mentioned factors in the process of determination of price. The prevailing market prices also provide basis for the price determination. There should be negotiation between the purchase department and the suppliers for the determination of proper price. A traditional purchasing objective is to obtain the lowest possible purchase price. However, the common practice is to obtain the best life cycle price or the lowest total acquisition cost. "The factor that affect the price of items are quality and quantity required, urgency of requirements, demand and supply of materials in the market, whether there is room for competition or not, whether the past business relationship was good or not' strained " (Parson, 1982).

Right Place: Besides obtaining the materials of the right quality and quantity from the right source at the right price, it should be ensured that the materials are available at the right place. Transportation and material handling costs are greatly affected by the selection of the right place from where the materials are to be acquired. For minimizing these costs, selection of right

place for the acquisition of material is of utmost importance. If local as well as outside supplier fulfills these conditions, the former should be preferred. The above mentioned principles of purchasing can be summed up as the six R's of purchasing.

2.5 Problems associated with materials management in project

(Kasim, Anumba, & Dainty, 2005), identifies improper Construction materials management as a factor affecting the general performance of construction projects in respect to construction time, quality, cost and overall construction productivity. (Kasim. N, 2011), informed that late delivery of Construction materials, unavailability of materials before commencement of construction work, and the long distance of materials from the work location is the principal causes of materials-related problems on construction sites. (Kazaz, Manisali, & Ulubeyli, 2008), found that poor planning for Construction materials and difficulties associated with site transportation as factors leading to a lack of Construction materials on sites.

Furthermore, (Dey, 2001), noted that the common issues relating to materials management are as follows: Receiving materials before they are required, causing more inventory cost and chances of deterioration in quality; not receiving materials at the time of requirement, causing loss of productivity; incorrect materials take-off from drawings and design documents; Subsequent design changes; and Damage/loss of items; selection of type of contract for specific materials procurement; vendor evaluation criteria; piling up of inventory and controlling of the same; and Management of surplus materials.

Process of purchasing and supply of materials, the challenges often occurs when the materials is not equivalent as the ordering purchase, the skipped list out ordering materials, timing of materials arriving, quantities of materials, lack of training and adequate management, lack of Just In Time strategy, lack of communication and relation between contractor and supply chain companies are the main impediment.

2.6 Factors Affecting Cost and Time Performance

(Chan & Kumaraswamy, 2002), remarked that studies in various countries appear to have contributed significantly to the body of knowledge relating to time performance in construction projects. (Iyer & Jha, 2005), remarked that project performance in term of cost is studied since 1960s. These studies range from theoretical work based on experience of researcher on one end to structured research work on the other end. Moreover, (Tai, Sui, & Quek, 2006)) stated that there have been many past studies on project performance according to cost and time factors.

(Maxwell, 1996), stated that a number of unexpected problems and changes from original design arise during the construction phase, leading to problems in cost and time performance. It is found that poor site management, unforeseen ground conditions and low speed of decision making involving all project teams are the three most significant factors causing delays and problems of time performance in local building works.

(Okuwoga, 1998), stated that cost and time performance has been identified as general problems in the construction industry worldwide. (Dissanayaka & Kumaraswamy, 1999), remarked that project complexity, client type, experience of team and communication are highly correlated with the time performance; whilst project complexity, client characteristics and contractor characteristics are highly correlated with the cost performance. (Reichelt & Lyneis, 1999), obtained that project schedule and budget performance are controlled by the dynamic feedback process. Those processes include the rework cycle, feedback loops creating changes in productivity and quality, and effects between work phases.

(Chan A. , 2001), identified that the best predictor of average construction time performance of public sector projects. This relationship can serve as a convenient tool for both project managers and clients to predict the average time required for delivery of a construction project.

(Kuprenas, 2003), stated that process of a design team meeting frequency and the process of

written reporting of design phase progress were found to be statistically significant in reducing design phase costs. Otherwise, the use of project manager training and a project management based organizational structure were found to be processes that do not create a statistically significant in reducing design phase costs.

(Iyer & Jha, 2005), remarked that the factors affecting cost performance are: project manager's competence; top management support; project manager's coordinating and leadership skill; monitoring and feedback by the participants; decision making; coordination among project participants; owners' competence; social condition, economical condition and climatic condition. Coordination among project participants was as the most significant of all the factors having maximum influence on cost performance of projects. (Love, Tse, & Edwards, 2005), examined project time-cost performance relationships by using project scope factors for 161 construction projects that were completed in various Australian States. It is noticed that gross floor area and the number of floors in a building are key determinants of time performance in projects.

Furthermore, the results indicate that cost is a poor predictor of time performance. (Chan & Kumaraswamy, 2002), proposed specific technological and managerial strategies to increase speed of construction and so to upgrade the construction time performance. It is remarked that effective communication, fast information transfer between project participants, the better selection and training of managers, and detailed construction programs with advanced available software can help to accelerate the performance, stated that managing speed in engineering, procurement and construction projects is a key factor in the competition between innovative firms. It is found that customers can consider time as a resource and, in that case, they will encourage the contractor to improve the time performance.

2.6.1 Cost Factors

(Curt, 2005), argued that the cost management system tracks current spending and commitments and predicts ultimate cost outcome. (Yafiah, 2013) Indicate that procurement selection criteria of cost, time, quality, project characteristics and external environmental factors have effects on project performance. (Fetene, 2008), found that the most common effects of cost overrun were delay, supplementary agreement, adversarial relations among stakeholders, and budget shortfall of project owners which guides efforts to improve the performance of the construction industry in the future. (Aftab & Azis, December 2010) stated that fluctuation in price of material, cash flow and financial difficulties faced by contractors, shortage of site workers, lack of communication between parties, incorrect planning and scheduling by contractors are most severe factors while frequent design changes and owner interference are least affecting factors on construction cost performance.

(Amusan, 2011), discovered from the analysis that factors such as contractors in experience, inadequate planning, inflation, incessant variation order, and change in project design were critical to causing cost overrun, while project complexity, shortening of project period and fraudulent practices are also responsible. (Baloyi & Bekker, 2011), discovered that the increase in material cost is the single largest contributor to cost overruns for both global and local projects. (Mhando & Mrema, 2005), found that in most cases, distortion of clients to assume roles of their consultants through making decisions and changes that affect the design and the project cost has undermined the efforts to attain the intended goals. (Shaban, April, 2008), stated that the most important factors affecting the performance of construction projects agreed by the owners, consultants and contractors were: average delay because of closures and materials shortage, availability of resources as planned through project duration, leadership skills for project manager, escalation of material prices, availability of personals with high experience and qualification and quality of equipment and raw materials in project.

2.6.2 Time Factors

Time is money to owners, builders, and users of the constructed facility. From the owner's perspective there is lost revenue by not receiving return on investment, cash flow crunch, potential alienation and loss of clients/tenants, extended interest payments, and negative marketing impacts. From the users' perspective, there are financial implications similar to owners (Muir Bob, 2005). (Aje, 2009), showed that contractors' management capability has significant impact on cost and time performance of building projects. (Wiguna & Scott, 2005), showed the critical risks affecting both project time and cost perceived by the building contractors were similar. They were: high inflation/increased material price, design change by owner, defective design, weather conditions, delayed payments on contracts and defective construction work. With respect to time delays the most significant contributing factor for global projects was late delay in payments while for the stadia projects design-related factors caused the most delays, (Baloyi & Bekker, 2011), identified the factors that contribute substantial detrimental effect to project performance, thus affecting the integrity of the construction industry.

2.6.3 Quality Factors

(Curt, 2005), stated that the quality management system monitors and analyzes quality of the constructed project and predicts quality problems and issues. Typical quality measures include: (I) Quality control tests: number performed, frequency and percentage passed/failed, number of non-conformance issues, number of change requests and root causes, cost of rework, number of exceptions at turnover and cost of quality (ii) Quality Assurance Cost (cost of resources): quality assurance cost as a percentage of construction cost, cost of quality and Cost of quality as percentage of construction cost. (Lepartobiko, 2012), stated that quality can be assured by identifying and eliminating the factors that cause poor project performance. Lack of contractor experienced topped the quality related cause of project failure.

(Bui & F.Ling, 2010), discovered that major enablers that lead to project success are foreign experts' involvement in the project, government officials inspecting the project and very close supervision when new construction techniques are employed. A factor which leads to poor performance is the lack of accurate data on soil, weather, and traffic conditions.

2.6.4 Project Success and Project Performance

(Al-Momani, 2000), stated that the success of any project is related to two important features, which are service quality in construction delivered by contractors and the project owner's expectations. Managing the construction so that all the participants perceive equity of benefits can be crucial to project success. It is obtained that the complete lack of attention devoted to owner's satisfaction contributes to poor performance. Declining market shares, low efficiency and productivity, and the rapid construction cost escalation also lead to poor performance.

(Skibniewski & Nitithamyong, 2004), remarked that the success of construction projects depends up on technology, process, people, procurement, legal issues, and knowledge management which must be considered equally. (Pheng & Chuan, 2006), defined project success as the completion of a project within acceptable time, cost and quality and achieving client's satisfaction. Project success can be achieved through the good performance of indicators of the project. So, success refers to project success and performance refers to performance of indicators such as project managers.

(Wang & Huang, 2006), stated that Project success has been widely discussed in the project management literature. The focus of most studies of project success is on dimensions of project success (how to measure it) and factors influencing project success. (Wang & Huang, 2006), studied that how the engineers evaluate project success and to what extent key project stakeholders' performance correlates with project success. It is obtained that project owners play the most important role in determining project success, and project management

organizations' performance as the single point of project responsibility has significant correlations with project success criteria. (Lam, Chan, Wong, & Wong, 2007), stated that the allocation of risk among the contracting parties in a construction contract is an important decision leading to the project success.

2.6.5 Performance of Construction Projects

To perform is to take a complex series of actions that integrate skills and knowledge to produce a valuable result (Edger.D, 2008). Project performance has been defined as the degree of achievement of certain effort or undertaking which relates to the prescribed goals or objectives that form the project parameters (Ahmad, et al., 2009). The key requirements of suitable performance measures and measurement frameworks are identified as including, having a few but relevant measures, being linked with critical project objectives, providing accurate information, and comprising financial and non- financial measures (Ankrah & Proverbs, 2005). There are many potential measures of performance for evaluating the success of a construction project. All address performance in three key areas: scope, schedule and budget (Alvarado, Silverman, & Wilson, 2005). (Takim & Akintoye, 2002), discovered seven project performance indicators, namely: construction cost, construction time, cost predictability, time predictability, defects, client satisfaction with the product and client satisfaction with the service and three company performance indicators. Namely: safety, profitability and productivity.

2.6.6 Performance Indicators

The UK working groups on Key Performance Indicators (KPIs) have identified 10 parameters for benchmarking projects in order to achieve a good performance in response to (Egan, 1998). However, most of these indicators, such as construction cost, construction time, defects, client satisfaction with the product and service, profitability and productivity, promote result-

orientated thinking, whereas predictability of design cost and time, and predictability of construction cost and time, and safety can be regarded as process-orientated thinking. There are no suggestions for performance indicators in benchmarking projects at the project selection phase i.e., analysis stage. According to (Dvir, Raz, & Shenhar, 2002), the output of the requirements at the analysis stage will most likely determine the output of the entire development process. They indicate that the origination and initiation phase, in which major decisions are made, such as decisions on the project's objectives and planning the project's execution, has the most influence on the project's success. The issue is much more serious when the kind of activities that should be undertaken depends on the outcome of earlier activities. It is therefore important to identify parameters for benchmarking projects at the project selection phase in order to achieve good project performance.

(Posten, 1985), who found that 55% of all defects in R&D projects occur during requirement analysis and specification, earlier documented this position, whereas 43% of all defects are not found until after the testing stage. It is not surprising that the same situation is applicable to construction projects.

2.9 Measures for managing materials in building project

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

2.8. Performance Measure

A performance measure is used to calculate the effective working of a function. These performance measures may differ from system to system. The measures divide the materials management system into parts and make the working of the system more efficient. When joined, the measures make the complete materials management system.

Research has been done in the past by (Plemmons & Bell, Nov/Dec 1995), about the effectiveness of performance measures in materials management. Plemmon's developed a list of performance measures for use in industrial construction projects and proposed a model for benchmarking the materials management process in industrial construction. The Plemmon's performance lists are to be used in this study to assess its importance, and practicality of implementation in residential construction projects. (Patel & Vyas, 2011), are of the view that for managing a productive and cost efficient site efficient material management is very essential. Research has shown that Construction materials and equipment may constitute more than 70% of the total cost for atypical construction project. 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. One of the major problems in delaying construction projects is poor materials and equipment management.

(Madhavi, Mathew, & Sasidharan, 2013), states that the objective of the present study is to understand about all the problems occurring in the company because of improper application of material management. In construction project operation, often there is a project cost variance in terms of the material, equipment, manpower, subcontractor, overhead cost, and general condition. Material is the main component in construction projects. Therefore, if the material management is not properly managed it will create a project cost variance. Project cost can be controlled by taking corrective actions towards the cost variance. (Kareem & Pandey, 2013)are of the view that now days, the increased economic growths as well as urbanization in

developing countries have led into extensive construction activities that generate large amounts of wastes. Material wastage in construction projects resulted into huge financial setbacks to builders and contractors. In addition to this, it may also cause significant effects over aesthetics, health, and the general environment.

2.9 Conceptual Framework

A conceptual framework is defined as a set of broad ideas and principles taken from relevant fields of enquiry and used to structure a subsequent presentation (Reichel & Ramey, (Eds.), 1987:). The conceptual framework in this study was used to show various variables that affect the performance of construction projects.

Performance of Construction project performance depend up on change in independent variable elements, like; planning and scheduling; testing the quality of construction materials; procurement procedures; warehousing; handling; controlling of material wastage; distribution and disposal procedure. The study suggests that firm’s performance is a function of material management system. Material management process is an independent variable of the study, while performance is dependent variable. The study presumes that material management process has significant impact on the performance of construction project, in the case of Addis Ababa Housing Development project office. Hence; 1 unit increasing or decrease the independent variable will increase or decrease the value of dependent variables.

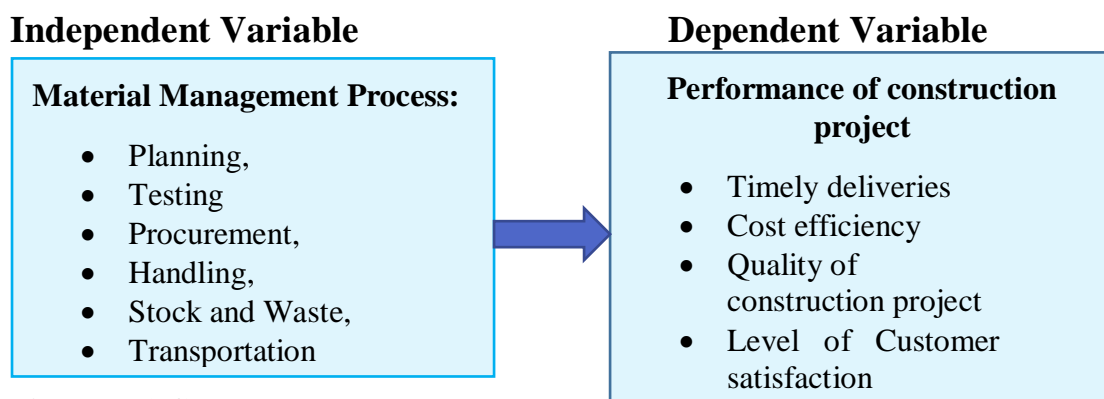


Figure 2. 1 Conceptual Frame Work

CHAPTER THREE

3. RESEARCH DESIGN AND METHODS

3.1 Research Design

Research design is a strategic framework for action that serves as a bridge between research questions and the execution, or implementation of the research strategy,, (Durrheim, 2004). In this study, a descriptive; linear regression model and explanatory research design were used, the major purpose of descriptive research is description of the state of affairs as it exists at present, to obtain information concerning the current status of the phenomena, and to describe "what exists" with respect to variables or conditions in a situation and. The study also employed an explanatory research type for qualitative data collection and analysis by using multiple regression models after checking the six assumptions of this model to measure the relationship between dependent and independent variables. Then this study describes and critically assesses the factor affecting the performance of construction projects in AAHDPO.

3.2 The research Approach

To address the key research objectives, a mixed research design that involves both a quantitative and qualitative research methodologies were adopted in this research. The overall aim of using mixed methods was to overcome the limitations of other data collection methods, to triangulate and dig the research problem in detail to increase validity, and also it can answer research questions that other methodologies cannot address. The justification for using a mixed method research is that it provides advanced and comprehensive methods to handle both qualitative and quantitative data (Creswell, 2014).

3.3 The Population of the Study

The population of the study comprises six groups of stakeholders involved in construction projects in Addis Ababa Housing Development Project Office staff, this stakeholders includes 85 contractors; 18 consultants; 17 site engineers, 15 material management department; 21 purchasing department and 13 material quality inspection, a total of 169 was the total population size of the study. .

3.4 Sampling method

A two-step process is used in which the population is partitioned into six groups as contractors; consultants; site engineers, purchasing; material management department and quality and inspection departments. The group are mutually exclusive and collectively exhaustive in that every population element should be assigned to consultants and site engineers and no population elements should be omitted hence this two department is small in number and manageable, then censure sampling was adapted for the two clients and Purposive or judgmental sampling for the rest four groups.

3.5 Sampling Method

Purposive or judgmental sampling is a strategy in which particular settings persons or events are selected deliberately in order to provide important information that cannot be obtained from other choices (Maxwell, 1996). According to (Wei, 2009)purposive sampling is the most important type of non-probability sampling. Due to the fact that researchers used purposive or judgmental sampling of non- probability sampling techniques to conduct the study. Thus, respondents with basic understanding and experience were selected by a researcher for the study, which enables a researcher to select any respondent that he/she thinks best to fit the question, and to obtain information in detail.

3.6 Sampling Size Determination.

In the case of the research population, it does not mean that all members of stakeholders are possible respondents for the questionnaire. To this end; the sample size determination was conducted in two ways, the scenario was selecting respondents from four groups like; contractors; purchasing and planning department; material management department and material quality and inspection based on a researcher's personal judgments. The second scenario was selecting respondents from two groups, like; consultants and site Engineers by using census sampling techniques, hence the number of these two groups was small in number and manageable to collect and analyze the data easily. The purpose of using these techniques was to get relevant and accurate information that enhances the accuracy relevance and acceptance of the study.

Accordingly; a sample of 100 respondents was selected using the purposive and census sampling techniques. Of the total respondents 65 was selected by using purposive sampling technique and 35 respondents were selected through census sampling techniques. Based on this 17 respondents were from site Engineers, 18 from Consultants, 13 from purchasing and planning department; 6 from material quality and inspection department; 11 from material management department; and 35 from site contractors was selected to conduct the study

3.7 Data Sources

The data was obtained from primary and secondary data sources. The primary data collection refers to first-hand information collected directly from key stockholders and project office employees through questionnaires and interviews, and through direct observation. Secondary data refers to the information that has been already collected, analyzed, documented and published by another researcher or institute (Kent, 2015). The secondary data was collected from books, research articles, journals, internet, and statistical reports.

3.8 Data Collection Instrument

Survey questionnaire, interview, and site observation are the data collection instrument used by the researcher to conduct the study. The questionnaire was carefully developed and formulated based on intended key objectives of the study. A researcher also used the five-Likert-style scale rating data collection instrument to get respondents' level of agreement on factors that affect performance of construction projects. The following ratings were adopted in this research to facilitate the analysis: Strongly Agree-5, Agree-4, Neutral-3, Disagree-2, and Strongly Disagree-1

3.9 Method of Data Processing

After the required data was collected from primary and secondary sources, it was processed and checked before any data analysis was made; because collected raw data should be transformed into meaningful and readable data. Accordingly; data was presented; edited; coded and organized to enhance the accuracy and reliability of data.

3.10 Validity of Instrument

A pilot test was conducted to review the items in the instrument and determine whether the items would measure the information it was designed to elicit. Accordingly; questionnaire was distributed to 10 respondents, purposely selected department staff and stakeholders. These respondents gave feedback regarding the layout and the content in the questionnaire. Accordingly; the questionnaire was modified and adjusted as per the feedback of the respondents to improve the questionnaire to get better response from the respondents; to identify any mistakes in the questionnaire.

3.11 Reliability Analysis

The data were collected independently from different respondents at different designation and from different departments. So it is important to check the validity and reliability of collected data. Cronbach's alpha is the most common measure of internal consistency ("Reliability"). It is most commonly used when we have multiple Likert questions in a survey/questionnaire that form a scale. For this reason a reliability test was conducted using SPSS software.

Table 3. 1 Reliability Statistics

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.913	0.911	51

Table 1 shows the reliability of data. The data is reliable when alpha value is higher than 0.60, as the value of alpha is 0.913, so data is highly reliable

3.12 Method of Data Analysis

The descriptive frequency distribution was used to determine the six groups of respondents' level of agreement to identify factors that affect performance of construction projects and the existing materials management practices in AAHDPO. Likewise; multiple linear regression model was adopted to measure the relationship between dependent and independent variables, and to determine the extent in which one unit change in independent variable will change the value of dependent variable, keeping that multiple linear regression assumptions like, Linearity between dependent and independent; variable(s); multicollinearity between independent variable; correlation between the residual (error) terms; error terms must have constant variance and the error terms must be normally distributed.

3.13 Ethical issues

Ethics is one of the major considerations in research. The researcher of this study was also subjected to the following ethical considerations. The research work was started after getting the willingness of the stated organizations. Respondents were clearly communicated about the objective of the research before they were asked to give their answer. There was no physical or psychological damage to them because of the research. Respondents were not asked about their name, race, religion, etc.

CHAPTER FOUR

4. DATA PRESENTATION ANALYSIS AND INTERPRETATION

4.1 Respondent demographic characteristics

In this chapter, results have been presented and discussed to address the research questions and objectives

Table 4. 1: Frequency of Respondent Profile

Respondent Department		Frequency	Percent
	Site Engineer	17	17
	Contractor	35	35
	Consultant	18	18
	Purchasing Department	13	13
	Material Management Department	11	11
	Material quality and Inspection Department	6	6
Total		100	100
	BSC	43	43
	BA Degree	39	39
	Diploma	6	6
	MSC Degree	12	12
Total		100	100
	1-5 Years of Experience	37	37
	6-10 Years of Experiences	40	40
	Above 10 Years	23	23
Total		100	100

Table 4.1 above, summarizes the characteristics of the respondents in terms of their occupation; educational backgrounds and year of experiences in the study area, to this end; the table indicates that the six groups selected purposely from the project office clients and project offices' different departments. The clients and project office department staff are consultants; contractors; site Engineers; purchasing department; materials management; and from materials quality and inspection department to conduct the research.

To this end; The table also indicates that majority of respondents have BSC and BA Degree i.e. from 100 respondents 43% had BSC, 39% had BA Degree, 6% respondent had diploma and 12% respondents had MSC, and from the foregoing information, it is also evident that, accordingly; the respondents had 1-5years(37%); 6-10years(40%) and above 10 years(23%) of experiences, the respondents are very much related to construction materials management to respond the questionnaire, most of the respondents are educated and experienced to provide relevant data on effects of materials management on performance of construction project.

4.2 Factor that affects Performance of Construction Project

Table 4.3 below is an indication of the factor that affects performance of construction project in terms of project delivery time, cost and the quality of construction project in AAHDPO.

Table 4. 2: Factor that affects Performance of Construction Project

Factor that affect Performance of construction project	Strongly Disagree	Disagree	Neut ral	Agr ee	Strongl y Agree	Total N	$\Sigma(A+S. A)$
Scale Value	1	2	3	4	5		Percent
Factor that affect project deliver							
Inadequate contractor experience	4	5	1	57	27	94	89%
Shortage of required construction material	0	5	3	43	43	94	91%
Delay in progress payment to contractors by owner	2	18	7	53	14	94	71%
Financial difficulties of owner	3	21	8	45	17	94	66%
Delay in materials procurement	0	3	8	62	21	94	88%
Late Delivery of Construction Material	0	5	6	53	30	94	88%
Shortage of technical personnel(skilled labor)	3	12	11	43	25	94	72%
Incorrect planning and scheduling by contractors	3	9	9	46	27	94	78%
Weather condition and Ground work	5	26	9	50	4	94	57%
Mistakes made by contractors during construction	5	8	18	54	9	94	67%
Factors that affect project Cost							
Fluctuation in price of Construction materials	1	5	6	51	31	94	87%
Frequent Design changes and specification by project office or by consultant.	1	11	14	50	18	94	72%

Factor that affect Performance of construction project	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total N	$\Sigma(A+S.A)$
Scale Value	1	2	3	4	5		Percent
Contractual claims, such as, extension of time with cost claims	1	15	16	50	12	94	66%
Rework from poor material quality	5	19	14	42	14	94	60%
Incompetent Project team (designers and contractors)	3	11	13	50	17	94	71%
Factors that affect Quality of the project							
Lack of Coordination between Designer, Contractor; supplier and other stakeholder of construction project	-	2	12	50	30	94	85%
Absence of clear and standard Quality management practice in project office	-	4	10	54	26	94	85%
Contractor's poor site management and Supervision	-	6	8	46	34	94	85%
Using Defected Construction material	2	22	13	42	15	94	61%
Dissatisfaction of the workers	1	13	10	53	17	94	74%
Inadequate control procedure	-	14	8	54	18	94	77%
Improper inspection of construction material as per the specification	3	14	9	49	19	94	72%

As per the above frequency distribution table respondents identified and agreed on the top ten major factors that affects the performance of construction projects as per the below table 4.4.

Table 4. 3: Factor that affects Performance of Construction Project

Factor that affect Performance of construction project	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total N	$\Sigma(A+S.A)$
Scale Value	1	2	3	4	5		Percent
Shortage of required construction material	0	5	3	43	43	94	91%
Inadequate contractor experience	4	5	1	57	27	94	89%
Delay in materials procurement	0	3	8	62	21	94	88%
Late Delivery of Construction Material	0	5	6	53	30	94	88%
Fluctuation in price of Construction materials	1	5	6	51	31	94	87%
Lack of Coordination between Designer, Contractor; supplier and other stakeholder of construction project	0	2	12	50	30	94	85%
Absence of clear and standard Quality management practice	0	4	10	54	26	94	85%
Contractor's poor site management and Supervision	0	6	8	46	34	94	85%
Incorrect planning and scheduling by contractors	3	9	9	46	27	94	78%
Inadequate control procedure	0	14	8	54	18	94	77%

The inference made from the six groups of respondents under Table 4.4 above shortage of required construction material with 91% level of agreement; inadequate contractor experience with 89% , delay in material procurement with 88%, late Delivery of Construction Material with 88%; Price fluctuation with 87%; lack of coordination between different stakeholders , absence of clear and standard quality management, poor site management , incorrect planning and scheduling by contractors and inadequate control procedure with 85%, 85%; 85% and 78% and 77% level of agreement respective are the top ten major factor that affects performance of construction project in terms of delivery time, cost and quality of the project.

Shortage of required construction materials is the first major factor that affects performance of construction projects with 91% level of agreement. This is a strong indication of maintaining effective material management principles like; acquiring required materials and service at the right place at the right time, from the right source at the right prices, hence; it has a negative implication on the successful implementation of the project.

On the other hand, inadequate contractor experience and shortage of technical personnel (skilled labor) are the other factors that affect performance of construction projects with 89% level of agreement. In construction projects, most of the time, contractors are hired unskilled manpower or unskilled manpower at project sites because of the current higher labor cost. At the time; skilled workers do not want to get a job from the contractor with lower labor cost, hence; they are more professional and they don't want to work with a very low cost, so that contractors are forced to hire unskilled labor. Due to the fact that contractors could not complete the construction project as per the contract agreement and performance of construction project in terms of cost, quality of construction project and the satisfaction of the clients have been affected.

Delay in material procurement, late delivery of construction materials and planning and scheduling are the three major interdependent factors that affects performance of construction project with 88%; 88% and 78% level of agreement respectively, because failure to prepare material required plan periodically by expertise, and submitted to purchasing department, will enforces purchasing department not to buy and supply construction materials on time, so that there might be dalliance of procurement and late delivery of construction project at project site. In general; failure to submit a bill of quantity (BOQ), by contractors and indicated factors will affect the performance of construction projects, unless we maintain the above indicated materials management functions like planning and scheduling is the basic for every construction work, hence; it has the highest contribution on the success of the construction project.

Dalliance of payments to contractors for the work done by the project office is considered as a factor that causes delay in construction projects. This research reveals that the project office or the owners do not release payments for executed work on time. The delay in progress payments will create financial difficulties for contractors and the pitfalls of the progress of the projects. Therefore; Owners should effect immediate payment of the dues to the contractor for the work being carried as well as the payments of finished items according to the terms of the contract.

Currently, we have been hearing from different Mass Medias, the problem related to fluctuation of price and booming of construction project cost. This major problem is spread to all over the country and to domestic contractors, which critically affected construction projects. Moreover; performance of construction projects is also affected in terms of time, cost and quality. Unpredictably price fluctuations have also had an impact both on the capacity of the Contractors to undertake their projects and on the overall performance of the project itself. Therefore, price fluctuations can result in poor project performance by delaying project time, by increasing the project cost and by making contractors deliver poor quality projects.

On the other hand most of the time the design of building construction has been changed during the construction stage, there is a tendency in increasing cost construction projects. The injection of more money will be required if the design changes are complex or increase the project scope. As such, some of the changes require new items that can be more expensive than first proposed ones. So that; some of the project will stop for more than a year just waiting for clients to have enough money to complete the project while some might be abandoned. This will happen in circumstances where design changes compel some areas of the already constructed elements of the building structure to be demolished or reworking of a construction project. Changes in construction design during construction may create disagreement between members of the project due to the absence of coordination between different stakeholders.

This comes in line with (Al-Moghany, 2006) study which concluded that more than 80% of contractors consider that which factor cause waste on construction site lack of coordination; lack of documentation; not follow the existing purchasing procedure and problem related to selection of capable supplier

Absence of clear and standard Quality management practice in the project office is one of the highest ranked factors that affects quality of construction project. Quality is also an essential element for sustainability and customer satisfaction. Lack of coordination between different stakeholders of construction projects is also another major factor that affects quality of construction projects. Coordination between different stakeholders is very vital in successful completion of construction. So, stakeholders should come together and discuss periodically, to evaluate the progress of construction projects, and to take corrective action on identified gaps.

Sound contractor's site management and supervision has significant positive impact in getting the perfect output. Similarly good quality construction is achieved only by means of proper inspection and monitoring. So, without proper site management, it is very difficult to execute construction projects effectively. Hence; poor construction project management has an adverse impact on clients, stakeholders who are involved in construction projects. The poor management of construction projects is a common phenomenon in any construction industry.

Inadequate control procedure is the other major factor that affects the quality of construction projects. To this end; the negligence about project management not only the adverse effect of the project office but also the effect of clients and every party who is involved in the construction project has a negative impact on the quality of construction project, if there is no sound controlling procedure in construction project. Therefore; site management and supervision is important for the successful implementation of construction projects.

The study also revealed that improper inspection of construction material as per the specification in the project office was another factor that affects the quality of construction projects. The revealed factor leads contractors to use poor quality construction materials to execute the construction project. If there is no property inspection of construction materials as per the specification in the project office, the implication is very high in terms of client's satisfaction and life of building construction.

In general; the top ten factors that were identified by the respondents have a negative implication on the success of the construction project in terms of project delivery time, cost, quality and clients satisfaction, if we cannot manage properly.

4.4 Material Management Practices in Project Office

In this section table 4.4 a researcher divided the factor that affects material management practices of AAHDPO in eight groups. These are Scheduling/Planning; Testing Quality of Materials; Procurement/Purchasing Procedure Warehousing/Storage Handling Wastage of materials Distribution and Disposal, the total number of factors under the eight groups are 29 factors. Of the total 29 factors the top 7 factors were identified and interpreted under table 4.4 next to main table 4.4 below Table 4. 4: Factor That Affects Construction Material Practices in AAHDPO

Factor that affect Performance of construction project	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total N	$\Sigma(A+S.A)$
Scale Value	1	2	3	4	5		Percent
Scheduling/Planning							
Lack of proper Material Requirement Plan	0	10	6	55	23	94	83%
Lack of considering the availability of inventory level in stock, while procurement plan.	0	9	12	56	17	94	78%
Testing Quality of Materials							
Lack of proper quality inspection in the project office.	5	21	12	43	13	94	60%
Lack of proper mechanism for testing the quality of construction material	6	18	14	43	13	94	60%
Absence of enough experts in the project office who inspect the quality of construction material.	4	25	16	37	12	94	52%
Using defected or rejected construction materials rather than removing from site or returned to the supplier.	7	22	19	39	7	94	49%
Procurement/Purchasing Procedure							
Lack of proper selection of Competent and capable suppliers in transparent way	3	25	18	30	18	94	51%

Factor that affect Performance of construction project	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total N	$\Sigma(A+S.A)$
Scale Value	1	2	3	4	5		Percent
Lack of using the existing purchasing policies and procedure to purchase construction material.	8	15	16	38	17	94	59%
Lack of proper documentation when construction materials are purchased, stored, used or moved from one place to another.	4	19	13	47	11	94	62%
Lack of coordination between Purchasing Department, Material Management Department and Store keepers.	3	13	15	45	18	94	67%
Lack of purchasing construction material as per the specifications, at right quality with right price, quantity, and delivery (time and place) in the Project office	6	12	12	43	21	94	68%
Warehousing/Storage							
Lack of proper cross checking of goods received against the ordered quantities.	5	23	13	42	10	93	56%
Lack of proper checking of damaged/defect construction material and fill out damage reports on time.	6	19	7	47	15	94	66%
Lack of proper recording of each item in stock showing the quantity on hand, quantity received, quantity issued, and location in the warehouse.	7	19	11	43	14	94	61%
Improper layout of construction materials in the store of project office.(Based on Similarity and cost type)	3	19	20	35	17	94	55%
Proper inspection is made by experts for critical construction materials and equipment in project office.	3	25	13	37	16	94	56%
Enough and conducive stocking space of construction materials in the project sites.	4	23	8	45	14	94	63%
Handling							
Excess/under handling of construction materials in store.	1	11	11	42	29	94	76%
Lack of coordination and organized system to withdraw materials from the stores	2	27	13	35	17	94	55%

Factor that affect Performance of construction project	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total N	$\Sigma(A+S.A)$
Scale Value	1	2	3	4	5		Perce nt
Absence of skilled and experienced security guards who protect the store from theft and misused.	3	20	11	37	23	94	64%
Lack of experience in keeping adequate Surplus/Reserve/buffer stock in project office.	6	17	15	44	12	94	60%
Wastage of materials							
Poor control systems of material wastage on sites	0	9	8	47	30	94	82%
Lack of Taking inventory of materials on project site	0	13	13	56	12	94	72%
Lack of an automated system used to identify, track, report, and facilitate control of project material throughout the life of the project	2	5	17	45	25	94	74%
Distribution							
Poor submission of the reports of surplus and obsolete materials by material manager to board to get the approval to dispose.	1	11	14	55	13	94	72%
Lack of material distribution processes in the project office that liable or legally responsible for misuse, wastage or theft	5	15	14	50	10	94	64%
Poor transportation facilities to distribute and transfer materials from one operation to another operation in a safe and smoothly way	2	19	14	43	16	94	63%
Disposal							
Lack of proper policy and procedure to manage scrape, surplus & disposal of materials	7	10	16	49	12	94	65%
Poor management of old or dead stock	1	7	9	59	18	94	82%

A researcher identified 29 factors that affect managerial management practices and distributed to 100 respondents to get their level of agreement, accordingly; 94 respondents identified the top ten factors that affect material management practices of the project office. This factors are Lack of proper Material Requirement Plan, Poor control systems of material wastage on sites, Poor management of old or dead stock, Lack of considering the availability of inventory level in stock, while procurement plan., Excess/under handling of construction materials in store., Lack of an automated system used to identify, track, report, and facilitate control of project material throughout the life of the project, Lack of Taking inventory of materials on project site and Poor submission of the reports of surplus and obsolete materials by material manager to board to get the approval to dispose, with 83%; 82%; 82%; 78%; 76%; 74%; 72% and 72% level of agreement respectively

Table 4. 5: Factor Top Seven Factors that Affects Construction Material Practices

Factor that affect Performance of construction project	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total N	$\Sigma(A+S.A)$
Scale Value	1	2	3	4	5		Percent
Lack of proper Material Requirement Plan	0	10	6	55	23	94	83%
Poor management of old or dead stock	1	7	9	59	18	94	82%
Poor control systems of material wastage on sites	0	9	8	47	30	94	82%
Lack of considering the availability of inventory level in stock, while procurement plan.	0	9	12	56	17	94	78%
Excess/under handling of construction materials	1	11	11	42	29	94	76%
Lack of an automated system used to identify, track, report, and facilitate control of project material	2	5	17	45	25	94	74%
Poor submission of the reports of surplus and obsolete materials by material manager to board to get the approval to dispose.	1	11	14	55	13	94	72%

Table 4.5 above revealed that, Lack of proper Material requirement plan with 83% level of agreement is the first major factor that affects material management practices of the project office. To this end; planning is a fundamental, and the key function of material management, which is closely linked with project planning and control set-up. Scheduling the entire construction project activities are essential to meeting the project timetable. Therefore; the study concludes that lack of proper Planning and scheduling; and lack of considering the availability of inventory level in stock are the major existing problems of in Addis Ababa Housing Development project office that should be fought in a holistic manner, hence it has a negative impacts on the material management process and performance construction project in terms of project delivery time, cost and quality of construction project.

The second major factors that affects material management process or practices is Poor management of old or dead stock with 82% level of agreement, if we cannot manage old and dead stock properly as per the existing policy and procedure of the project office construction materials might be abused by individuals and exposed to theft so that the project office fall under risk.

The third major factor that affects material management practices of the project office is Poor control systems of material wastage on sites. Most of the time we have been seeing scattered construction material has been seen here and there outside of the stake and due to this construction materials has been abused and misused individuals so that the project office incurred additional cost for construction of materials. To this end; Ethiopia loses about one billion birr per year from the construction industry sector due to misuse, corruption and bad practices, according to, Ministry of Urban Planning and Construction reported by (ENA, 2019).

The fourth major factor that affects material management practices of the project office is lack of considering the availability of inventory level in stock while purchasing, this implies that

the project office might face under/overage of construction projects, due to absence of taking periodic inventory count and updating construction materials stock card. If we cannot consider the inventor level in the stock there might be over/under stock of construction materials this leads the project office to incurred additional costs like store cost. To tackle this problem the project office should record daily the materials that have been received and issued. Other factor that affects material management practices of the project office is excess/under handling of construction materials in store with 76% level of agreement. Poor handling of construction materials affects the overall performance of construction projects in terms of time, cost, quality and productivity. Therefore; proper planning and scheduling shall be maintained in the project office to avoid over/under stock, the project office shall also use all available space effectively and hire experienced security guards and train them periodically to protect thefts and miss use project office material for personal use. And also to avoid the materials that are displayed here and there outside of the stock; and wastage of materials should also be minimized during construction to be cost effective.

The researcher concluded that the majority of respondents agreed that lack of proper policy and procedure to manage scrape, surplus & disposal of materials; poor management of old and dead material in stock and lack of obsolete and surplus materials to the concerned body are the major factor that affects construction materials disposal practices of the project office. These factors have a negative impact on the performance of the project office. If the project office doesn't dispose of the dead construction material on time; the project office will incur additional cost for store, labor cost for security guard, on the other hand, holding dead construction material may bring health problems to staff who are involved in material management process. So; the researcher recommended the project office to dispose of the dead construction material on time to minimize the risk that was brought due to dead materials.

4.6 Relationship between Dependent and Independent Variables

SPSS V25 was used to analyze the regression and analysis of variance (ANOVA) to assess the factors affecting performance of construction projects. This helps the researcher to understand how the typical value of the dependent variable changes when any of the independent variables varied, while other independent variables held fixed. The results are as stated below.

Table 4. 6: Model Summery for respondents

Model Summary ^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.854 ^a	.729	.696	.62777	2.256

a. Predictors: (Constant), Lack of using the existing purchasing policies and procedure to purchase construction material., Poor management of old or dead stock, Absence of skilled and experienced security guards who protect the store from theft and misused., Late Delivery of Construction Material, Financial difficulties of owner, Lack of considering the availability of inventory level in stock, while procurement plan., Improper inspection of construction material as per the specification, Lack of proper policy and procedure to manage scrape, surplus & disposal of materials in project office., Lack of proper mechanism for testing the quality of construction material in the project site., Lack of proper checking of damaged/defect construction material and fill out damage reports on time.

b. Dependent Variable: Lack of proper quality inspection in the project office.

The factors R² has the value of 0.729 and expressed that 72.9% of the variation of performance of contraction projects in Addis Ababa Hosing Development Project Office can be explained by the variables taken into consideration. The adjusted correlation ratio shows that 0.696 of the total variation is due to the regression line, given the number of degrees of freedom. The multiple correlation coefficients(r), with a value of 0.854, represent the correlation ratio indicating the existence of link between construction performance and its main factors. This is a satisfactory result to understand that the independent variable have effect on the dependent variable.

Multiple linear regression model assumes the residuals are independent of one another. The Durbin-Watson statistic is used to test for the presence of serial correlation among the residuals. The value of the Durbin-Watson statistic ranges from 0 to 4. As a general rule, the residuals are not correlated if the Durbin-Watson statistic is approximately 2, and an acceptable range is 1.50 - 2.50. From the table above, we can also understand that the assumption of independence of residuals is meet, hence Durbin-Watson value is 2.256 which is less than 2.5.

SPSS V20 was used to analyze the regression and analysis of variance (ANOVA) to assess the factors affecting performance of construction projects. This helps the researcher to understand how the typical value of the dependent variable changes when any of the independent variables varied, while other independent variables held fixed or constant.

Table 4. 7: ANOVA results of respondents

ANOVA ^a

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	87.928	10	8.793	22.311	.000 ^b
Residual	32.71	83	0.394		
1 Total	120.638	93			

a. Dependent Variable: Lack of proper quality inspection in the project office.

b. Predictors: (Constant), Lack of using the existing purchasing policies and procedure to purchase construction material., Poor management of old or dead stock, Absence of skilled and experienced security guards who protect the store from theft and misused., Late Delivery of Construction Material, Financial difficulties of owner, Lack of considering the availability of inventory level in stock, while procurement plan., Improper inspection of construction material as per the specification, Lack of proper policy and procedure to manage scrape, surplus & disposal of materials in project office., Lack of proper mechanism for testing the quality of construction material in the project site., Lack of proper checking of damaged/defect construction material and fill out damage reports on time.

The regression analysis explains the extent to which the independent variables predict the effect of factors on construction performance. Test F shows the role of the independent variable to explain the evolution of the dependent variable. The value of test F (22.311) in the ANOVA table, the mode reaches statistical significance (sig. =.000, $p < 0.5$) shows the regression mode is valid and can be used to analyze the relationship between independent and dependent between variables. Hence, the hypothesis that the independent variables will significantly explain the variance in dependent variables is accepted.

Table 4. 8: Regression coefficient of factors affecting construction project performance

Coefficients ^a

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	-.513	.602		-.851	.397		
Late Delivery of Construction Material	-.246	.094	-.165	-2.625	.010	.829	1.206
Financial difficulties of owner	.233	.066	.229	3.531	.001	.773	1.293
Poor management of old or dead stock	.176	.086	.128	2.047	.044	.837	1.194
Absence of skilled and experienced security guards who protect the store from theft and misused.	-.149	.062	-.152	-2.411	.018	.818	1.223
Lack of considering the availability of inventory level in stock, while procurement plan.	.318	.091	.230	3.491	.001	.752	1.330
Improper inspection of construction material as per the specification	.298	.075	.276	3.957	.000	.672	1.488
Lack of proper mechanism for testing the quality of construction material in the project site.	.548	.078	.548	6.994	.000	.532	1.879
Lack of proper policy and procedure to manage scrape, surplus & disposal of materials in project office.	-.206	.079	-.196	-2.600	.011	.573	1.746
Lack of proper checking of damaged/defect construction material and fill out damage reports on time.	.189	.078	.194	2.413	.018	.507	1.974
Lack of using the existing purchasing policies and procedure to purchase construction material.	-.052	.066	-.055	-.786	.434	.669	1.496

a. Dependent Variable: Lack of proper quality inspection in the project office.

The above table showed that VIF values for all variables became less than the tolerable value, i.e. 10. And Tolerance value of all variables also became above 0.1 which indicates that this model is free from multicollinearity problem between the independent variables.

As reveals from the above table 4.8, all the independent variables have statistically significant relationship with the dependent variable since their p-value is below the alpha level which is 0.05. Considering the standardized beta coefficients, the strongest predictor of the dependent variable (performance of construction projects) is Lack of proper mechanism for testing the quality of construction material in the project site with 0.548 value. The regression analysis support that all except late delivery of construction material; absence of skilled and experienced security guards who protect the store from theft and misused; lack of proper policy and procedure to manage scrape, surplus & disposal of materials in project office and lack of using the existing purchasing policies and procedure to purchase construction material factors groups were positively related to performance of construction project in the same direction. That is the standard beta coefficients (β) gave a measure of the contribution of each variable to the dependent variables. A large value indicates that a unit change in this independent variable has a large effect on the dependent variable.

So from the above table a researcher drive the model as follows;

$$Y = -0.513 - 0.246X_1 + 0.233X_2 + 0.176X_3 - 0.149X_4 + 0.318X_5 + 0.298X_6 + 0.548X_7 - 0.208X_8 + 0.189X_9 - 0.052X_{10} + \epsilon$$

More specifically, the variables specification was specified as follows:

Y = Level of performance of construction projects,

X₁... X₁₀ = the factors contributing to improving the performance of construction Projects.

X1= Financial difficulties of owner; X2=Poor management of old or dead stock; X3=Absence of skilled and experienced security guards who protect the store from theft and misused; X4=Lack of considering the availability of inventory level in stock, while procurement plan; X5=Improper inspection of construction material as per the specification; X6= Lack of proper mechanism for testing the quality of construction material in the project site; X7=Lack of proper policy and procedure to manage scrape, surplus & disposal of materials in project office; X8=Lack of proper checking of damaged/defect construction material and fill out damage reports on time; X9= Lack of proper checking of damaged/defect construction material and fill out damage reports on time; and X10= Lack of using the existing purchasing policies and procedure to purchase construction material Labor and material related factors.

The first thing that must be discussed here should be the overall fitness of the model; this fact has been confirmed by different types of statistical results. The first way is the ANOVA test that produced a P-value of 0.000 which is below the alpha level, i.e. 0.05. That means the overall independent variables have statistically significant relationship with that of the dependent variable, i.e. Performance of construction projects.

The R (Coefficient of Correlation), which is simply measures the degree of (linear) association between the dependent variable and the independent variables jointly, 0.854 means, there is a very strong relationship between the independent variables as a whole. The adjusted R square (Coefficient of Determination), can be defined as the proportion of the total variation or distribution in the performance of construction projects (dependent variable) that explained by the variation in independent variables in the regression. So with adjusted R Square value of 0.696, meaning, 69.6% of the variation in construction performance is explained by the linear relationship with all the independent variables. The effect of this is that only 30.4% of the variation in construction performance is unexplained by the relationship. Thus when adjusted R square is high it means that the independent variables included in the study play an important

part in affecting the dependent variable. Generally speaking, the regression model developed under the study can be considered as a good fit or predictor of construction performance of AAHDPO.

The individual effects of the independent variables can be explained by their respective beta coefficients. As per the regression result, the construction performance and lack of proper mechanism for testing the quality of construction material in the project site factors has the strongest positive relationship. 1-unit increment in proper mechanism for testing the quality of construction material related factors can cause about 54.8% improving performance of construction projects. They noted that maintaining of proper mechanism for testing the quality of construction materials will assist the project parties to implement their project goals in a very professional way and standard quality for better performance of quality, time, cost, productivity and safety of the project.

The second variable under study was considering the availability of inventory level in stock, while procurement plan was the second factor that affect performance of construction project, whenever there is change in independent variable; and according to the regression result, it has a positive relationship with the construction performance, a 1-unit increment on this variable will cause about 31.8% increment on construction performance. These ideas were shared in the study by (Dissanayaka & Kumaraswamy, 1999) that the characteristics of client enable a significant contribution to the success of a project. The third variable was lack of proper inspection of construction material as per the specification is the other factor that has a positive relationship with the construction performance with a magnitude of 1 unit increase in absence of proper inspection of construction material as per the specification will increase unsuccessfulness of the project performance by 29.8%.

The fourth factor under study was financial difficulties of owner, and this factor has a positive relationship with the construction performance with 1-unit increment in financial difficulties related factors will cause about 23.3% increase in construction performance. (Aftab & Azis, December 2010) stated that fluctuation in price of material, cash flow and financial difficulties faced by contractors, shortage of site workers, lack of communication between parties, incorrect planning and scheduling by contractors are most severe factors while frequent design changes and owner interference are least affecting factors on construction cost performance

The fifth factor under study was proper checking of damaged/defect construction material and fill out damage reports on time factors, and this factor has a positive relationship with the construction performance with 1-unit increment in proper checking of damaged/defect construction material will cause about 18.9% increase in construction performance.

The sixth factor under study was poor management of old or dead stock factors, and this factor has a positive relationship with the construction performance with 1-unit increment in management of old or dead stock related factors will cause about 17.6% increase in construction performance.

The seventh factor considered in this study was late delivery of construction material and as per the result it has a negative relationship with the construction performance where a 1 unit increase in Late Delivery of Construction Material would impact about 24.6% decrease in construction performance. (Kasim. N, 2011), informed that late delivery of Construction materials, unavailability of materials before commencement of construction work, and the long distance of materials from the work location is the principal causes of materials-related problems including performance problem on construction sites.

The Eighth factor considered in this study was Lack of proper policy and procedure to manage scrape, surplus & disposal of materials in project office is other factor as per the result, it has a

negative relationship with the construction performance where a 1 unit increase in Lack of proper policy and procedure to manage scrape, surplus & disposal of materials in project office would impact about 20.6% decrease in construction performance.

The Ninth factor considered in this study was Absence of skilled and experienced security guards who protect the store from theft and misused.as per the result, it has a negative relationship with the construction performance where a 1 unit increase in Absence of skilled and experienced security guards who protect the store from theft and misused would impact about 14.9% decrease in construction performance

The Tenth factor considered in this study was Lack of using the existing purchasing policies and procedure to purchase construction material as per the result, it has a negative value with no relationship with the construction performance, hence P value is greater than .05. In our case the P value is .434 which is greater than .05, so 1 unit increase in lack of using the existing purchasing policies and procedure will no impact on construction performance

Table 4. 9: Residuals Statistics

Residuals Statistics ^a

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	.3208	5.2150	3.4043	.97235	94
Residual	-1.64865	1.32249	.00000	.59306	94
Std. Predicted Value	-3.171	1.862	.000	1.000	94
Std. Residual	-2.626	2.107	.000	.945	94

a. Dependent Variable: Lack of proper quality inspection in the project office.

Linearity between dependent and independent; variable(s); multicollinearity between independent variable; correlation between the residual (error) terms; error terms must have constant variance and the error terms must be normally distributed.

CHAPTER FIVE

5. FINDINGS CONCLUSIONS AND RECOMMENDATIONS

The comprehensive study was carried out to identify the factor that affects, performance of construction project and material management practices in Addis Ababa Housing Development Project office, specifically; in 17 building construction projects. Accordingly; a researcher was identified 51 most frequent factors after comprehensive literature review, and distributed to Contractors, Consultants, site Engineers, Purchasing department, Quality and inspection department and material management department. A total 100 questionnaires were distributed to the respondents, out of which 94 were returned, and six respondents did not respond. Accordingly; the data that was collected through primary and secondary data sources, by using mixed research design approach, and data were analyzed using descriptive statistical analyses, and multiple regression model to measure the relationship between dependent and independent variables by Statistical Package for Social Scientist (SPSS)

5.1 Summary of Findings

The study revealed that, the benefits of material management approach which have a strong positive effect on construction project delivery success in terms of project schedule, overall cost of materials, quality of the project and reduction of accidents rates on site will elude most of the firms since material management techniques is not properly practiced. Based on the findings from the question raised in this research, the following conclusions are drawn. The study shows that effective material management brings positive results in achieving early building project completion. The study agrees with (Madhavi et al, 2013), that suggested the need for improving purchasing, transportation and introduction of new possibilities, like, purchase requisition slip, and transportation order respectively. The study also shows the importance of managing all materials from the design stage to the completion stage because

poor management of construction materials affects the overall performance of construction projects in terms of time, cost, quality and productivity.

The study also revealed that, the most prevalent practices of materials management are purchasing of materials, material planning method, transportation of materials while the prevalent challenges are lack of proper work planning and scheduling, cash flow problems to contractors due to delayed payments and are problems associated with materials management. This gives light to the fact that pre-planning is important in controlling the total project cost and effective material management (Gulghane, 2015). For effective materials management, measures shown by the study include adequate management and supervision; it shows that administration of sites was the best in respect to conditions for achieving good materials management.

5.1.1 Findings in Relation with Performance of Construction Project

Most of the building construction projects in Ethiopia, specifically in the Addis Ababa Housing and Development project office, are not completed within the intended period of time and within budget limit and standard quality as per the actual contract agreement, due to various reasons. To this end; a researcher identified 22 factors that affect performance of construction projects in terms of project delivery time, cost and quality, and distributed them to 100 respondents to get their level of agreement on the identified factors. Accordingly; respondents agreed and identified the top 10(Ten) factors that affect performance of construction projects, as per the summary table 4.3, p.51 indicated above.

5.1.2 Findings in Relation with Construction Materials Management practices

The study also examined the existing materials management practices, in Addis Ababa Housing and Development Project office; accordingly; a researcher identified 29 factors that affect material management process of the project office, and distributed to 100 respondents to get their level of agreement on the identified factors under table 4.5. Accordingly; respondents agreed and identified the top seven factors that affect material management practices of the Addis Ababa Housing Development Project office. The identified top ten factors are indicated under Table 4.5, p.59 above.

5.1.3 Major Findings Obtained from the Interview Questions

Besides the survey questionnaire, the researcher used an open ended and in-depth structured interview questionnaires, and site observation as a data collection instrument to conduct the study. Accordingly; data was collected from the 10 key project office staff to triangulate the data, to generate deeper and broader insights about the research area. Based on the analyzed data the following findings are identified.

The first major finding in the project office is a problem related to the supply of construction materials to contractors. Construction materials have been supplied to contractors by the AAHDPO, this brings carelessness of managing construction material at project site by contractors due to the absence of a sense of ownership.

The second major factor that affects construction materials management practices is a problem related to setting a wrong standard (in terms of quantity and quality of the item); for construction materials, due to this materials issued for from store for building construction is not properly used by contractors, and scattered materials; surplus or excess construction materials have been located to the different corners of the warehouse and compound covered with dust at project site.

On the other hand; Consultants are not committed to supervise contractors and enforce to finish to project within a given contract agreement, hence; consultant wants to stay at project site intentionally, until the completion of the project to get additional payment from the owner; and selection criteria of the contractors are not reliable hence selection is made from those who are registered on the waiting list, by using first come first serve principle. Finally; Political interference is one of the major factor that affect performance of construction project, hence; most of the time staff are not assigned as per their professions and their educational background, rather they are assigned based on political perception he/she has; specially on positions that needs experts, due to this the project office losses experienced contractors.

5.2 Conclusion

Based on the findings from the question raised in this study, the following conclusions are drawn. The study shows that effective material management brings positive results in achieving construction projects in a successful way in terms of early building project completion, cost effectiveness and construction quality assurance.

A researcher also examines the relationship between dependent and independent variables; the impacts of independent variables on dependent variables which is performance of construction projects by using multiple regression models. Accordingly; the study revealed that as there is a strong relationship between dependent and dependent variables, this result has been indicated under from Model Summary table 4.6, p 62 above with an R value of 0.854^a which is near to one. Finally; the study concluded that failure to maintain or manage the top factor that affects performance of construction projects and factors that affect material management practices will lead the project office to not meet its vision 2025 which is to alleviate the serious house shortage in Addis Ababa within the intended period of time. Likewise; it also lead to loose public acceptance and reputation of the project office.

5.3 Recommendations

Based on the research findings, the following recommendation should be put into practice for the project office, policy makers, and other stakeholders to put it into actions, in order to mitigate factor that affects the performance of construction project (in terms of project delivery time, cost and quality of building construction); and material management practices of the project office. Accordingly; the researcher recommend the following facts on the identified findings or factors that affects performance of construction project in terms of the timely delivery, cost and quality of construction project:

The project office should use the 5Rs of materials management principles, which includes acquisition of materials and services of the right quality, in the right quantity, at the right time, from the right source and at the right price, to alleviate problem related to dalliance of material delivery time; planning and scheduling of construction materials to get required construction material on time. The project office should also apply Just-in-Time (JIT) materials management system in construction projects to optimize materials delivery timing and to minimize inventory quantities. Inventory or storage on site are exposed into certain deficiencies such as protecting it against theft, damage, and weather, and failing to provide space for materials (Chalam, Lakshmi, & Prof. G. V., 2016)

The project office should undertake the four major types of planning on construction project, mainly; Material planning; labor planning, time scheduling and cost planning based on Bill of Quantity prepared by the client or by experienced contractors. Planning should be prepared frequently as possible in order to monitor whether work is progressing as planned, so that the project office will minimize the dalliance of construction projects.

Owners should effect immediate payment of the dues to the contractor for the work being carried out, as well as the payments of finished items according to the terms of the contract to minimize financial difficulty of contractors. And the project office and other stakeholder should consider appropriate risk factor and price escalation factor during cost estimation process to minimize price inflation of construction materials, because during the construction period the cost of construction materials, tools, labors, equipment etc. may vary from time to time. so; considering different risk factors should include during estimation cost of construction.

The contractors and project offices should employ the right professional for the right position related to work, i.e. on project manager (PM) position the contractor should assign a person who has experience and specializes on construction technology and management, construction engineering and management, and related professionals, to avoid reworking construction project, wastage of material and additional cost that will be incurred.

Periodic joint monitoring visit should be organized by project offices professions, to evaluate the progress of the construction project to identify and discuss on the strength and weakness of the project, and to take corrective action on the identified gap on time, to minimize additional cost that has been incurred by the project office due to the dalliance of construction project.

The project office should maintain strong policies and procedures that make constructors and consultants; responsible and accountable for any dalliance and any construction defect made at the project site. So that the project will complete as per the project contract agreement without any additional cost claim and project time period extension.

The project office should adopt a total quality management system, undertake project planning, designing and controlling, and monitor the expert at the construction site whether the work in progress is executed as per the intended plan to minimize the Quality problems through implementation of the construction project.

The project office should create a conducive working environment that helps all stakeholders of the project to come together and discuss and evaluate the progress of the construction project periodically. So that; it is possible to enhance the coordination between different stakeholders of the project, to enhance clients satisfaction, to minimize conflict of interests raised due to frequent design change among them.

The Project Office's should record daily construction material transactions and reconcile the stock cards with materials that has been received and issued, so that project will have updated information about the inventor level in stock., so that project office should put in place well designed tracking system of material management in the construction project and also discuss the software technology companies to develop software. The project office should put in place an easy solution of an electronic tracking system, like; Automated systems barcodes, to scan something to mark that it has been received or removed from the site, to minimize theft and loss, and it will help you find something quickly and easily; and ABC classification inventory controlling system should maintain by the project office, to more focuses on material with high risk and their level of risk.

Project offices should hire well trained and experienced security guards to safeguard construction materials from misuse, theft, and corruption and other hazards. Project offices should dispose of obsolete or old and outdated items as per the existing policy and procedures, to avoid large numbers of stocks of material exposed to dust, and rust. Finally; to ensure contractors sense ownership, the project office should transfer ownership to contractors that make contractors to supply construction material and use its own construction material, under the supervision consultants and project office experts.so that project office will minimize the scattered equipment out of the warehouse that is at risk of theft and corruption. The project office should avoid political interference and staff should be assigned as per his/her qualification, rather than assigning staff who are members of a political party.

5.4 Limitation of the Study

The following limitations were encountered during research work: unavailability of written literatures in relation to this study especially; in Ethiopian context; the contradiction between MoSHE and ABH, Jimma University; Communication gap between a researcher and Jimma University; Frequent revision of time schedule by Jimma University for preparing this thesis; Some of the respondents in the project office was busy in different organizational business, due to this; it takes long time to get first-hand information during interview and also the current world pandemic COVID-19 and the existing political situation were also one of the main challenges faced in getting internet connection, and other necessary information to finalize the thesis.

Finally; the issue of construction Material is the most important component in every construction industry. However; the study did not incorporate different Mega projects like; Railway construction; Road construction; Water Construction; Hydroelectric power construction and Dam Construction, which has a major contribution in Country's Economy development; rather it was focused on the effect of material management on performance of building construction, by excluding. So, this study requires more intensive research by researchers than what is presented in this research paper. So, comprehensive study should be conducted on the effects of materials management on the performance of construction industry, specifically in Ethiopia, like; Railway construction; Road construction; Water Construction; Hydroelectric power construction and Dam Construction and etc.

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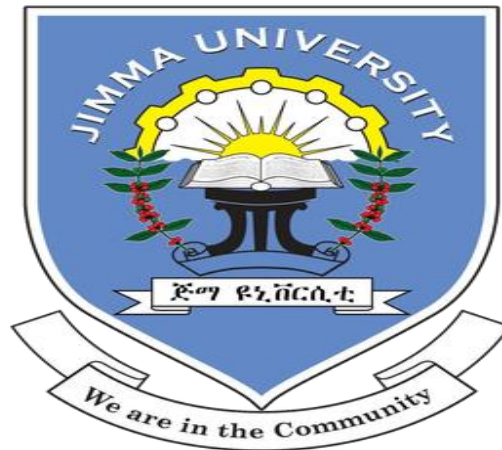
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Appendix One

The Effect of Materials Management on Performance of Construction Project: In Case of Addis Ababa Housing Development Project Office



MBA Program, Department of Management Collage of Business and Economics Jimma
University

Subject:-Request for cooperation

Dear Sir/Madam,

I am currently doing my thesis on the research title “Effects of Material Management on Performance of Construction Project” in the case of Addis Ababa Housing Development Project, for the Master degree on Business Administration (MBA) at Jimma University. The purpose of this questionnaire is to get views of respondent’s how material management is being conducted in the Project office. The information obtained will be used for academic purpose only; all information and feedbacks will be kept strictly confidential.

Your experience and educational background in the construction industry will greatly contribute to the success of my study and I believe this kind of study will be an input for the development of Ethiopian construction industry. Your response for each questionnaire is highly valuable and contributory to the outcome of the study. So, I am kindly requesting you to take a few minute and respond each and every question.

Thank you

Desta Bekele; Postgraduate student: - MBA

Part I: Background Information

In-depth structured survey questionnaire protocol to collect relevant data from key informants of Addis Ababa Housing Development Project office stakeholder (Project office staff/Employee, site Engineer, consultant and contractor) parties

Interview Date: _____ Educational Background: _____

Project Site: _____ Year of Experience: _____

Organization: _____ Current Position: _____

Part II: Questionnaires

For the following questions, please put (X) mark in the box corresponding to your preferred response using the scale below:

- Strongly Agree,
- Agree,
- Undecided,
- Disagree,
- Strongly Disagree

1. Factors Affecting Time (Duration); Cost and Quality of Construction Project

No.	1.1. Factors Affecting Time (Duration) of Construction Project	Strongly	Agree	Undecided	Disagree	Strongly	Remarks
1	Inadequate contractor experience						
2	Shortage of required construction material						
3	Delay in progress payment to contractors by owner						
4	Delay in materials procurement						
5	Shortage of technical personnel(skilled labor)						
6	Incorrect planning and scheduling by contractors						
7	Weather condition and Ground work						
8	Mistakes made by contractors during construction						
No.	1.2. Factors Affecting Cost of Construction Projects						
1	Fluctuation in price of Construction materials						
2	Frequent Design changes and specification by project office or by consultant.						
3	Contractual claims, such as, extension of time with cost claims						
4	Rework from poor material quality						
5	Incompetent Project team(designers and contractors)						
No.	1.3. Factors Affecting Quality of Construction Projects						
1	Lack of Coordination between Designer, Contractor; supplier and other stakeholder of construction project						
2	Lack of proper quality inspection in the project office.						
3	Absence of clear and standard Quality management practice in project office						
4	Contractor's poor site management and Supervision						
5	Using Defected Construction material						
6	Dissatisfaction of the workers						
7	Inadequate control procedure						
8	Improper inspection of construction material as per the specification.						

2. Construction Material Management Practices, in AAHDPO.

No	2.1. Construction Material management Practices	Strongly Agree	Agree;	Undecided	Disagree	Strongly Disagree	Remarks
	A).Construction Material Schedule/Planning Practice						
1	Lack of proper Material Requirement Plan project office.						
2	Lack of considering the availability of inventory level in stock, while procurement plan.						
	B).Testing the Quality of Construction Materials						
1	Lack of proper quality inspection in the project office.						
2	Lack of proper mechanism for testing the quality of construction material in the project site.						
3	Absence of enough experts in the project office who inspect the quality of construction material.						
4	Using defected or rejected construction materials rather than removing from site or returned to the supplier.						
	C).Purchasing/Procurement						
1	Lack of proper selection of Competent and capable suppliers in transparent way in the project office.						
2	Lack of using the existing purchasing policies and procedure to purchase construction material.						
3	Lack of proper documentation when construction materials are purchased, stored, used or moved from one place to another.						
4	Financial difficulties of owner						
5	Late delivery of construction materials						
6	Lack of coordination between Purchasing Department, Material Management Department and Store keepers.						
7	Lack of purchasing construction material as per the specifications, at right quality with right price, quantity, and delivery (time and place) in the Project office						
	D).Construction Material Warehousing/Storage						
1	Lack of proper cross checking of goods received against the ordered quantities.						
2	Lack of proper checking of damaged/defect construction material and fill out damage reports on time.						
3	Lack of proper recording of each item in stock showing the quantity on hand, quantity received, quantity issued, and location in the warehouse.						
4	Improper layout of construction materials in the store of project office.(Based on Similarity and cost type)						

5	Proper inspection is made by experts for critical construction materials and equipment in project office.						
6	Enough and conducive stocking space of construction materials in the project sites.						
E).Construction Material handling							
1	Excess/under handling of construction materials in store.						
2	Lack of coordination and organized system to withdraw materials from the stores						
3	Absence of skilled and experienced security guards who protect the store from theft and misused.						
4	Lack of experience in keeping adequate Surplus/Reserve/buffer stock in project office.						
F).Construction Material Wastages							
1	Poor control systems of material wastage on sites						
2	Lack of Taking inventory of materials on project site						
3	Lack of an automated system used to identify, track, report, and facilitate control of project material throughout the life of the project						
G).Distribution (Transportation)							
1	Lack of material distribution processes in the project office that liable or legally responsible for misuse, wastage or theft						
2	Poor transportation facilities to distribute and transfer materials from one operation to another operation in a safe and smoothly way in project office.						
H).Construction material Scrape and surplus disposal management							
1	Lack of proper policy and procedure to manage scrape, surplus & disposal of materials in project office.						
2	Poor management of old or dead stock						
3	Poor submission of the reports of surplus and obsolete materials by material manager to board to get the approval to dispose.						

THANK YOU

Appendix Two

Interview Guide for Key Informant Interviews

Jimma University, College of Business and Economics, Department of Management, Master's Program in MBA

Research Title: Effects of Material Management on Performance of Construction Project, in the case of Addis Ababa Housing Development Projects office

In-depth structured interview protocol to collect relevant data from key informants in the projects of Addis Ababa Housing Development Project office stakeholder (owner/agent, site Engineer, employees, consultant and contractor) parties

Interview Date: _____ Time: _____

Location: _____ Organization: _____

Year of experience: _____ Current Position: _____

Introduction: Thank you for your willingness to participate in this study as a respondent. This interview is used to collect data for the master's research entitled. "The Effects of Material Management on Performance of Construction Project, in the case of Addis Ababa Housing Development Projects office."

Your experiences and opinions will significantly add value as an input to this thesis. The researcher assures you that the information you provide used only for academic research purpose and anonymity of the respondent maintained throughout the research process.

Thank you for your cooperation.

B. Open ended questions for the selected sample respondents.

1. How do you evaluate the status of condominium housing project performance against the objectives?

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.....

2. What are the major weaknesses of Material Management in terms of quality, time, and cost and client satisfaction?

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.....

3. How much is achieved the construction of condominium housing until now compared to the objectives?

.....
.....

4. What are major factors that affect the quality of condominium housing projects?

.....
.....
.....

5. What major factors do you observe that affect the time schedule and cost of construction in the project?

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.....

6. Do you think that only government can achieve the provision of condominium housing compared to the high demand?

.....
.....
.....

7. What are the external factors that influencing the performance of housing construction?

.....
.....

8. What is your opinion about the purchasing, finance and supply management in light of the urgency of the projects?

.....
.....

9. Is there any shortage and increasing cost of Construction materials to run easily the project of condominium housing?

.....
.....
.....

10. How do you evaluate the finishing of condominium housing project in terms of customer satisfaction (expectation)?

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.....
.....

11. How do you see the coordination and communication of project (owner, consultant and contractors) stakeholders?

.....
.....

12. What do you say about the process of selecting competent consultant and reliable contractors to carry out the work of projects?

.....
.....

13. Does government follow well flexible methods and systems in purchasing, finance and supply management to speed up the project activities?

.....
.....

14. What other major constraints do you observe during the project of condominium housing?

.....
.....

15. What major problems do you see with construction of condominium housing?

.....
.....

16. What do you suggest for the problem of condominium housing construction in general?

