



**JIMMA UNIVERSITY**  
**JIMMA INSTITUTE OF TECHNOLOGY**  
**SCHOOL OF GRADUATE STUDIES**  
**FACULTY OF CIVIL AND ENVIRONMENTAL ENGINEERING**  
**CONSTRUCTION ENGINEERING AND MANAGEMENT CHAIR**

**ASSESSMENT OF INVENTORY MANAGEMENT PRACTICE ON**  
**BUILDING CONSTRUCTION PROJECTS:**  
**A CASE OF JIMMA TOWN**

A Thesis submitted to School of Graduate Studies, Jimma University, Jimma Institute of Technology, Faculty of Civil and Environmental Engineering in Partial Fulfillment of the Requirements for the Degree Master of Science in Construction Engineering and Management

By

Fatuma Umer Mahammed

February, 2021

Jimma, Ethiopia

JIMMA UNIVERSITY  
JIMMA INSTITUTE OF TECHNOLOGY  
SCHOOL OF GRADUATE STUDIES  
FACULTY OF CIVIL AND ENVIRONMENTAL ENGINEERING  
CONSTRUCTION ENGINEERING AND MANAGEMENT CHAIR

ASSESSMENT OF INVENTORY MANAGEMENT PRACTICE ON  
BUILDING CONSTRUCTION PROJECTS:  
A CASE OF JIMMA TOWN

A Thesis submitted to School of Graduate Studies, Jimma University, Jimma Institute of Technology, Faculty of Civil and Environmental Engineering in Partial Fulfillment of the Requirements for the Degree Master of Science in Construction Engineering and Management

By: Fatuma Umer Mahammed

Advisor: Alemu Mosisa (Assistant Professor)

Co-Advisor: Mebratu Abera (Eng.)

February, 2021

Jimma, Ethiopia

## DECLARATION

I declare that this research entitled “**Assessment of inventory management practice on building construction Projects in Case of Jimma Town**” is my original work and has not been submitted as requirement for the award of any degree in Jimma University or elsewhere.

Name: - Fatuma Umer Mohammed

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

As research Adviser, I hereby certify that I have read and evaluated this thesis paper prepared under my guidance, by Fatuma Umer Mohammed entitled “**Assessment of inventory management practice on building construction projects: A case of Jimma town**” and recommend and would be accepted as a fulfilling requirement for the Degree Master of Science in Construction Engineering and Management.

Name: - Eng. Alemu Mosisa (Assistant Prof)

\_\_\_\_\_  
Advisor

\_\_\_\_\_  
Date

Name: - Eng. Mebratu Abera (Eng.)

\_\_\_\_\_  
Co-Advisor

\_\_\_\_\_  
Date

## **ABSTRACT**

*Inventories are any stored resource that are used by the contractor or organization which keeps in hand for efficient construction works and successful completion of construction project. The company manages this substantial portion of asset of the company in different way of managing system indeed they should be seen as a potential factor in optimization of resource used and in cost reduction. In construction project operation, often there is a project cost variance in terms of the material, equipment, overhead cost, and general condition. This is due to consist impact in construction project which caused to the occurrence of many problems such as cost overrun, delay, and material wastage, dispute between stockholders, storing and handling material. Inventory management aims to optimize the investment by maintaining adequate and satisfactory levels of materials capable of meeting the needs of once construction projects. This research paper is sought to assess inventory management practice, problems associated with inventory management and measures for managing inventory in building construction project. The study was analyzed using descriptive survey design approach. And data was collected by questionnaires, interview and site observation. Quantitative data was analyzed and ranked by relative important index while the qualitative data was analyzed by content analysis method. The study shows that awareness regarding to material management practice were relatively high on Purchasing of materials, Material planning and Proper Transportation. The study also identified major problems such as late delivery of ordered materials, Rejection of materials due to non-compliance to the specification and damage to materials during transportation to the site. Always Better Control (ABC) and Periodic inventory review were identified as the major inventory management practice on the study, which are effectively used by the construction company. Generally, the study concludes that, the major activities on inventory management, asses the level of awareness regarding to material management practice, Problems related with inventory management and measures for effective inventory management system were analyzed. Finally, the study recommends that the construction companies should use effective inventory management system to increase their profit and save their time by avoiding project delay and cost variance.*

**Keywords:** *Always Better Control, Construction industry, Construction materials wastages, Inventory management, Measures for effectiveness, Periodic inventory review.*

## **ACKNOWLEDGMENT**

First of all, I would like to gratefully thank Ethiopian Road Authority for giving me this great opportunity.

I really thank my advisor, Eng. Alemu Mosisa (Assistant Professor) without his sincere supervision, comments and continuous advice this paper couldn't be finalized. And also I would like to thank my co-advisor, Eng. Mebratu Abera, for his advice throughout my work.

My special credit goes to my husband and my family for their unconditional support and love. Finally, I would like to thank my friends who support me in data collection, communicating with the respondents and by giving information throughout the research.

---

## TABLE OF CONTENTS

DECLARATION .....	i
ABSTRACT .....	ii
ACKNOWLEDGMENT .....	iii
TABLE OF CONTENTS .....	iv
LIST OF TABLES .....	vii
LIST OF FIGURES.....	viii
ACRONOMIES .....	ix
CHAPTER 1 .....	1
INTRODUCTION.....	1
1.0 Background of the study.....	1
1.1 Problem of the statement .....	2
1.2 Research questions .....	3
1.3 Objectives of research .....	4
1.3.1 General objective .....	4
1.3.2 Specific objective.....	4
1.4 Expected Outcomes .....	4
1.5 Scope of the Research.....	4
1.6 Significance of study .....	5
1.7 Limitations of the study.....	5
CHAPTER 2 .....	6
LITERATURE REVIEW .....	6
2.0 Essence of Inventory and Inventory Management .....	6
2.1 Objective of Inventory Management.....	7
2.2 Types of Inventory.....	8
2.3 Elements of Inventory Management.....	10
2.4 Inventory Management Practice .....	11
2.4.1 Information technology usage.....	13
2.4.2 Inventory record accuracy.....	13
2.4.3 Stock out .....	14
2.4.4 Inventory planning and control.....	14

---

2.5 Inventory management system in construction project .....	15
2.5.1 Inventory control of materials on site: .....	15
2.5.2 Materials Planning and Control .....	16
2.5.3 Purchasing.....	16
2.5.4 Stores and Inventory Control .....	16
2.5.5 Material Management Techniques.....	17
2.5.6 Control of Construction Waste .....	17
2.6 Methods of Evaluating Inventory .....	18
2.7 Factors affecting of Inventory Management .....	18
2.7.1 Staff characteristics.....	19
2.7.2 Inventory record system.....	19
2.7.3 Storage system .....	19
2.7.4 Wastage handling system.....	19
2.7.5 Inventory procurement system.....	20
2.8 Inventory Control Systems (Techniques) .....	21
2.9 The Importance of Inventory Control.....	24
CHAPTER 3 .....	26
RESEARCH METHODOLOGY .....	26
3.0 Study Area .....	26
3.1 Research Design .....	26
3.2 Population.....	27
3.3 Sample Size and Sampling technique.....	27
3.4 Study variables .....	28
3.5 Data Collection Process.....	28
3.6 The Questionnaire.....	28
3.6.1. Pilot Questionnaire.....	29
3.6.2. Main Questionnaire Administration .....	29
3.7 Interview .....	30
3.8 Data Processing and Analysis.....	30
3.9 Ethical Consideration .....	30
3.10 Reliability of data .....	31

---

3.11 Sources of data.....	32
3.12 Data collection procedure .....	32
3.13 Data presentation and analysis .....	32
3.14 Data quality assurance .....	33
CHAPTER 4 .....	34
RESULTS AND DISCUSSIONS .....	34
4.0 Introduction .....	34
4.1 Demographic variables and respondent’s profiles.....	34
4.2 Reliability Check - Cronbach's Alpha .....	38
4.3 Inventory management practice on building construction projects.....	38
4.3.1 Inventory management practice on Building Construction Project sites.....	38
4.3.2. Awareness of materials management practice .....	41
4.3.3 Factors Associated with Inventory Management On Building Construction Projects .	42
3.4. Strategies for Inventory Control on Construction Projects.....	45
CHAPTER 5 .....	48
CONCLUSION AND RECOMMENDATION .....	48
5.1. Conclusions .....	48
5.2. Recommendation.....	50
REFERENCES.....	51



---

## LIST OF TABLES

Table 3.1 Total administered questionnaires and the return rate .....	30
Table 3.2 Cronbach's Alpha .....	32
Table 4.1 Cronbach's Alpha for Questionnaires .....	38
Table 4.2 inventory management practice on Building Construction Project sites .....	39
Table 4.3 awareness of materials management practice .....	41
Table 4.4 Factors Associated With Inventory Management.....	43

---

## LIST OF FIGURES

Figure 2.1 Conceptual Frameworks of the Study .....	15
Figure 2.2 Manual inventory control system .....	22
Figure 3.1 Map of Oromia Region (Source Google Earth) .....	26
Figure 4.1 Respondent's information .....	35
Figure 4.2 Position of respondents in the organization.....	35
Figure 4.3 Academic Qualifications of Respondents .....	36
Figure 4.4 Area of experience of the respondents .....	37
Figure 4.5 Experience of respondents.....	37
Figure 4.6 Strategies for Inventory Control on Construction Projects .....	45

---

## ACRONYMS

ABC	Always Better Control
AC	Average Cost
COVID 19	Corona virus
EOQ	Economy Order Quantity
Et Al	Et Ali
FIFO	First in First Out
IM	Inventory management
IMP	Inventory management practices
JIT	Just in Time
JIT	Jimma institute of technology
LIFO	last in first out
MRP	Material Requirement Planning
RII	Relative Importance Index
ROP	Re-order Point
SC	standard cost

## CHAPTER 1

### INTRODUCTION

#### 1.0 Background of the study

Successful completion of construction projects requires all resources to be effectively managed. In today's world, inventory has become a vital part of construction project. Every construction company has their own inventory where each of the company manages their inventory by various ways of managing system. But the purpose of the inventory remains the same; Inventories are any stored physical stocks of items or material that are used by the contractor or organization which keeps in hand for efficient construction works and installation activities at site to fulfill current or future needs of the construction company. Inventory consists of raw materials, component parts, tools, spares, finished goods, plant & machineries and in process products which are recorded and stored at the construction site or storage "go down" for some period of time. Hence Inventories will cost money on hiring storage space, equipment idling time, deterioration, wastage, procuring process and delivery lead time and above all, the cost of the capital required in financing these stocks. Inventory management is crucial function in construction industry. Thus, it gives systematic approach to plan, acquire, store, move and control materials in store in order to optimize all company resources, with each passing day, the inventory management system become more modern and well organized that the companies easily access their inventory level that help to complete the project successfully within right quality in right time.

According to (Atnafu & Balda, 2018)inventory Management can be defined as a framework employed in firms in controlling its interest in inventory which includes the recording and observing of stock level, estimating future request, and settling on when and how to arrange.

Inventory management is a science primarily about specifying the shape and percentage of stocked goods by giving the method that can be use building construction companies to organize, store, and replace inventory, to keep an adequate construction material, equipment, supply of goods at the same time minimizing cost which is required at different locations within a facility or within many locations of a supply network to precede the regular and planned course of production and stock of materials (Aravinth & Indhu, 2016).

Inventory management is a process for planning, executing and controlling the field and office activities in construction. It also refers to the system for planning and controlling all of the efforts necessary to ensure that the correct quality and quantity of materials are properly specified in a timely manner, obtained at a reasonable cost and most importantly, available at the point of use when required (Aravinth & Indhu, 2016).

According to (Patel, et al., 2015) Poor materials management can result in increased costs during construction. Thus, Materials inventory management is important as materials constitute a large amount in construction costs. This is because the poor inventory management can affect not only to the increase in costs, but also contribute to schedule and project delays.

Efficient management of materials can result insubstantial savings in project costs. Materials may deteriorate during storage or get stolen unless special care is taken. Therefore, effective construction material management process is a key to success of construction project (Patel, et al., 2015).

Inventory management aims to optimize public or private resource used by improving productivity and cost efficient of a project which is directly contribute in cost reduction to help to ensure timely completion of the project by maintaining adequate and satisfactory levels of materials capable of meeting the needs of once construction projects.

## **1.1 Problem of the statement**

The concept of inventory management has been one of many analytical aspects of management. Lack of inventory may lead to stock-outs, resulting in production down time ( Nanaware & Saharkar, 2017) accordingly, (Atnafu & Balda, 2018) stated that Poor inventory management translates directly into strains on a company's cash flow. This is due to consist impact in construction project which caused to the occurrence of many problems such as cost overrun, delay, and material wastage, dispute between stockholders, storing and handling material etc. However, improper inventory management has those wide effects on construction project but neglected to do research about it.

Inventory management is the process of efficiently overseeing the constant flow of units into and out of an existing inventory. This process usually involves controlling the transfer in of units in order to prevent the inventory from becoming too high, or dwindling to levels that could

put the operation of the company into jeopardy. (Semahegn, 2017) from the main problems that adversely affect the performance of construction projects is the improper handling of construction materials during site activities. Construction sites are usually affected by shortage of navigable space and storage area. Which leads them inappropriate handling and management of construction materials on construction sites that has the potential to severely hamper project performance. Failure in managing inventory will result in cost overrun, delays in project completion and reduce overall project performance.

There are major factors which affect inventory management activities such as late delivery of ordered materials, transportation problems, constraints on storage areas, site logistics with regards to materials handling and distribution, Rejection of materials and also ordering and delivery of materials to the construction site which causes delay in construction. This paper described the main results of survey carried out in Jimma town that assessed the inventory management practice on building construction projects.

In light of the arguments presented above, there was a clear need for the assessment of inventory management practice and investigate the current trained of using inventory management system, identify the major problems, and measures for the improving of inventory management practice on building construction project sites that would allow to take remedial measures to minimize the improper construction materials management on building construction projects in the town.

## **1.2 Research questions**

1. What are the Inventory Management practices followed by the construction projects?
2. What are the factors that affect inventory management system in construction projects?
3. What are the strategies that can be used for inventory control system in construction projects?

## **1.3 Objectives of research**

### **1.3.1 General objective**

The main objective of this study was to assess the inventory management practices in construction projects in Jimma town.

### **1.3.2 Specific objective**

- To investigate the current trends of inventory management practice in construction projects.
- To identify the factors that affect the inventory management practice construction projects in Jimma town.
- To evaluate the strategies for inventory control system in construction projects.

## **1.4 Expected Outcomes**

The findings from the study were identified the following outcomes which will be discuss in chapter four, result analysis and discussion.

- The Inventory Management practices followed by the construction companies were assessed.
- The factors that affect inventory management system in construction project were identified.
- The strategies that can be used for inventory control system in construction project were evaluated.

## **1.5 Scope of the Research**

In the construction industry, there are many firms and stakeholders. However, it is hard to cover all of the firms and stakeholders in this single study due to time and cost constraints. Therefore, this study's scope was limited to assess inventory management practice on Building Construction project only. The targeted population will be limited to Building Construction; the samples or respondents were Consultants and Contractors involved in Building Construction Projects in Jimma Town.

### **1.6 Significance of study**

The study is Significant for different Construction Projects to consider their inventory management Practices and to use their resources effectively without stock out that resulting material downtime by having the importance of inventory management practice and its impact on the project. Additionally, it is significant to pave the way for academic scholars who wish to conduct further research related to this study.

### **1.7 Limitations of the study**

In the study, only inventory management practices on building construction projects were assessed and each building construction projects directly participated by questionnaire and interview. Also it faced with the difficulties of not getting all respondents on time, were busy and tight with the routine job to reply the questionnaires on time, due to pandemic (covid 19) it was difficult to make interview and formal discussion as much as needed.



---

## CHAPTER 2

### LITERATURE REVIEW

#### 2.0 Essence of Inventory and Inventory Management

(Kasim, et al., 2012) Defined inventories as stockpiles of raw materials, supplies, components, work in process and finished goods that appear at numerous points throughout a firm's production and logistics channels. Similarly, Inventory is the stock of any item or resource used in an organization and it is defined as the stored accumulation of materials resources in a transformation system.

Inventory is a necessary evil of any business which is important and valuable asset that constitutes substantial portion of the total current business because inventories themselves do not earn any revenue. Holding either too little or too much inventory incurs costs. It must be noted that organizations hold inventories for various reasons, which include speculative purposes, functional purposes, physical necessities and among others (Juneja, 2015).

On the other hand, inventory system is the set of policies and controls that monitor levels of inventory and determine what levels should be maintained, when stocks should be replenished, and how large orders should be. While any organization which is into production and service of a product will necessarily hold stock of various physical resources to aid in future consumption (Kasim, et al., 2015)

Inventory management is a management cum operations function. It requires operational processes to be followed and maintained on the floor and in inventory management systems. Coupled with operations, it entails continuous study, analysis and decision making to control and manage inventory levels. The aim of inventory management is to hold inventories at the lowest possible cost, given the objectives to ensure uninterrupted supplies for ongoing operations. When making decisions on inventory, management has to find a compromise between the different cost components, such as the cost of supplying inventory, Inventory-holding costs and costs resulting from insufficient inventories (Kasim, et al., 2012).

(Mohamed, et al., 2016) said that every company manages its inventory items by using different ways of their own managing system. However, the usage of inventory is similar, and also where the inventory is stored or is ready to be used and the cost must expect to be low.

Therefore, inventory is part of the company assets so that the management of an organization becomes very concerned as it is always reflected in the company's balance sheet. Inventory management scope is concerned with the replenishment and lead time, carrying costs of inventory, asset management inventory forecasting, inventory valuation, inventory visibility, available physical space for inventory, quality management, returns and defective goods and damage forecasting. It includes the recording and observing of stock level, estimating future request, and settling on when and how to arrange (Girma, 2016).

## **2.1 Objective of Inventory Management**

The main objective of inventory management is identifying the effects of cost that having items in stock and not having items in stock and compute the cost of holding and ordering the inventory. Basic inventories decisions are two types they are inventory item is empty and to fill again and How much of an item to order when the inventory of that item is to be filling again. In order to attain a balance between inventory availability and cost must be addressed the main target inventory management volume that How much to order and when to be order. Therefore, since inventories a key to any organization, inventory management must be pay attention when decision making. There are different techniques and modeless can help inventory management control systems (Lemma, 2017).

According to (Kasim, et al., 2012), the objectives of inventory management are as follows:

- Efficient material planning and recording
- Storing and inventory control
- Stock and waste control
- observing of stock level
- to maintain adequate sock
- to avoid production stoppages
- estimating future request
- to reduce cost of holding stock
- to avoid investment in stock outs (running out of stock)
- increase cost of emergency action

To fulfill all these objectives, it is necessary to establish well organized and improved inventory management practice in the building construction project and has enriched department which has good co-ordination with the other departments like construction material management staff of the organization to serve all production centers. Project Managers of firms should therefore keep their inventory to an optimum level since mismanagement of inventory will lead to tying up excess capital at the expense of profitable operations (Kasim, et al., 2015).

## 2.2 Types of Inventory

Inventory may be classified as: Raw materials, Work in process, Finished Goods and Supplies inventory, (Girma, 2016)

**i. Raw materials:** The purchased items or extracted materials that are transformed into components or products. These are the resources required in the production or processing activity of the firm.

**ii. Work-in-process:** item that is in some stage of completion in the manufacturing process.

**iii. Finished goods:** Completed products that will be delivered to customers.

**iv. Distribution inventory:** This includes finished goods and spare parts that are at various points in the distribution system.

**v. Supplies (often called Maintenance, repair, and operational inventory):** Items that are used in manufacturing but do not become part of the finished product are classified as such types of inventory.

Furthermore According to (Girma, 2016) types of Inventory systems can be classified in to the following two types.

### 1. Continuous Receive System /Fixed Quantity System

**Perpetual System:** a record is kept of each transaction& the stock balance is compare to the order point. The order quantity is fixed; the time between orders will vary depending on the random nature & demand. Also (Lemma, 2017) noted that Perpetual Inventory System- in practice, technological advances have made the periodic system obsolete and provided the computer software for firms to use a perpetual system. Under a perpetual system, firms or business organization continually update inventory accounts for each purchase and each sale.

A perpetual system is superior to a periodic system because it always provides current information about inventory levels; costs of goods sold, and gross profit.

Similarly (Kilfe, 2019) stated that Industrial advancement has made the periodic system outdated and provided the computer software for organizations to use a perpetual system. Under this system, organizations continually update inventory accounts for each purchase and each sale. A perpetual system is superior to a periodic system because it offers up-to-date info about inventory levels; price of items sold, and gross profit.

## **2. Periodic Review System**

According to (Girma, 2016) periodic review system involves determining the amount of an item in stock at a specified fixed time interval and placing an order for a quantity that when added to the quantity on hand will equal to Predetermined maximum law. The time period between rows of the quantity on hand is fixed. The maximum inventory level is the sum of the anticipated demand during lead time, the anticipated demand during the replenishment period (review period) and the safety stock. Also under a periodic system, a company determines the inventory balance and cost of goods sold at the end of the accounting period. That is, firms or any business organization can determine its inventory on perpetual system. The firm or business organization's the beginning balance sheet includes the opening balance of inventory. Purchases made during the period increase inventory available for sale. At the time of operation purchase discount and return can be occurred that recorded on temporary account and closed at the end of period. The beginning inventory balance plus the net purchases is the cost of goods available for sale that is, the total amount of inventory that will either be sold during the period or remain in ending inventory. The ending inventory balance is taken based on a physical count of the inventory.

Inventory level of goods is revised at prearranged, fixed points in time. If the primary situation review occurs at time  $T$ , the second review would be carried out at time  $2T$ , and so on. Under a periodic system, a company limits the inventory balance and price of items sold at the end of the accounting period. That is, firms or any business organization can determine its inventory on perpetual system. The business organization's the starting balance sheet embraces the opening balance of the inventory. Procurements made during the period increase inventory available for sale. At the time of operation purchase discount and return can be occurred that recorded on temporary account and closed at the end of period. The entire amount of inventory

---

that will either be sold during the period or remain in ending inventory is the sum of the initial inventory balance and the net purchases. As (Kinfе, 2019) said the ending inventory balance is taken based on a physical count of the inventory. Recall that in periodic review models, the inventory levels are reviewed at predetermined, discrete times such as every Friday, the last working day of every month, etc. A review of on-hand inventory is conducted at time, and an order is placed. The order quantity is equivalent to the quantity that is needed to bring the inventory level back up to a pre specified maximum level, Therefore, in periodic review models, the order quantities generated varies each period.

### **2.3 Elements of Inventory Management**

Various elements of an inventory control model are discussed by (Girma, 2016) According to him inventory management control systems have different elements. Among these, the following are considered as basic elements:

**A. Minimum Level:** This is the level below which the inventory level is not allowed to fall. In case, for any reason, the stock goes below the minimum level, the matter is reported immediately and action is taken to ensure that the material is received at the earliest with extra effort. In fact, reaching minimum level is an indication of the danger of a likely stock- out situation. It is essential to keep an eye on all the items, which have reached the necessary for these items.

**B. Maximum Level:** This is a control point to avoid any extra stock. Attempt is made to avoid excessive purchasing that may result in crossing the maximum level, and to ensure that the money is not blocked unnecessarily. Crossing of maximum level reflects inadequate inventory control and should not be allowed without proper analysis of overall benefits. Failure to control the maximum level may result in non-moving or slow-moving items and obsolescence. Inventory turnover would be adversely affected if maximum level is not controlled.

**C. Safety Stock:** This is a level, decided by keeping in view the degree of safety planned against being out of stock. A very high degree of safety would need a high level of inventory; where as a low degree of safety would require low inventory stock. If the risk of being out-of stock is acceptable, there is no need of having safety stock. As the extent of Safety planned increases; a higher level of inventory is to be maintained. For a high level of safety a very large quantity is

to be stocked, which is into desirable. According to the desired safety level, the inventory level, which is termed as 'Safety Stock' can be decided. Normally most organizations maintain safety stock equal to the minimum stock level.

**D. Lead Time:** The time from the point a requisition for material is raised by the user or the inventory control section has raised a purchase requisition after review of stock level and a future requirement, to the point when material is received, inspected, and is ready for use is known as the lead time.

**E. Re-order Point Level:** This is the level of inventory that triggers a purchase order. Usually the reorder point is equal to the amount would be used during the lead time period.

**F. Material Requirement Planning (MRP):** In order to avoid the conflicting objectives of Inventory management, which is concerned in minimizing inventory costs while providing adequate dependent demand inventory, inventory manager must balance the costs of having dependent demand inventory with the cost of doing without this type of inventory. MRP is a computer based management information system, which is used for determine the quantity and timing for the acquisition of dependent demand items needed to satisfy master schedule requirements.

**G. Economic Order Quantity (EOQ):** If one has to make decisions about managing an inventory, it is useful to understand the behavior of the inventor-related cost factors just discussed. These factors often help a manager determine which items should or should not be carried in inventory, what inventory levels should be carried for specific item, what order quantities are appropriate for given items. Among the factors that often enter this decision process is a concept known as EOQ the notion of an economic order quantity.

As its name suggests, this concept holds that the appropriate quantity to order may be the one that tends to minimize all the costs associated with the order-carrying costs, acquisition costs, and the cost of the material itself.

## **2.4 Inventory Management Practice**

Inventory is a very expensive asset that can be replaced with information which is a less expensive asset but to do this, the information has to be accurate, timely, reliable and consistent.

This implies that inventory management is very important if a company wants to achieve a balance between efficiency and responsiveness. Inventory management is a critical management issue for most companies – large companies, medium-sized companies, and small companies. Effective inventory flow management in supply chains is one of the key factors for success. The challenge in managing inventory is to balance the supply of inventory with demand (Baye, 2017).

Similarly, (Opoku, et al., 2020) implies that, the success of any organization, particularly construction, primarily relies on the inventory practices they adopt to manage their inventories. Inventory management practices (IMP) refer to the various practices of firms to ensure that inventories are kept at optimum levels to provide maximum service levels at minimum costs. They are primarily concerned with balancing demand and supply by controlling and monitoring manufacturing and purchasing orders so as to ensure uninterrupted material flow and value adding activities. Inventory management practices ensure that manufacturing firms are able to effectively and efficiently manage their inventories.

Inventory plays a significant role in the growth and survival of an organization in the sense that ineffective and inefficient management of inventory will mean that the organization loses customers and sales will decline. Prudent management of inventory reduces depreciation, pilferage, and wastages while ensuring availability of the materials as at when required (Baye, 2017).

This entails a reduction in the cost of holding stocks by maintaining just enough inventories, in the right place and the right time and cost to make the right amount of needed products. High levels of inventory held in stock affect adversely the procurement performance out of the capital being held which affects cash flow leading to reduced efficiency, effectiveness and distorted functionality. In order to achieve the objectives of minimizing stock related costs, firms should maintain adequate levels of stock in order to enable smooth business operations. A number of practices have therefore been advanced to handle these costs. A company would ideally want to have enough inventories to satisfy the demands of its customers- no lost sales due to inventory stock-outs. On the other hand, the company does not want to have too much inventory staying on hand because of the cost of carrying inventory. Enough but not too much is the ultimate objective (Baye, 2017).

Materials inventory management is important, as materials constitute a large amount in construction costs. This is because the poor inventory management can affect not only to the increase in costs, but also contribute to schedule and project delays. Therefore, those engaged in inventory should have an awareness of the interlocking activities contained in the process. (Deepak & Kumar , 2016) It is to ensure that the right quantity and quality of materials and equipment to be easily specified in a timely manner obtained at reasonable cost and are available when needed.

#### **2.4.1 Information technology usage**

Inventory is a very critical component in every organization and it requires serious managerial consideration since it ties up a lot of firms' capital. However, Inventories are essential for keeping the production continuous whereby moving inventories keep the market going and the distribution system intact. According (Baye, 2017)these functions include providing a cushion to prevent against stock-outs and therefore if there is a constant and efficient supply of inventory, it will reduce the chances of uncertainties or lack of stocks and the costs that relate to stock-outs and if this is well achieved, it will enable any firm to attain a competitive advantage over competitors. The failure leads to problems of daily sales accounting since there can be errors in the amounts received in relation to the amounts sold and numerous problems are also encountered in demand forecasting since material managers are not able to predict the exact amount of inventory to maintain so as to meet the customer's demand. Automated inventory systems usage has had little application and this has resulted in problems that come as a result of stock shortages and it is for this reason that various researches have been carried out pertaining to Inventory Management Control Systems.

#### **2.4.2 Inventory record accuracy**

According to (Baye, 2017)stock record system is the means of capturing and storing information and a facility for the analysis and use of this information so that the operation of the stores function and the control of stock can be performed in an efficient manner. A stock record system can be manual or computerized computer can in the simplest applications merely replace a set of stock record cards by maintaining a set of information on stock levels and carrying adjustments as necessary when directly instructed. defines a stock record system as a formal set



of records that contain information about stock held within the stores system. The range of this information will depend upon the system employed and the scope of the operation. However, there are basic functions which every stock record system should aim to cover the fundamental one being data held at any given time. It is because of the wide range of information held within a good record system.

### **2.4.3 Stock out**

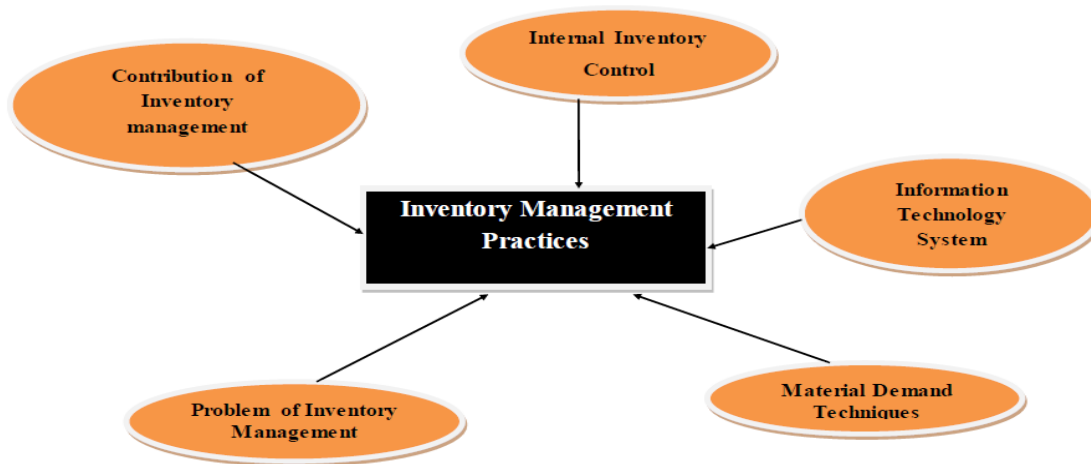
Stock-out's opposite is to carry too much stock or inventory that is called "Overstock" (Chua, 2019) companies are exploring ways to deal with the costly problem of stock out and uncertainty of demand by staging inventory in containers ahead of customer demand. Matching the exact amount of inventory to meet customer uncertain demand has presented a problem for managers. The need for frequent and timely restocking to support lean inventory has also created a challenge for retailers and suppliers sourcing products from overseas manufacturers. There is no more stock for a specific spare or material in current inventory of the construction site, store, along the supply chain or from the retailer, Financial Glossary (Baye, 2017). Too little inventory could lead to stock outs; as a consequence, customers could become dissatisfied and take their business elsewhere (Koumanakos, 2008).

### **2.4.4 Inventory planning and control**

Inventory planning and control are functions relating to inventory management. Business owners pay close attention to inventory as it usually represents the second largest expense in their businesses. Inventory planning includes creating forecasts to determine how much inventory should be on hand to meet consumer demand. Inventory control is the process by which managers count and maintain inventory items in the business (Baye, 2017).

Inventory control is a planned approach of determining what to order, when to order and how much to order and how much to stock so that costs associated with buying and storing are optimal without interrupting production and sales. (Chua, 2019) also defined, Inventory control is something that should be front-of-mind in building project. Many Project Manager neglected the importance of site Inventory control, which lead to lot of wastages in term of material wastage, labor working hour wasted due to "stock out" or search for material, pay higher price

to require immediate supply of specific material. Poor storage give rise to materials deteriorate, damage due to poor storage method, and lost (theft).



**Source:** Assessment of Inventory Management Practices (Manguday, 2018)

Figure 2.1 Conceptual Frameworks of the Study

## 2.5 Inventory management system in construction project

### 2.5.1 Inventory control of materials on site:

(Bamidele & Akinradewo, 2016) affirms that it involves taking note of the use and inventory of materials on site and recordings i.e. the loading and off-loading, transit and handling of materials. It is recommended that arrangements be made for materials to arrive on time. When a construction material is delivered to a site, it should be checked for damage, quantity, quality and specification.

(Bamidele & Akinradewo, 2016) stated, that this involves physical control of materials, preservation of stores, minimization of obsolescence and damage through timely disposal and efficient handling, maintenance of stores records, proper location and stocking. Stores are also responsible for the physical verification of stocks and reconciling them with book figures. The inventory control covers aspects such as setting inventory levels, ABC analysis, fixing economical ordering quantities, setting safety stock levels, lead time analysis and reporting.

### **2.5.2 Materials Planning and Control**

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. As a result, an excellent management of the materials record will help the flow of materials at the site in order to avoid several problems such as materials out of stock and materials that have not been delivered. Material planning would provide guides to all the subsequent activities and that this could have a great impact on the project plan. The materials planning process covers the set up and maintenance of records and determines the target inventory levels, and delivery frequency (Subramani, et al., 2017).

Material control is said to be “the process of providing quantity and quality of materials needed in the manufacturing process with an eye on economy in storage and ordering cost, purchasing price and working capital.” The material control process involves the following activities: Assessment of stock to be held as per the production schedule, decision of the extent of the stock to be held, procurement of the stock from suppliers, storage facilities available for materials carried in to the storehouse (Kaudunde, 2013)

### **2.5.3 Purchasing**

Purchasing is central to inventory management and it has the responsibility that the authority to commit project funds for materials, equipment, and services. This activity may be accomplished by the home office, the field, or a combination of both depending on the size and the scope of the project. The home office must maintain planning, procedural, and policy direction over the field operations in order to ensure consistent purchasing practices. It includes selection of sources of supply, finalization of terms of purchase, placement of purchase orders, follow-up maintenance of smooth relations with suppliers, approval of payments to suppliers, evaluating and rating suppliers. (Arijeloye & Akinradewo, 2016)

### **2.5.4 Stores and Inventory Control**

This involves physical control of materials, preservation of stores, minimization of obsolescence and damage through timely disposal and efficient handling, maintenance of stores

records, proper location and stocking. A store is also responsible for the physical verification of stocks and reconciling them with book figures (Subramani, et al., 2017).

Inventories control refers to a planned method of purchasing and storing the materials at the lowest possible cost without affecting the production and distribution schedule. Inventories, which consist of raw materials, consumable stores, machinery and equipment, general stores, working progress and finished goods are to be purchased and stored. Inventory control, therefore, is a scientific method of determining what, when and how much to purchase and how much to have in stock for a given period (Kaudunde, 2013).

### **2.5.5 Material Management Techniques**

Materials management is categorized to 5 processes. These processes are majorly followed on construction site; they are namely 1. Planning, 2. Procurement, 3. Logistics, 4. Handling 5. Waste control processes. Materials planning include quantifying, ordering and scheduling. Companies may have two major levels in planning- micro and macro level. Procurement is described as the purchase of materials and services from outside organizations. Purchasing procedure can be described as Step 1 – Material Indent, Step 2 – Enquiry to Vendors, Step 3 – Vendor Comparison, Step 4 – Vendor Selection and Negotiations, Step 5 – Purchase Order, Step 6 – Vendor Evaluation (Subramani, et al., 2017).

### **2.5.6 Control of Construction Waste**

Construction activities will generate big amount of the waste and it will cause difficulty to the construction industry. According to (Subramani, et al., 2017) Reduction of waste can be done by practicing attitude towards Zero wastage, proper decisions at design stage, site management, proper standardization of construction materials, and Codification of the same Construction waste can also be reduced by using waste management system on project. At the same time, planning of the inventory management which is effective will help to reduce the waste of material and increase the profit of the companies.

## 2.6 Methods of Evaluating Inventory

According to (Manguday, 2018) There are four methods accounting uses to cost inventory namely first in first out (FIFO), last in first out (LIFO), average cost (A.C) and standard cost (S.C).

**First in First out (FIFO):** This method assumes that the oldest (first) item in stock is sold first. In rising prices, replacement is at a higher price than the assumed cost. This method does not reflect current prices and replacement will be understated. The reverse is true in a falling price market.

**Last in First Out (LIFO):** This method assumes the nearest (last) item in stock is the first sold. In rising prices, replacement is at the current price. In a falling price market existing inventory is overvalued. However, the company is left with an inventory that may be grossly under stated in value.

**Average Cost (A.C):** This method assumes an average of all prices paid for the article. The problem with this method in changing prices (rising or falling) is that the cost used is not related to the actual cost.

**Standard Cost (S.C):** This method uses cost determined before production begins. The cost includes direct material, direct labor and overhead. Any difference between the standard cost and actual cost is stated as a variance.

## 2.7 Factors affecting of Inventory Management

According to (Kasim, et al., 2012) Inventory management in construction project could be affected by the factors such as; inadequate storage space, over ordering and double handling; and incomplete and lack of up-to-date information regarding on-site stock. to exercise inventory planning and control, the understanding of the factors influencing IM is necessary (Narayanapillai, 2014). It is very important to an organization maintaining an effective inventory management system. Various factors are affected to an effective inventory management system. Author (Pushpakumara, 2018) has emphasized opinion regarding this factor through published journal. Factors which have been identified are staff characteristics, inventory record system, storage system, wastage handling system and inventory procurement system.

### **2.7.1 Staff characteristics**

Storehouse staff is responsible for receiving and storing inventory, recording inventory information, security system of inventory etc. Therefore, staff characteristics are most important factor of controlling store room activities. According to (Pushpakumara, 2018) people in stores are responsible for the distribution of inventory to all storage or using locations and they are also responsible for the physical security and safekeeping of inventory at all stores places and for all storekeeping activities, including inventory receiving, put-away, and inventory picking and distribution. Therefore, companies should consider having capable and skilled staff to help the organization to achieve its goal and objectives.

### **2.7.2 Inventory record system**

Inventory record system is most important part of any kind of organizations. Also it helped to reduce stock outs, inventory frauds, obsolescence etc. (Pushpakumara, 2018) inventory should be recorded, manually or using an automated management information system. Also accurate records are a necessity to effective inventory management.

### **2.7.3 Storage system**

(Pushpakumara, 2018) Stated, that each of inventory items has been enough space in storehouse and it has handled by suitable system. Store management involves physical control of inventories, preservation of stores, minimization of obsolescence and damage through timely disposal and efficient handling, maintenance of stores records, proper location and stocking. Inventory managers have to stock-up when required and utilize available storage space resourcefully, so that available storage space is not exceeded.

### **2.7.4 Wastage handling system**

According to (Endale, 2016) Waste management is the collection, transport, processing or disposal, managing and monitoring of waste materials. The term usually relates to materials produced by human activity, and is generally undertaken to reduce their effect on health, the environment or aesthetics. Waste management practices differ for developed and developing nations, for urban and rural areas, and for residential and industrial producers. And also (Pushpakumara, 2018) state that, some commercial values are involved with waste and scrap, it

consists of spoiled raw-materials, rejected components, defective parts, waste from production departments etc. Therefore, waste management is a significant role in managing operations. Construction Industry involves multi echelon and multi item “Material Supply Chain”. There are many items of materials involves in every stage of the construction, and the timing to use the same materials are different at every give stage of construction schedule. When the materials, plants and machineries are poorly managed, the time lost for plants and machineries, and materials wastage will over run the construction budget. The literature reviews clearly indicated that material management is one of the critical aspects of construction industry. One of the critical reason for cost overrun is poor material management (Abas, et al., 2016). According to (Zou, 2012) proper inventory mechanism able to reduce construction cost. The tracking of ordering and reordering cycle, quantity stocking level, ordering lead time and safety stock level need to be control and manage for inventory cost minimization

### **2.7.5 Inventory procurement system**

According to (Lemma, 2017) Procurement is the processes of determining the order quantity purchase of items, work processing, store requisitions, issue of enquiries, and evaluation of quotations, supplier appraisal, negotiations, placing of contracts, progressing of deliveries and clarifying payments. Successful inventory management involves creating a purchasing plan and design that will ensure that items are available when they are needed but that neither too much nor too little is purchased and keeping track of existing inventory and its use.

Similarly (Kasim, et al., 2012) advocate that procurement is the process of obtaining products and services from suppliers. Procurement and Inventory management is critical to production companies as well as to service companies, as Spending in procurement is often one of the biggest parts of the company’s budget. This means knowledge about strategies, concepts, process, methods and technical system in the areas of procurement and inventory management. On the other hand, (Chan, et al., 2017) argue that the factors that will influence the effectiveness of inventory management are inventory control planning, documentation/ store records, knowledge and skills of employees, and funding. The effectiveness of inventory management is to augment operations of the organization to make sure the flow of resources, services and products are running smoothly. One of the critical elements in maintaining effective inventory management is planning. That is state as the method which is used to control and manage the

inventory such as forecast the market demand, make the plan for maintaining the safety quantity of materials, setting reorder point and manage the stock level in an organization. Material procurement variance is the major contributor to cost variance. As (Abas, et al., 2016) also states that poor material inventory management lead to construction cost overrun.

**Safety and security of supplies:** ensuring the avoidance of loss a result of deterioration, theft, waste and obsolescence, coordination of inventory to ensure that supplies can be rapidly located, preparation and interpretation of reports on stock levels, stock usage and surplus stock, liaison with auditors regarding all aspects of inventory, appropriate disposal of scrap, surplus and obsolete items (Manguday, 2018).

## 2.8 Inventory Control Systems (Techniques)

According to (Chua, 2019) Inventory control is crucial function in construction industry, well managed inventory control improved site installation more smoothly and in turn gain better productivity. Ideally, right material should be supplied at right place, at the right time and of right quantity so as to have speedy installation and minimize the cost of craft labor time of the project. The fundamental objective of a good inventory control system is to be able to determine

1. What to order;
2. When to order and at what interval?
3. What is the right price;
4. How many (quantity) to order; and
5. How much (quantity) to carry in stock

The right time to purchases at right price and quantity of Materials, will get the best deal. Similarly (Kaudunde, 2013) define, Inventory control refers to a planned method of purchasing and storing the materials at the lowest possible cost without affecting the production and distribution schedule. Inventories, which consist of raw materials, consumable stores, machinery and equipment, general stores, working progress and finished goods are to be purchased and stored. Therefore, it is a scientific method of determining what, when and how much to purchase and how much to have in stock for a given period.

There are two ways of performing Inventory Control,

- Computerized Inventory Control System; or
- Manually recording Inventory system



**Computerized the Inventory Control System**

According to (Chua, 2019)The Computerized Inventory Control System is designed to track all materials in bond or out bond and automatically record the stock level advice the lower reordering time. With the introduction of computerized system, the inventory control can synchronize with the handheld devices such as smart phones, tablets and other scanner.

**Manually record Inventory system**

Inventory Control system can be recorded using manual method the advantage of the manual method is not expensive and straight forward method but Tracking of materials and components in construction project is not an easy task. (Chua, 2019) agreed that materials tracking still remain as a big problem in construction jobsites. The difficulty in tracking over materials and components is contributed by the large amounts of materials and components involved in the construction process. Besides that, an on-site material tracking is also bound with the traditional-manual method which has several limitations which is; labor intensive, inaccurate and subjected to error prone which further leads to waste and surplus of materials, schedule delays, decrease in productivity, and the lack of up-to-date information regarding the status of materials. This manual process is labor intensive and data collected using this method is not reliable as they are dependent on workers motivations and skills to track the materials (Sardroud, et al., 2010). Therefore, computerized Inventory Control System is strongly recommended for efficient control and tracking of material inventory management.



**Perpetual Inventory Control**

ITEM		ITEM NUMBER	SHEET NUMBER								
ORDERED				RECEIVED				SOLD			
DATE	ORDERNO	VENDOR	QTY	DATE	QTY	BACKORDER	DUE DATE	DATE	ORDERNO	QTY	RELATIVE CONSIGN

**Source:** the impact of inventory control on profitability in the construction industry (Chua, 2019)

**Figure 2.2** manual inventory control system

The lack and incomplete of up-to-date information regarding on-site stock is caused by the poor tracking and locating of materials in construction sites. Thus, there is a need for a proper

inventory management in order for the materials to be tracked and located easily; and without employing additional costs

On the other hands according to ( Nanaware & Saharkar, 2017) Inventory Classification is very important to manage inventory efficiently. For inventory optimization and Inventory Forecasting, products need to be classified appropriately. Similarly, (GIRMA, 2016)stated, that Items that are in the inventory are not of equal importance in terms of the amount invested, profit potential and sock-out penalties, etc. Therefore, all items do not deserve the same degree of attention. Which implies; that selective inventory management approach has to be applied. There are several methods used for categorization of products and items in inventory.

**ABC inventory control technique;** The ABC (Always Better Control) inventory control technique is based on the principle that a small portion of the items may typically represent the bulk of money value of the total inventory in construction process, while a relatively large number of items may from a small part of the money value of stores. The money value is ascertained by multiplying the quality of material of each item by its unit price. ABC analysis is a technique for prioritizing the management of inventory. Inventories are categorized into three classes – A, B, and C. most management efforts and oversights are expended on managing A items. C items get the least attention and B. Typically less than 20% of items classified as A; contribute as much as 80% of the revenue. The next 15% (80% - 95%) contribution to revenue is done by B class Items. The last 5 % revenue is generated by items classified as C'. As the classification is done according to the importance of their relative value, this approach is also known as Proportional Value Analysis. (GIRMA, 2016)

**The Economy Order Quantity (EOQ);** The Economy Order Quantity (EOQ) refers to the order size that will result in the lowest total of order and carrying costs for an item of inventory. If a firm place unnecessary orders it will incur unneeded order costs. Thus, Inventory models deal with idle resources like men, machines, money and materials. That concerned with two decisions: how much to order (purchase or produce) and when to order so as to minimize the total cost. For the first decision—how much to order, there are two basic costs are considered namely, ordering costs and carrying costs. Ordering costs are costs that are incurred on obtaining, additional inventories. They include costs incurred on communicating the order, transportation cost, etc. Carrying costs incurred on holding inventory in hand. This includes

Cost of Storage, Insurance taxes, Deterioration & obsolescence this calculates in %. Inventory Carrying Cost It helps in finding appropriate levels for holding inventories. It facilitates the fixation of ordering sequence and the quantities so as to minimize the total materials cost. Before taking a decision on economic order quantity, the ordering cost, inventory carrying cost and inadequate inventory cost must be considered (Baye, 2017).

**The Re-Order Point (ROP);** The EOQ thought us the quantity size to order, but not the time to order. The reorder model finds out the time to order when the stock level go down to a predetermined amount, this generalize a quantity of stock to cover for the lateness between order delivery or the time gap of delivery and this activity that can reduce the risk of running stock out when the quantity level low (Lemma, 2017).

**Just in Time (JIT);** According to (Girma, 2016) JIT aims is to reduce time waiting during production process. Therefore, the cost of inventories not only can be minimized but also the time for the production also shortens. JIT concept is not saying about the standardization or the way of managing but it really focusing on the zero inventories. This system builds a good relationship and trust suppliers and based on willing of suppliers. similarly (Lemma, 2017)stated that, In every organization there are two types of common inventory management strategies are the just-in-time method direct purchase for direct to use, where establishments plan to receive items as they are needed rather than maintaining high inventory levels, and materials requirement planning, which schedules materials deliveries based on sales forecasts. Proper inventory management requires an organization to undertake stocking and use appropriate method to value stock so as not to under or over state profits. The inventory purchasing management approach of accurate response is an excellent mechanism that helps businesses manages their inventory; especially to Public Service Company it enables to give a quality and proper services.

## **2.9 The Importance of Inventory Control**

According to (Kaudunde, 2013) the primary objective of an inventory control is:

a) To minimize idle time caused by shortage of inventory and non-availability of inventories as per requirement, and

b) To keep down capital investment in inventories, inventory carrying cost and obsolescence losses.

Achieving of these objectives will result in more return on capital which is materially the prime objective of an organization whether commercial or industrial. Return on Capital is the ratio between Profit and Capital Investment. Construction profitability may vary depending on the usage of material, fully utilized plant and machinery, manpower deployment, the efficiency of subcontractor, overhead cost and other general issues. Since Materials, plants and machineries are the major cost ranging from 50 to 60% of the total construction cost; therefore emphasis on dynamic materials inventory control will impact the profitability of the project (Chua, 2019).

---

## CHAPTER 3

### RESEARCH METHODOLOGY

#### 3.0 Study Area

The study was conducted in Jimma Town which is located in Jimma zone which is one of the 17 zones in the Oromia Regional State, from July to December 2020. Jimma town is located in Oromia National Regional State, in Jimma zone, Jimma Woreda at a distance 352Km from Addis Ababa. Its astronomical location is 7° 4' North Latitude and 36° 5' East Longitude.

In the Town, different infrastructures such as building construction, road constructions, water supply and drainage expansions and stadium constructions are carried out. Therefor the research was conducted on Building construction projects found in the Town.

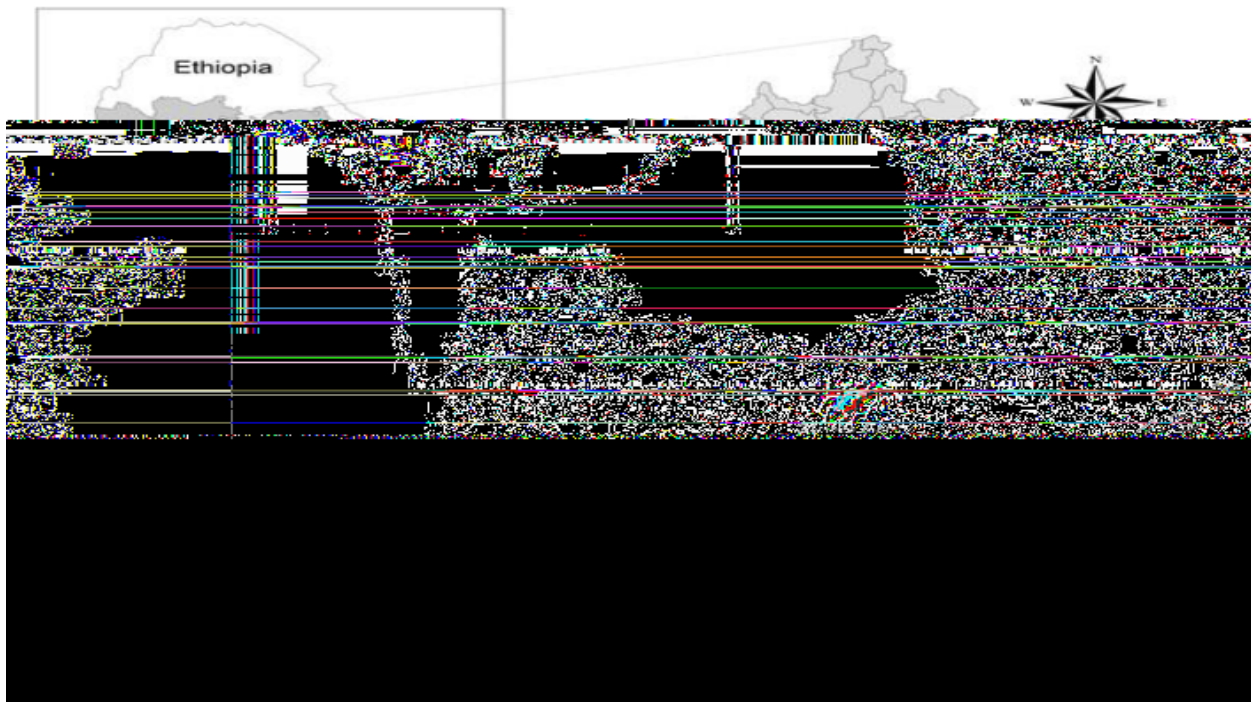


Figure 3.1 Map of Oromia Region (Source Google Earth)

#### 3.1 Research Design

The research is descriptive type of research which was found an appropriate method to assess inventory management practices in building construction projects which found in Jimma Town.

Data collection was mainly through questionnaires and interviews with the stockholders, top managers, and material management staff including other staff involved in inventory control operations as well as the opinions of contractor representatives, material management staff and managers.

### **3.2 Population**

The populations for this research were all ongoing building construction project sites in Jimma Town and the main sources of the information were contractors, consultants and client's representatives.

Therefore, the populations for this research, includes 33 building projects and general contractors actively on progress in the town

### **3.3 Sample Size and Sampling technique**

Sampling is a procedure that related with the selection of a subset of individuals from within a population to estimate the characteristics of whole population.

Sampling technique of study were designed to be non-probabilistic purposive sampling. This means selection is based on their necessity for the study from those who are included in the population. As reviewed in Jimma town construction biro 33 building project were under construction. But the progress of some projects were questionable (they are not active) and there is no full information who were the contractors and the consultants for the projects. Therefore, in case of small amount of population it shall take all population as a sample. As sample size increases, the accuracy of the result will be improved. Hence the study takes all of 33 populations as a sample. purposive sampling allows the researcher to select respondents who have good knowledge about the subject in question. Besides, looking at the nature of building construction industry, the study seeks to solicit information from a section of the population of contractors, consultants, clients and other professionals who have experiences of building construction in Jimma town to investigate the current inventory management practice followed by the construction companies in order to identify the factor that affect the system to improve inventory management system.

### **3.4 Study variables**

Dependent variable is Inventory Management Practices

Independent variables are Material planning and recording, Inventory controlling system, Material management techniques, cost of material transport, Inventory delivery system, Purchasing system, Stock system

### **3.5 Data Collection Process**

After a thorough review of relevant literature related to inventory management practice on building construction projects, questionnaire, interview and site observation were developed.

### **3.6 The Questionnaire**

Based upon a review of current literature and research objectives, structured questionnaire was prepared. Almost all the questionnaires have closed-ended questions since the study was assessment for the first time and to ensure consistency of respondent feedback. Because it is not entirely possible to design all questions as closed-ended, some questions were left open-ended, to obtain numerical data or to request some written comment.

For the purpose of the study, the questions were grouped under five main sections.

(1) Respondent Information, (2) Questionnaires about inventory management practice, (3) Level of awareness of materials management system 4) Factors associated with inventory management on building construction project 5) Strategies for inventory control on construction projects.

The General Information dealt with the demographics with respect to firms, position of the respondent in the organization, educational level of the respondents, area of experience and years of experience of the respondents. This aspect was deemed necessary in order to ascertain the reliability and credibility of the data and as a result, be used to correlate performance and satisfaction with the test system among different groups of users. The second section “Questionnaires about inventory management practice” asked more specific questions in relation to stakeholders’ skills on inventory management practice. It employed the five-point type ordinal scale to measure level of usage by responding firms from “Strongly Disagree” to

“Strongly Agree” that is, 1= Strongly Disagree, 2= Disagree, 3= Neutral, 4= Agree, 5= Strongly Agree.

The third section “Awareness of materials management system” inquires about the Awareness of inventory management practices on building construction projects. It employed the five-point type ordinal scale to measure level of awareness by responding firms from “Strongly Disagree” to “Strongly Agree” that is, 1= Strongly Disagree, 2= Disagree, 3= Neutral, 4= Agree, 5= Strongly Agree.

The fourth section “Factors associated with inventory management on building construction project” system” inquires about the factors affecting inventory management practice on building construction projects. It employed the five-point type ordinal scale to measure level of awareness by responding firms from “Strongly Disagree” to “Strongly Agree” that is, 1= Strongly Disagree, 2= Disagree, 3= Neutral, 4= Agree, 5= Strongly Agree.

The fifth section” Strategies for inventory control on construction projects” asks respondents to choose the best strategy that works better for their organization. It employed the” yes” or “No” method to identify the best strategy for inventory control system.

### **3.6.1. Pilot Questionnaire**

Before the main survey was undertaken, a draft version of the questionnaire was piloted in two building construction contractors and one building construction consultant. This pilot study was intended to elicit responses that would help to test the wording of the questionnaire, identify ambiguous questions, extra points that was added and removed and also provide an indication of the time to complete the questionnaire. Some of the comments and suggested amendments from the pilot study respondents were used to amend the questionnaire before its final distribution.

### **3.6.2. Main Questionnaire Administration**

The administration of the questionnaire began in September 2020 and completed in November, 2020. A period of four weeks was allowed for the administration of the questionnaire; however, all the completed questionnaires were retrieved by the four week. A total of 62 questionnaires were administered to the ongoing building construction project site respondents. Four (4) were targeted at clients or owners, twenty (20) were targeted at consultants, thirty-four (34) were



targeted at contractors, three (3) were targeted to academia and the remaining one (1) were targeted at suppliers. A total of 2 respondents from clients or owners, 15 from consultants, 30 from contractors, 3 from academia and 1 from supplier representing 82% were retrieved. The total administered questionnaires and the return rate are shown in Table 3:2

Table 3.1 Total administered questionnaires and the return rate

	No of questionnaires sent to respondents.	No of questionnaires returned.	Response rate ( % )
Respondents	62	51	82.3

### 3.7 Interview

Interview was conducted along with the questionnaire survey from those respondents who are willingness to interview and open their site for site observation.

### 3.8 Data Processing and Analysis

Data collected from the questionnaires were analyzed using three methods from descriptive and inferential statistics. These include Frequency Analysis, Mean/average Index Score and One Sample T-test. In order to generate the result, the researcher used Microsoft Excel.

### 3.9 Ethical Consideration

According to (Molla, 2016) under ethics of research, the following parts need to be considered.

A. Research Problem Statement - During the identification of the research problem, it is important to identify a problem that will benefit individuals being studied.

B. Statement and Research Questions- In developing the purpose statement or the central intent and questions for a study, proposal developers need to convey the purpose of the study that will be described to the respondents.

C. Data Collection-As researchers anticipate data collection they need to respect the respondents and the sites for research.

Other procedures during data collection involve gaining the permission of individuals in authority (e.g., gatekeepers) to provide access to study respondents at research sites.

- Researchers need to respect research sites so that the sites are left undisturbed after a research study.
- Researchers also need to anticipate the possibility of harmful information being disclosed during the data collection process.

D. Analysis and Interpretation-In anticipating a research study, consider the following:

- How the study will protect the anonymity of individuals, roles, and incidents in the project.
- Data once analyzed, need to be kept for a reasonable period of time. This is to protect leakage of information/raw data
- In the interpretation of data, researchers need to provide an accurate account of the information.

Considering the above recommendations and other procedures, formal letter was obtained from JiT Post Graduate and Research Program office and submitted to respondents (contractors, consultants, Clients/owner representatives who have experiences in building construction projects) for the remaining interviews the formal letters was also be used. Before starting data collection, the purpose of the study was explained to all respondents and informed consent was obtained

### 3.10 Reliability of data

According to (Aravinth & Indhu, 2016)the reliability of an instrument is the degree of consistency which measures the attribute; it is supposed to be measuring. The less variation an instrument produces in repeated measurement of an attribute, the higher its reliability, reliability can be equated with the stability, consistency or dependability of measuring tool. The Cronbach’s coefficient alpha is used to measure the reliability of the questionnaire between each field and the mean of whole fields of the questionnaire. The equation for finding Cronbach’s alpha ( $\alpha$ ).

$$\alpha = \frac{kr}{(1+(k-1)r)} \dots\dots\dots (1)$$

Where ‘K’ is the number of variables considered and ‘r’ is the mean of the inter-item correlations. The normal range of Cronbach’s alpha value is between 0.0 and +1.0 and the

higher degree of internal consistency. Table 2 gives the general acceptable value of Cronbach's alpha.

Table 3.2 Cronbach's Alpha

ALPHA	REMARKS
$\alpha > 0.9$	Excellent
$\alpha > 0.8$	Good
$\alpha > 0.7$	Acceptable
$\alpha > 0.6$	Questionable
$\alpha > 0.5$	Poor

### 3.11 Sources of data

This paper examined primary and secondary sources of data. Primary data is an original and unique data, which is directly collected by the researcher from a source such as observations, questionnaires, and interviews according to his requirements. Sources of secondary data are government publications, websites, books, journal articles, internal records

### 3.12 Data collection procedure

In this study data and information were collected by using both primary and secondary sources. The primary data was obtained by preparing questionnaire and an interview was directed to the sample construction companies/contractors that are involved in building construction projects which found in Jimma Town. And the questionnaire survey was designed based on the objectives of the study and it was distributed to respondents by using hardcopy and via email. The secondary data will obtain from previously done different researches, internet, journals, books and different articles in published documents.

### 3.13 Data presentation and analysis

The data obtained from questionnaires and interviews was processed which involves simple statistical approach, the data collected through pre-tested structured questionnaire was categorized and analyzed. The data was tabulated, analyzed and interpreted using Excel sheet. Most of the findings were presented in the form of tables, pie charts and bar graphs to clearly illustrate the result and to help to easily understand. The five-point scale was converted to a Relative Importance Index (RII) for each individual factor using the following formula. The

---

data received in the second questionnaire was analyzed by Relative Importance Index (RII) method.

$$\text{Relative importance index (RII)} = \frac{\sum W}{(H * N)} \dots\dots\dots (2)$$

Where W is the total weight given to each factor by the respondents, which ranges from 1 to 5 and is calculated by an addition of the various weightings given to a factor by the entire respondent, H is the highest ranking available (i.e. 5 in this case) and N is the total number of respondents that have answered the question.

To achieve the research objectives both of qualitative and quantitative methods of data analysis is applied. In order to analyze the questionnaires quantitative, the study is used simple descriptive statistics such as frequency, tables, and percentage. Also, the qualitative explanation is employed for key informant interview responses and open-ended questions which are analyzed thematically.

### **3.14 Data quality assurance**

- The quality of the data was assured by using validated structured questioner.
- Data collectors were trained intensively on the study, objective of the study, confidentiality of the information, informed consent and interview technique.
- The data collectors were work under close supervision of the researcher to ensure adherence to correct data collection procedures and reviews the filled questioner at the end of data collection every day for completeness.

---

## CHAPTER 4

### RESULTS AND DISCUSSIONS

#### 4.0 Introduction

The aim of this research project was to assess inventory management practice on building construction projects in Jimma Town. The rationale for conducting the research was the need for inventory management practice in constructions.

The chapter present data analysis and findings from the interview, survey questionnaire and site observation. It begins with descriptive analysis of the demographics variables of participating firms and respondents. This is followed respondent Information questions about stakeholder's skill on inventory management practice, level of awareness of materials management system, factors associated with inventory management on building construction project and strategies for inventory control on construction projects. The main statistical methods and tools used were relative importance index. Data collected from the questionnaires were tabulated and analyzed according to their ranking on relative importance index. Charts were created, where appropriate, in support of the descriptive analysis to clarify their status.

#### 4.1 Demographic variables and respondent's profiles

##### A. Respondents Information

With sixty-two questionnaires which were administered to the contractors, consultants, clients and other civil engineer professionals, a total of 51 questionnaires were returned constituting 82% response rate. Figure 4.1 shows the breakdown of the number of response received from the selected organizations. From the survey results from Figure 4.1, 2 questionnaires out of 4 were received from clients or owners side, 15 questionnaires out of 20 were received from consultants, 30 questionnaires out of 34 were received from contractors, and 4 out of 4 were received from suppliers constituting 4, 29, 59 and 8 % responses respectively from the total questionnaires sent to respondents.

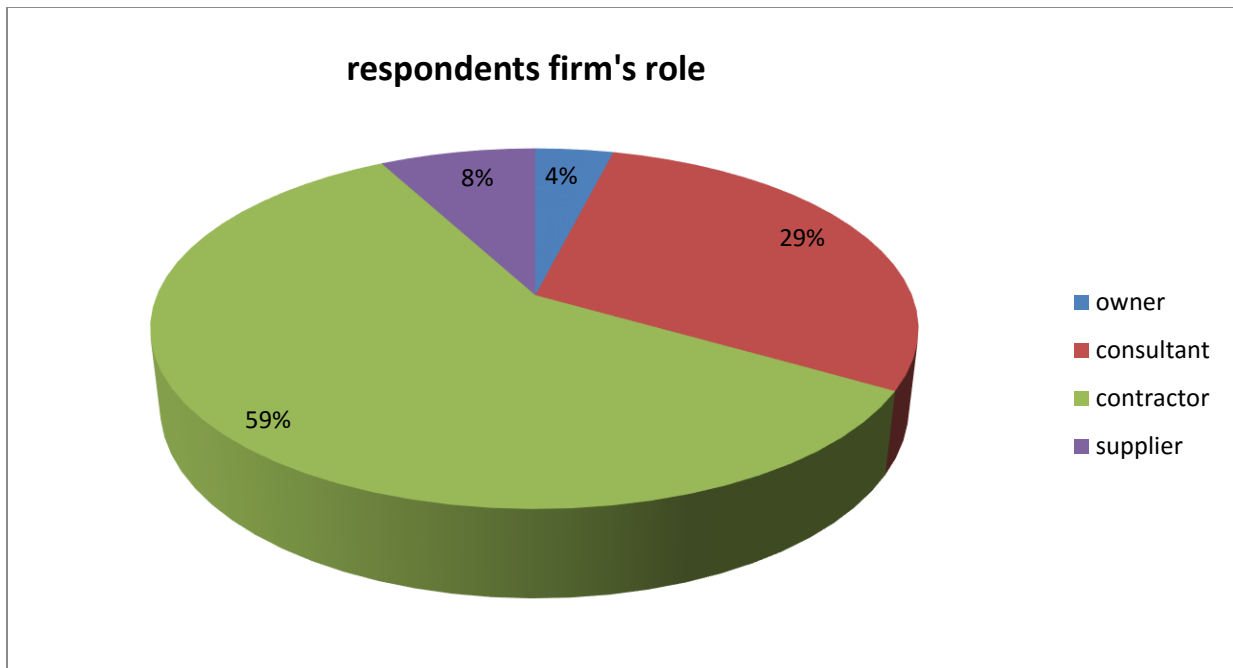


Figure 4.1 Respondent's information

### B. Position of respondents in the organization

Positions of respondents in the organizations were represented in the survey. Considering the current positions in their construction industry, 22(43%), were site engineers, 14(27%) office engineers, 3(6%) were project managers, 6(12%) were supervisors, 6(12%) were other civil engineer professionals.

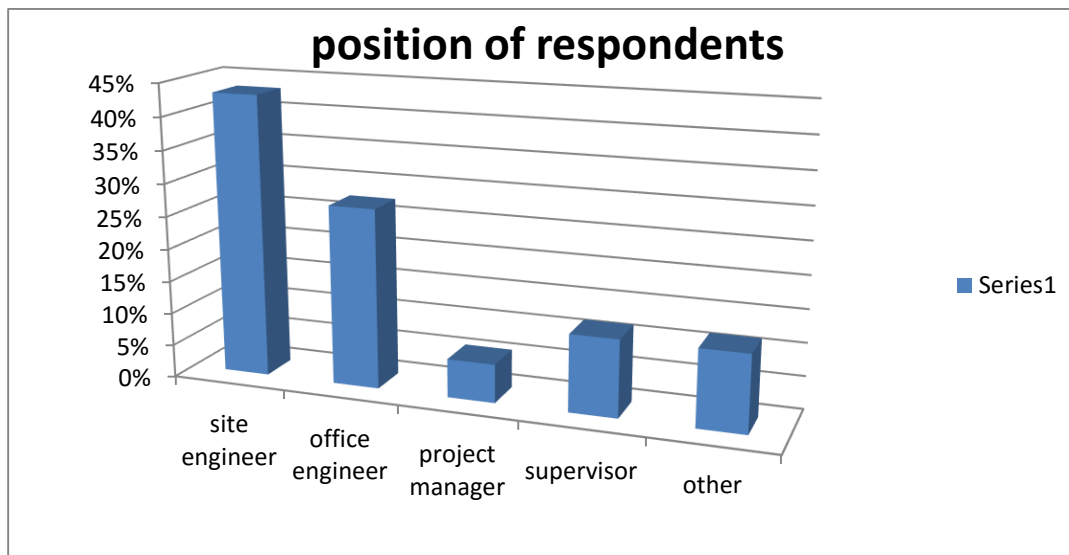


Figure 4.2 Position of respondents in the organization

### C. Academic Qualification of Respondents

Concerning professional backgrounds of respondents, Figure 4.3, shows that, academic qualifications of respondents comprised of bachelor degree (75%), and master degree (25%) and there were no qualifications below degree or above master's degree.

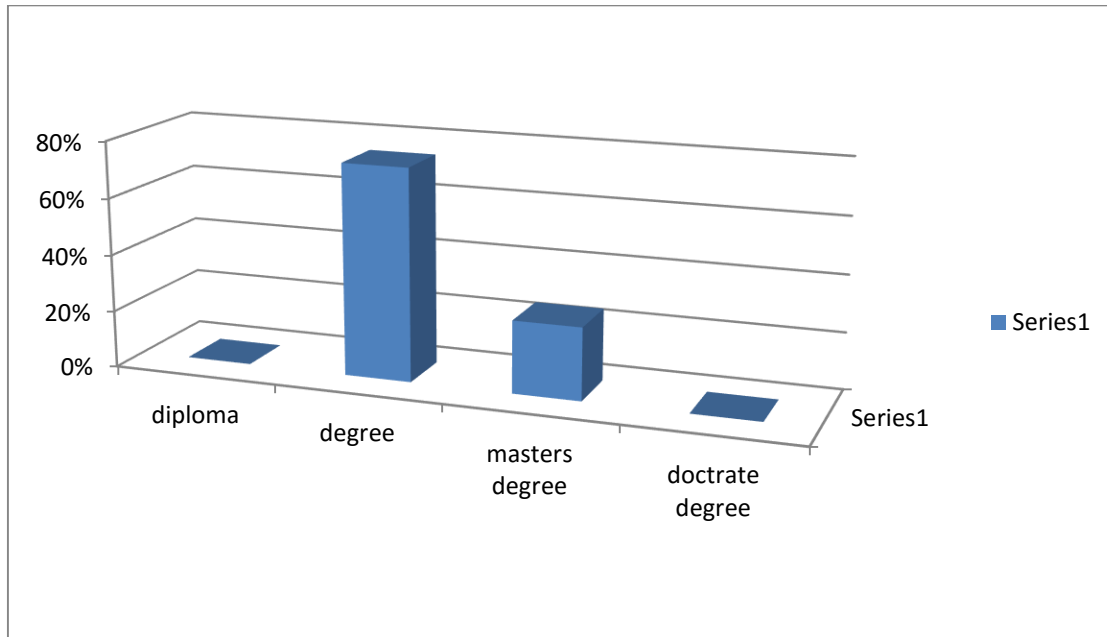


Figure 4.3 Academic Qualifications of Respondents

#### D. Area of experience of the respondents

Concerning area of experience of respondents, Figure 4.4, shows that, educational 6(12%), design 8(16%), construction 32(63%) and management 5(10%).

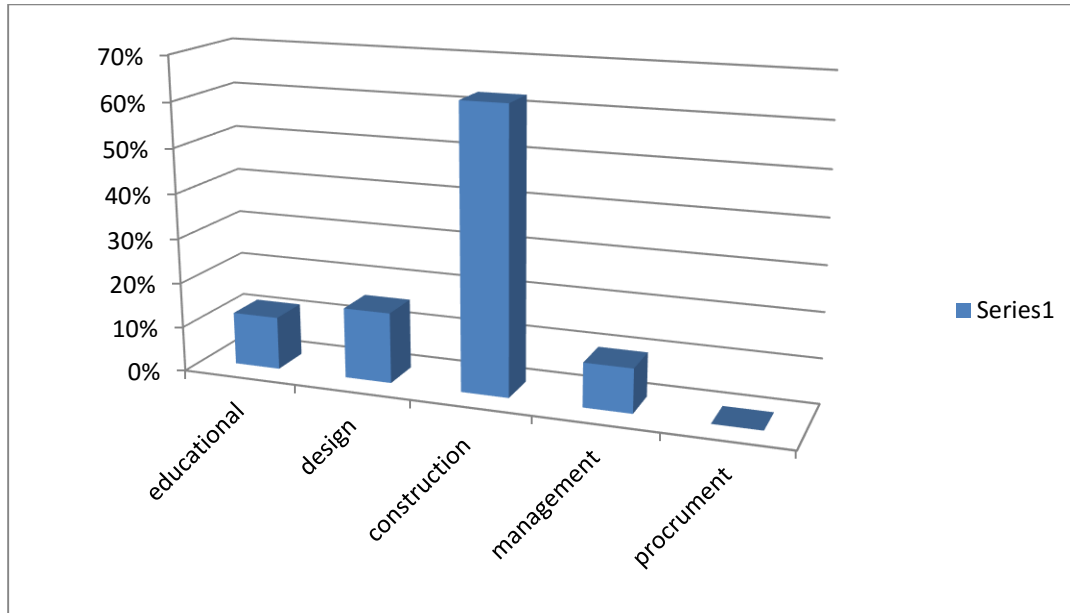


Figure 4.4 Area of experience of the respondents

#### E. Experience of respondents

Regarding the working experience of the respondents surveyed, Figure.4.5 shows that, 26(51%) of respondents had worked in the construction industry less than 5 years, 21(41%) between 6-10 years, 3(6%) between 11-15 years and 1(2%) between 21-30 years.

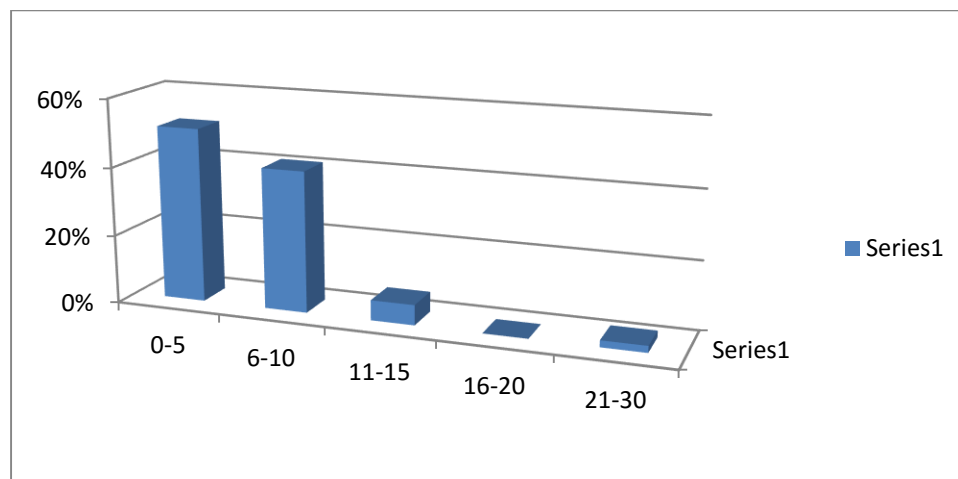


Figure 4.5 Experience of respondents



---

## 4.2 Reliability Check - Cronbach's Alpha

Table 4.1 Cronbach's Alpha for Questionnaires

No	Factors to be evaluated	No of items	Cronbach's Alpha
1	assess the practice	10	0.808
2	Awareness	10	0.881
3	factors related	14	0.938

**Source: Own Survey Data, 2020**

As indicated in the table 4.1 above,  $\alpha = 0.808$  for internal inventory control management dimensions,  $\alpha = 0.881$  for level of awareness and  $\alpha = 0.938$  for factors related service contribution dimensions. This show the questions are reliable and have high internal consistency. Moreover, the overall reliability test (Cronbach's alpha) for the items is 0.876. This implies that the items were reliable, clear and easily understandable by the respondents.

## 4.3 Inventory management practice on building construction projects

In this section, respondents answered questions related with inventory management practice which were analyzed in this section, respondents answered questions which were derived from the research objectives that is assess stakeholders' skills on inventory management practice, Level of Awareness of Materials Management practices, Problems related with the practice and Measures for effective Inventory Control on Construction Projects.

### 4.3.1 Inventory management practice on Building Construction Project sites.

This part is to investigate the inventory management practices on construction project. The statistical analysis employed in this situation was the RII.

From the interview construction projects apply manual inventory management system as current trained not only for the tracking of inventory but also to record as a whole and this involves paper-based techniques and is problematic with many human errors which have a negative impact on construction project progress.

Table 4.2 inventory management practice on Building Construction Project sites

S/NO_	inventory management Practice on building construction projects		
	stakeholders skills on inventory management practice	RII	rank
1	There are skilled and competent man powers in the construction projects store that use inventory Management tools properly.	0.804	2
2	The numbers of staff involved in construction project stock control activities are adequate	0.761	6
3	There are old aged employees who are assigned in areas which require extra energy and efforts of the store	0.631	10
4	Qualification is a prerequisite and matched with job requirements	0.776	4
5	Staffs are trained on inventory management control systems.	0.690	9
6	There is adequate supervision	0.808	1
7	There is clearly marking of damaged and obsolete Inventory	0.765	5
8	The counting of the items and access to the tags for custody of the particular items	0.725	8
9	There is prompt adjustment of records for inventory discrepancies after approval by a responsible official	0.753	7
10	There is signing and dating of inventory count sheets by the person supervising the count	0.796	3

The summary of the 10 inventory management practice on Building Construction Project sites have been identified and ranked on Table 4.2. The Relative importance index (RII) ratings on the identified problems were calculated based on a scale of 1-5 (from “Strongly Disagree” to “Strongly Agree”).

Accordingly, the adequate supervision (0.808), the skilled and competent man powers (0.804) and the signing and dating of inventory count sheets by the person supervising the count (0.796) were the top three inventory management Practice on building construction projects ranked by respondents based on their RII values.

Construction industry remains an important economic sector that has a vital role to play in ensuring economic development in a country’s economy. Developing Town like Jimma should

use the inventory management practice seriously according to the data from the interview there are a lot to do on this useful asset. There is a very high variability of inventory indices from site to site. Furthermore, similar sites might present different levels of inventory management for the same material. This indicates that a considerable portion of cost variability, delays and other related problems can be avoided if we take this seriously. It is very vital to assess stakeholder's skills on inventory management practice before we pass to the next level. Based on the findings presented above there are highly occurred problems associated with inventory management practice in a developing town like Jimma appears quiet high. Due to this (Stakeholders skills on inventory management practice) must be examined.

A number of stakeholders are involved in the inventory management practices. Each of them involved take different roles in construction projects with very different objectives. Inventory is a shared responsibility between all parties of the supply chain, from the client down to the contractor. Effective management of building-related inventory requires coordinated action of government, business, supplier, professional groups and their activities.

For successful completion of one construction project it is mandatory to have complete supervision between the construction company and the supplier. And must be full of skilled and competent man power in order to have adequate supervision

It is one of the most problem occurs in construction company is to have old aged employees who are assigned in areas which require extra energy and efforts of the store. Continuous staff training on how to control inventory is very essential for the company

The study conducted by (Opoku, et al., 2020) also revealed that during inventory management, firms develop strong, mutually collaborative and long-lasting relationships with third parties notably key suppliers. This helps them to obtain vital resources in areas of expertise, financial assistance, and even exposure to new and innovative ways of successfully managing inventories. According to, through strategic partnerships and collaborations, firms are also able to exchange ideas with their key partners while acquiring sensitive and highly expensive facilities and technologies which promote inventory management and invariably operational performances of the firms studied.

### 4.3.2. Awareness of materials management practice

This part examined the awareness of materials management practice on building construction project. Table 4.3, provides level of awareness of materials management practice on building construction sites and the RII of the respondents. RII were calculated based on a scale of 1-5 (from “strongly disagree” to “strongly agree”).

Table 4.3 awareness of materials management practice

S/NO_	Section III: Awareness of Materials Management practices		
	Practices	RII	Rank
1	There is awareness about purchasing of materials	0.835	1
2	There is awareness about material planning methods	0.808	4
3	There is awareness about transportation of materials	0.820	2
4	There is awareness about material handling	0.812	3
5	There is awareness about inventory management	0.773	7
6	There is awareness about warehousing management	0.753	10
7	There is awareness about material waste control	0.765	8
8	There is awareness about economic order quantity	0.804	5
9	There is awareness about just in time method	0.780	6
10	There is awareness about recovering and recycling of materials	0.761	9

By considering awareness of material management in building construction project sites; the study revealed that respondent’s awareness about material management practice we have about 10 activities. This is an indication that, almost all of the respondents, had variations in the rating of their awareness the respondent’s ratings. From Table 4.3 it was observed that the respondents level of awareness on material management methods were relatively high especially,

---

Purchasing of materials methods with (RII=0.835), Material planning methods with (RII = 0.808), Proper transportation methods with (RII=0.820), and Material handling methods with (RII=0.812), while the awareness was relatively low on Recovering and recycling of materials method with (RII = 0.761), Just in time method with (RII = 0.780), Economic order quantity method with (RII = 0.804), and Material waste control with (RII=0.765). From the on-going, the awareness on emerging methods of material management like Just in time (JIT) and Economic order quantity (EOQ) should be improved.

The study conducted by (Arijeloye & Akinradewo, 2016) also revealed that purchasing of materials, material planning method and transportation of materials are the most common practices of materials Management. However, the control of materials on construction sites is handled carelessly by planning and purchasing departments, site supervisors and engineers as well as contractor's organization and this have been posing various problems to contractors in realizing reasonable profit margin. As we observed from the result material waste control, recovery and recycling of materials need attention on construction site because it is the most fundamental problem on the construction site the study conducted by (Endale, 2016) also revealed that the construction industry produces a huge amount of waste which is environmentally unfriendly, and costly to project budgets. In some areas all or part of construction and demolition waste is unlawfully deposited on land, or in natural drainage including water, contrary to regulations to protect human health, commerce and the environment.

The result pointed out Recovering and recycling of Materials, just in time method, Economic order quantity and Material waste control need strong concern.

#### **4.3.3 Factors Associated with Inventory Management On Building Construction Projects.**

This section analyzed that identifying factors associated with inventory management on building construction projects in the town.

This objective was examined through the research question indicated below using Likert Scaling like objectives one as discussed above.

The Factors Associated with Inventory Management on Building Construction Projects sites in the town was analyzed using relative importance index method as indicated above. The RII

ratings on the factor associated were also calculated based on a scale of 1-5 (from “strongly disagree” to “strongly agree”).

Table 4.4 Factors Associated With Inventory Management

S/NO_	Section IV: Factors Associated With Inventory Management On Building Construction Projects.		
	Problems	RII	Rank
1	Negligence	0.588	13
2	Insufficient storage space	0.659	4
3	Late delivery of ordered materials	0.698	1
4	Incompetent material suppliers are selected for the projects	0.635	8
5	Site access problem	0.588	13
6	Difficulty in managing materials among subcontractors due to the limited storage space on site	0.616	12
7	Damage to materials during transportation to the site	0.647	5
8	Lack of security personnel	0.624	11
9	Lack of Health and safety procedures implementation on site	0.667	3
10	Hindrance to work progress due to improper stocking of materials	0.639	7
11	Difficulty in coordinating sub-contractors materials on site	0.635	8
12	Rejection of materials due to non-compliance to the specification	0.694	2
13	Conflict among sub-contractors due to acute space available for material	0.643	6
14	Accidents/ injury occurred at site	0.631	10

Based on the response of the respondents, the top three factors associated with inventory management were identified. Accordingly, Late delivery of ordered materials (RII=0.698), Rejection of materials due to non-compliance to the specification (RII=0.694) and Health and safety procedures implementation on site (RII=0.667) were the top three factors affect inventory management practice.

While, the difficulty in managing material among subcontractors due to the limited storage space on site, negligence and site access problem is not causes much problem on inventory management practice.

As it has been observed on the site and based on the interview that the study find out financial factor, supplier, management, external factors, less manpower and lack of skilled labor one on

store, lack of awareness on higher persons to energy incorporation of parties participated integration, lack of information between parties, market availability, shortage of currency, negligence about the quality of purchased materials are the main obstacle in implementing inventory management practices on construction projects indeed There is a very high variability of inventory indices from site to site. Furthermore, similar sites might present different levels of inventory management for the same material. This indicates that a considerable portion of Late delivery of ordered materials, Rejection of materials due to non-compliance to the specification which will be the courses for cost variability, delays and other related problems can be avoided if the stakeholders collaborate. The study conducted by (Richard, 2020) also revealed that during inventory management, firms develop strong, mutually collaborative and long-lasting relationships with third parties notably key suppliers. This helps them to obtain vital resources in areas of expertise, financial assistance, and even exposure to new and innovative ways of successfully managing inventories.

Additionally, the result observed that Construction site face short of maneuver space and storage area. Hence Inventories will cost money most materials require proper storage and cover up again weather to avoid damages and deterioration on hiring storage space, equipment idling time, wastage, procuring process and delivery lead time and above all, the cost of the capital required in financing these stocks. Therefore, late delivery of ordered materials and Rejection of materials due to non-compliance to the specification, for use will maximize the holding stock and wastage. The process will gain economy in purchasing, minimizing storing capacity at site, increase wastage, and longer the procurement time. As we have seen the result show up there are problems which invite failure in managing site inventory that resulted in cost overrun, delays in project completion and reduce overall project performance. The study conducted by (Molla, 2016)also revealed that Project delay due to slow delivery materials, Material Shortage during construction, Lack of proper work planning and scheduling, inadequate supervision in usage of materials and Over-ordering of materials were the most identified problems which cause construction delays.

### 3.4. Strategies for Inventory Control on Construction Projects

This section presents data analysis and findings from the questionnaire survey. It begins with descriptive analysis of the general demographics variables of respondents. This is followed by analysis Strategies for Inventory Control on Construction Projects.

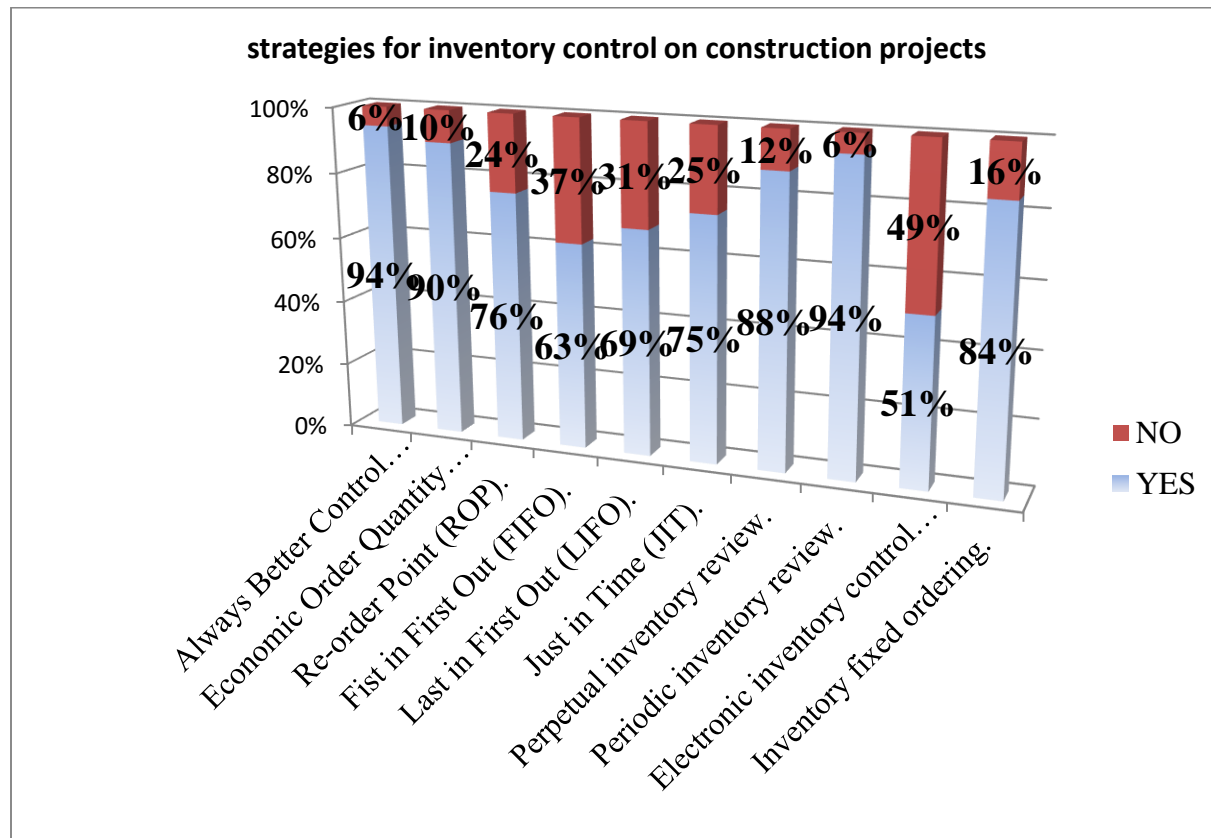


Figure 4.6 Strategies for Inventory Control on Construction Projects

In this section, 10 strategies for inventory control system on construction project sites were mentioned and our respondents were asked to choose the appropriate inventory control system for their organization. From those strategies our respondents preferred Always Better Control (ABC), Periodic inventory review, Economic Order Quantity (EOQ), perpetual inventory review, Inventory fixed ordering, Re-order Point (ROP), Just in Time (JIT), Last in First Out (LIFO), Fist in First Out (FIFO) and Electronic inventory control system respectively.

The study concludes that Always Better Control (ABC) and Periodic inventory review inventory control are the most used inventory control system in respondents' organization. The most common answer received is that the respondents company is currently applying manual



inventory control method. periodic review system involves determining the amount of an item in stock at a specified fixed time interval and placing an order for a quantity that when added to the quantity on hand will equal to Predetermined maximum law. The time period between rows of the quantity on hand is fixed.

From the interview result almost all construction projects use the traditional-manual inventory control method, which has several limitations. Which is; labor intensive, inaccurate and subjected to error prone which further leads to waste and surplus of materials, schedule delays, decrease in productivity, and the lack of up-to-date information regarding the status of materials. This manual process is labor intensive and data collected using this method is not reliable as they are dependent on workers' motivations and skills to track the materials and also the companies are not use any software /technology to alerts the user when inventory levels are below or above certain levels.

Inventory control strategies is indispensable function in construction company, well managed inventory improved site installation more smoothly and in turn gain better profitability. Ideally, right material should be supplied at right place, at the right time and of right quantity so as to have speedy installation and minimize the cost of craft labor time of the project it is mandatory to have well organized inventory control system. There is a very high variability of inventory control strategies from site to site on their inventory control system but all of them were arguing to achieve fundamental objective of a good inventory control system that is able to determine What to order, when to order and at what interval? What is the right price, how many (quantity) to order and How much (quantity) to carry in stock? The right time to purchases at right price and quantity of Materials, will get the best deal. because as we have seen in the above result not knowing these fundamental inventory control objectives are causing project delays and cost overrun.

From the time that we have in the study Inventory control is something that should be front-of-mind in building project. But in our situation Many Project Manager neglected the importance of Inventory control, which lead to lot of idle time in term of material, equipment, labor working hour wasted due to “stock out” or search for material, pay higher price to require immediate supply of specific material. Poor storage give rise to materials deteriorate, damage due to poor storage method, and lost. This construction projects use manual inventory management system

as current trained not only for the tracking of inventory but also to record as a whole and this involves paper-based techniques and is problematic with many human errors which have a negative impact on construction project progress.

And also the study conducted by (Molla, 2016) conclude that, it is plausible to conclude that more advanced and newer technologies are poorly utilized by contractors, consultants, clients/owners and other professionals in Jimma. The findings suggest that, while there is some level of awareness about these technologies, the motivation for usage is lacking due to both internal and external constraints.

The study also show that the construction companies are not using Inventory fixed ordering, Re-order Point (ROP), Just in Time (JIT), Last in First Out (LIFO), First in First Out (FIFO) and Electronic inventory control system respectively this inventory control strategies finds out the time to order when the stock level go down to a predetermined amount, this generalize a quantity of stock to cover for the lateness between order delivery or the time gap of delivery and this activity that can reduce the risk of running stock out when the quantity level low this is also save the time gap between time to order and delivery this will avoid the uncertainty for the project companies plus save construction wastage by preventing material deterioration and this will protect the company in order not to face obsolete inventory. But the construction companies are engaged in manual inventory record system there is no any software which will alert when the inventories are below or above level.

---

## CHAPTER 5

### CONCLUSION AND RECOMMENDATION

This research focused on assessment of inventory management practices on building construction project a case of Jimma Town. In this chapter the researcher gives conclusions and recommendations in line with the research questions and objectives.

#### 5.1. Conclusions

Based on the result the following conclusions are drawn.

- Almost all construction projects apply manual inventory management system as current trained not only for the tracking of inventory but also to record as a whole and this involves paper-based techniques and is problematic with many human errors which have a negative impact on construction project progress.
- The management and employees working on inventory management are facing lack of stakeholder's skills and many management deficiencies on inventory management practice like, old aged employees who are assigned in areas which require extra energy and efforts of the store, Staff training on inventory management control systems.
- The study also concludes 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 Material Handling Inventory management and Warehousing management 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.
- Late delivery of ordered materials, financial factor, supplier and management problems are the most significant factors in respondents' organization which affect the inventory management system.
- The most highly used inventory control strategies in the respondents' organizations is Always Better Control (ABC), Periodic inventory review, while Economic Order Quantity (EOQ), Perpetual inventory review, Inventory fixed ordering, were the next highly used inventory control systems.

- Finally, from this study concluded that almost all construction projects use the traditional-manual inventory control method, which has several limitations. This manual process is labor intensive and data collected using this method is not reliable as they are dependent on workers' motivations and skills to track the materials and also the companies are not use any software /technology to alerts the user when inventory levels are below or above certain levels.

## **5.2. Recommendation**

Based on the results of the study, the following recommendations are suggested for consideration:

- Contractors, consultants, client's representative working in the construction should use effective inventory management system to increase their profit and save their time to avoid cost variance by increasing commitment to conduct education and training programs for staff and managers on basic knowledge; and other relevant training areas so as to develop the necessary skills to update the current trained for the reduction of problems and the employees in the construction industry need to be trained continuously to develop their skill in the use of inventory management practice.
- The management of human resource particularly employment, assignment and motivation of employees working on inventory management and control functional areas needs appropriate attention of company's management.
- For effective inventory management it seems mandatory to the company to use modern technologies and computers that incorporate inventory management software to alert the user when inventory levels are below or above certain levels.
- The management of construction activities is gradually moving from the traditional paper based format to more digital processes. It is therefore recommended that, adequate inventory control strategies training and technical support for professionals in building construction firms should be vigorously promoted.

---

## REFERENCES

- Nanaware, . R. M. & Saharkar, . R. U., 2017. Inventory management technique in construction. International journal of engineering sciences & research technology, 6(9).
- Abas, M. et al., 2016. Identification of factor affecting cost performance of construction projects.. Technical Journal, 1(21), pp. 104-109.
- Ajay, S. & Miccah B, M., 2014. Sampling Technique and Determination of sample size in applied statistica research. International journals of econamics,commerce and management , 2(11).
- Aravinth, K. G. & Indhu, . B., 2016. Case Study on Inventory Management System Followed by Major Builders in Chennai Region and Proposing Recommendations to Improve the System. International Journal of Innovative Research in Science,Engineering and Technology, 5(4).
- Arijeloye, B. . T. & Akinradewo, F. O., 2016. Assessment of materials management on building projects in Ondo State, Nigeria. world scientific news.
- Atnafu, D. & Balda, A., 2018. The impact of inventory management practice on firms' competitiveness and organizational performance: Empirical evidence from micro and small enterprises in Ethiopia. Cogent Business & Management, 5(1).
- Bamidele, A. T. & Akinradewo, F. O., 2016. Assessment of materials management on building projects in Ondo State, Nigeria. worldscient i fic new, pp. 168-185.
- Baye, D., 2017. Effect of inventory management practice on organization operational performance; the case of Ethiopian airlines., Addis Ababa: s.n.
- Chan, S. W. et al., 2017. Factors Influencing the Effectiveness of Inventory Management in Manufacturing SMEs. s.l., IOP Publishing.
- Chua, B., 2019. The impact of inventory control on construction industry, malasiya: s.n.
- Deepak, D. & Kumar , M. S., 2016. Inventory management and cost analysis. International journal of scientific & engineering research, april, 7(4), pp. 2229-5518.
- Endale, W., 2016. Construction Materials Waste and Its Management Practices:A Case Study on Housing Construction Projects in Addis Ababa, Jimma: jimmaa university.
- Girma, L., 2016. Assessment on inventory management and stock control practices:, Addis Ababa: s.n.

---

Girma, L., 2016. Assessment on inventory management and stock control practices: the case of ethiopian electric utility, addis ababa regions, addis ababa: s.n.

Juneja, P., 2015. Certified Education Provider. [Online].

Kasim, H., Zubieru, M. & Antwi, . K. S., 2015. An assessment of the Inventory Management Practices of Small and Medium Enterprises (SMEs) in the Northern Region of Ghana. *European Journal of Business and Management*, 7(20).

Kasim, N., Liwan, R. S., Shamsuddin, A. & Kamaruddin, C. N., 2012. Improving on-site materials tracking for inventory management in construction projects. s.l., s.n.

Kaudunde, M., 2013. An assessment of effectiveness of inventory control system in the public sector in Tanzania a case of Kilwa district council. s.l.:s.n.

Kinfe, B., 2019. Improvement of Demand Forecasting in Inventory: The Case of Ethiopian Agricultural Business Corporation, Addis Ababa: s.n.

Koumanakos, D., 2008. The effect of inventory management on firm performance .. *International Journal of productivity and performance management.*, pp. 355-369.

Lemma, S., 2017. An assessment of inventory management system:the case of ethiopian electric utility, Addis Ababa: s.n.

Manguday, F., 2018. Assessment of inventory management practices of Habesha Steel Mills PLC, Addis Abeba: s.n.

Mohamed, J., Suraidi, N. N., Abdurahman, N. A. & Suhaimi, D. S., 2016. A study on Relationship Between Inventory Management and Company Performance: a Case Study of Textile Chain Store,. *Journal of Advanced Management Science*, January. Volume 4,.

Molla, A., 2016. Assessment of Construction Materials Management practice on Building Construction Project sites in Jimma town, jimma: s.n.

Narayanapillaai, R., 2014. factors discriminating inventory management performance:an exploratory study of indian machine tool SMEs. *journal of industrial engineering and management*, 7(3), pp. 605-621.

Opoku, R. et al., 2020. Inventory Management Practice and operational performance of manufacturing firms in ghana. *advance in research*, 21(10), pp. 1-18.

Patel, H., Pitroda, . J. & Bhavsar, J. J., 2015. Analysis of factor affecting material management and inventory management: survey of construction firms in gujarat region of india. *International journals of advanced research in engineering, science and management*.

Pushpakumara, W., 2018. Factors that affect to effective inventory management system in government sector or Dambulla secretary division. *International Journal of Scientific Research and Innovative Technology*, 5(9).

Sardroud, J., Lirnbachiya, M. C. & Sarami, A. A., 2010. Ubiquitous Tracking and Location of construction resource using GIS AND RFID. 6th Gis confrence and exhibition.

Semahegn, A., 2017. Assessment on Health Inventory Management Practices and challenges: The Case of Zewditu, Addis Ababa: s.n.

Subramani, T. et al., 2017. A Study Of Inventory Management System In Construction Industry. *International Journal of Application or Innovation in Engineering & Management (IJAIEM)*, 6(5).

Zou, A. J., 2012. Optimization Research of Construction Inventory Management on Site Based on Inventory Theory. *Applied Mechanics and Materials*,. Trans Tech Publ. .



Questions related with inventory management Practice on building construction projects										
stakeholders skills on inventory management practice										
	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15
R1	4	4	5	4	4	5	4	3	3	4
R2	5	5	4	4	4	5	4	3	3	4
R3	4	4	1	5	3	5	5	5	5	5
R4	4	4	3	4	4	5	5	5	4	4
R5	4	1	3	4	4	4	4	3	3	4
R6	4	5	4	4	5	5	2	3	3	3
R7	4	5	4	4	5	5	2	3	3	3
R8	2	1	2	1	2	3	2	3	3	2
R9	4	4	4	5	3	5	5	4	4	4
R10	4	4	4	5	3	5	5	4	4	4
R11	4	4	4	5	3	5	5	4	4	4
R12	3	3	1	3	1	5	3	3	5	5
R13	1	2	2	3	1	4	3	3	3	3
R14	4	3	4	4	3	3	3	3	3	4
R15	5	5	1	3	4	4	3	3	3	5
R16	5	4	3	4	4	3	3	3	4	4
R17	4	4	4	4	5	4	4	4	4	4
R18	4	4	4	4	4	3	3	3	4	4
R19	4	4	3	4	4	4	4	4	4	4
R20	4	4	4	4	3	4	4	3	4	4
R21	4	3	4	3	4	4	4	3	3	4
R22	4	3	2	3	3	4	4	2	3	3
R23	4	3	4	4	3	4	3	4	4	4
R24	3	4	2	3	2	4	4	3	4	3
R25	4	4	3	4	5	4	4	5	4	5
R26	3	3	3	4	3	3	4	3	4	3
R27	4	2	2	4	1	2	3	3	4	5
R28	4	4	2	4	3	4	4	4	3	4
R29	3	3	4	4	3	4	4	3	3	4
R30	3	3	4	4	3	4	4	3	3	4
R31	4	4	4	4	3	4	3	3	3	3
R32	4	4	4	4	3	3	3	3	4	3
R33	4	4	3	3	3	4	3	4	4	4
R34	4	4	2	4	3	4	2	3	4	4

R35	5	4	4	5	4	5	4	4	4	4
R36	4	3	3	4	3	4	4	4	4	4
R37	5	5	2	4	5	5	4	5	4	4
R38	3	3	2	3	2	2	2	2	3	3
R39	5	5	3	4	5	5	5	4	4	4
R40	5	5	3	4	5	5	5	5	4	5
R41	4	4	4	2	2	2	4	5	5	4
R42	5	5	4	5	5	4	5	3	3	5
R43	4	4	5	5	5	4	5	3	3	5
R44	5	5	1	4	3	4	4	4	4	4
R45	4	4	5	4	4	4	5	5	5	5
R46	5	4	3	4	3	4	4	5	5	5
R47	4	3	2	3	4	3	3	3	4	3
R48	5	5	2	5	4	5	4	5	4	4
R49	4	4	3	4	5	5	5	5	4	5
R50	4	4	3	5	4	5	5	4	4	4
R51	5	5	5	3	2	2	5	4	5	4

Section III: Awareness of Materials Management practices										
	Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25
R1	4	4	5	4	4	4	5	5	4	4
R2	4	5	5	5	5	4	4	5	5	4
R3	5	5	5	5	5	5	4	5	4	5
R4	5	4	5	5	4	4	5	4	4	5
R5	4	4	3	2	2	3	3	3	2	4
R6	5	4	5	5	4	4	5	5	4	4
R7	5	4	5	5	4	4	5	5	4	4
R8	4	3	4	2	2	1	3	4	4	1
R9	4	4	4	5	4	4	2	4	2	4
R10	4	4	4	5	4	4	2	4	2	4
R11	4	4	4	5	4	4	2	4	2	4
R12	5	5	5	5	3	3	5	3	5	4
R13	2	2	2	1	2	2	2	2	2	3
R14	4	4	5	4	3	3	4	3	4	4
R15	5	4	5	4	4	4	5	5	5	4
R16	4	4	4	4	4	3	3	4	4	4
R17	4	4	5	4	4	4	4	5	4	4

R18	4	4	4	5	4	4	5	4	4	4
R19	4	4	5	4	5	5	4	4	4	4
R20	4	4	4	5	4	4	4	5	4	4
R21	4	4	3	4	4	3	4	4	4	3
R22	4	4	3	4	4	2	3	3	3	2
R23	4	4	3	4	4	4	3	4	4	3
R24	3	4	4	4	3	3	2	2	4	4
R25	4	3	3	3	4	3	4	4	4	4
R26	3	4	3	3	3	3	3	3	3	4
R27	5	5	4	4	5	5	4	5	4	5
R28	3	3	4	4	4	4	3	4	4	4
R29	4	4	3	4	3	4	3	3	4	3
R30	4	4	3	4	3	4	3	3	4	3
R31	4	4	3	4	3	4	3	4	3	4
R32	4	4	3	4	3	4	4	4	3	3
R33	4	4	4	3	4	4	3	4	4	3
R34	4	5	4	5	5	4	5	5	5	4
R35	4	5	4	4	4	4	4	5	5	5
R36	4	3	4	4	4	4	5	4	4	3
R37	5	5	5	5	5	4	4	4	4	4
R38	3	3	3	3	4	3	3	3	4	4
R39	4	4	4	4	4	4	4	4	4	4
R40	5	5	5	5	5	5	5	4	4	4
R41	5	4	5	2	2	2	3	4	4	2
R42	5	5	4	5	5	5	4	4	5	5
R43	5	4	4	4	4	5	5	4	4	5
R44	4	4	4	4	4	4	5	4	5	4
R45	5	4	5	5	4	4	5	4	4	4
R46	5	3	4	4	4	5	5	5	4	4
R47	3	3	3	4	4	4	4	4	5	5
R48	5	4	5	5	5	4	4	5	4	4
R49	4	5	5	4	5	5	5	4	4	4
R50	5	4	5	5	4	4	4	4	4	4
R51	4	5	5	2	3	2	3	4	5	2

Section IV: Factors Associated With Inventory Management On Building Construction Projects.														
	Q26	Q27	Q28	Q29	Q30	Q31	Q32	Q33	Q34	Q35	Q36	Q37	Q38	Q39
R1	1	1	2	1	1	1	2	1	1	1	2	1	1	2
R2	1	1	2	1	2	1	1	1	3	1	1	2	1	2
R3	1	1	1	1	1	1	1	1	1	1	1	1	1	1
R4	3	5	4	4	4	4	4	4	4	4	5	4	4	4
R5	2	2	2	2	3	3	4	3	3	4	3	2	2	2
R6	1	3	3	3	4	4	5	4	4	4	3	2	1	2
R7	1	2	4	4	4	3	1	3	3	4	4	4	1	2
R8	5	3	3	2	1	3	3	4	4	3	4	2	3	3
R9	3	4	4	5	2	4	3	1	2	3	2	5	5	2
R10	3	4	4	5	2	4	3	1	2	3	2	5	5	2
R11	3	4	4	5	2	4	3	1	2	3	2	5	5	2
R12	5	5	3	1	1	3	1	1	3	1	1	1	3	1
R13	4	4	4	4	5	4	4	4	4	3	4	4	4	3
R14	3	4	3	2	3	2	5	5	5	5	5	3	3	5
R15	5	5	5	4	4	3	4	3	4	4	5	3	5	5
R16	4	2	2	2	2	2	2	3	3	3	4	4	5	5
R17	3	4	4	3	4	3	4	4	4	4	4	4	4	4
R18	3	4	4	4	3	4	4	4	4	4	3	3	4	4
R19	3	4	4	4	4	3	4	4	4	3	4	4	4	4
R20	3	4	4	4	3	4	4	5	4	4	5	4	4	5
R21	4	3	4	4	3	3	3	4	4	4	4	4	4	4
R22	2	2	3	3	2	2	3	3	4	3	2	3	4	3
R23	3	3	4	4	3	3	4	4	4	4	4	4	4	4
R24	2	3	3	3	3	4	4	4	4	4	1	2	2	2
R25	4	4	3	3	3	4	4	3	4	3	4	4	4	4
R26	3	4	3	3	4	3	3	3	3	3	3	4	4	4
R27	3	2	4	4	4	2	2	3	3	3	2	3	4	3
R28	3	2	3	3	3	4	4	3	4	4	4	4	4	4
R29	4	4	4	3	3	3	3	4	4	3	3	3	3	3
R30	4	4	4	3	3	3	3	4	4	3	3	3	3	3
R31	3	4	4	3	4	4	3	3	3	3	4	3	4	3
R32	3	4	4	3	3	4	3	4	4	3	4	4	3	3
R33	3	4	4	3	3	3	4	4	4	4	4	4	4	4
R34	1	2	2	3	3	3	4	4	3	4	4	3	3	3
R35	4	5	4	4	5	4	4	4	5	5	4	4	5	4
R36	3	2	4	4	3	3	4	5	3	3	2	4	2	3

R37	5	5	5	5	5	5	5	5	5	5	5	5	5	5
R38	4	4	4	4	3	3	3	3	4	4	3	2	3	3
R39	1	3	3	2	3	3	3	3	2	2	5	5	2	3
R40	1	3	3	2	2	2	2	1	3	2	2	5	2	3
R41	4	4	4	4	2	3	3	2	2	4	2	4	3	2
R42	1	1	2	1	1	1	2	1	1	1	2	1	1	2
R43	1	1	2	1	2	1	1	1	3	1	1	2	1	2
R44	2	2	2	2	2	3	3	2	3	2	2	2	2	3
R45	5	4	5	4	4	4	4	5	5	4	4	5	5	5
R46	3	2	4	4	2	2	4	5	3	3	2	4	2	3
R47	4	5	4	5	4	4	3	3	3	3	4	4	3	3
R48	4	5	5	4	5	5	5	5	4	5	5	5	5	4
R49	2	3	4	3	2	3	2	2	3	2	2	5	3	4
R50	2	4	3	3	3	3	4	3	2	3	5	5	2	3
R51	5	4	5	4	3	3	4	2	3	4	2	4	3	2

Section V: Strategies for Inventory Control on Construction Projects											
	Q40	Q41	Q42	Q43	Q44	Q45	Q46	Q47	Q48	Q49	
R1	1	1	1	2	1	1	1	1	1	2	
R2	1	1	1	2	1	1	1	1	1	1	
R3	1	1	1	2	1	1	1	1	1	1	
R4	1	1	1	2	1	2	1	1	1	1	
R5	1	1	2	1	1	1	1	1	2	1	
R6	1	1	1	1	2	1	1	1	1	1	
R7	1	1	1	1	1	1	1	1	1	1	
R8	1	1	2	1	2	1	1	2	2	1	
R9	1	2	1	2	1	1	1	1	2	2	
R10	1	2	1	2	1	1	1	1	2	2	
R11	1	2	1	2	1	1	1	1	2	2	
R12	2	1	2	1	2	2	2	2	2	1	
R13	1	1	1	1	2	1	1	1	1	1	
R14	1	1	1	2	1	1	1	1	2	1	
R15	1	1	1	2	1	1	1	1	2	1	
R16	1	1	1	2	1	1	1	1	2	1	
R17	1	1	1	1	1	2	1	1	2	1	
R18	1	1	1	1	1	2	1	1	2	1	
R19	1	1	1	1	1	2	1	1	2	1	

R20	1	1	1	2	1	2	1	1	2	1
R21	1	1	2	1	1	1	1	1	1	1
R22	1	1	1	2	1	1	2	1	1	2
R23	1	1	2	1	1	1	1	1	1	1
R24	1	1	2	1	2	1	1	1	1	1
R25	1	1	2	1	1	1	1	1	1	1
R26	1	1	1	1	1	1	1	1	1	1
R27	1	1	1	1	2	1	1	1	1	1
R28	1	1	2	1	2	1	1	1	1	1
R29	1	1	1	1	1	2	1	1	2	1
R30	1	1	1	1	1	2	1	1	1	1
R31	1	1	1	1	1	2	1	1	2	1
R32	1	1	1	1	1	2	1	1	2	1
R33	1	1	1	1	1	2	1	1	2	1
R34	1	1	2	1	1	1	1	2	1	1
R35	1	1	1	1	2	1	1	1	1	1
R36	1	1	1	1	2	1	2	1	1	2
R37	1	1	1	1	2	1	1	1	2	1
R38	1	1	2	1	2	1	1	1	1	2
R39	1	1	1	1	1	1	1	1	2	1
R40	1	1	2	1	2	1	2	1	2	1
R41	1	2	1	2	1	1	1	1	1	1
R42	1	1	1	2	1	1	1	1	2	2
R43	1	1	1	2	1	1	1	1	1	1
R44	1	1	1	2	1	1	1	1	1	1
R45	1	1	1	2	2	1	1	1	2	1
R46	1	1	1	1	1	2	1	1	2	1
R47	2	1	1	2	2	2	1	1	1	1
R48	2	1	1	1	2	1	2	1	2	1
R49	1	1	2	1	2	1	2	1	1	1
R50	1	1	1	1	1	1	1	1	2	1
R51	1	2	1	2	1	1	1	1	1	1

S/N O_	Questions related with inventory management Practice on building construction projects	str on gly dis agr ee	dis agr ee	ne utr al	agr ee	stron gly agr ee	$\Sigma W$	N	H*N	RII	ran k
	stakeholders skills on inventory management practice	1	2	3	4	5					
Q6	There are skilled and competent man powers in the construction projects store that use inventory Management tools properly.	1	1	6	31	12	205	51	255	0.80	2
Q7	The numbers of staff involved in your construction project stock control activities are adequate	2	2	11	25	11	194	51	255	0.76	6
Q8	There are old aged employees who are assigned in areas which require extra energy and efforts of the store	4	11	13	19	4	161	51	255	0.63	10
Q9	In your project site store, qualification is a prerequisite and matched with job requirements	1	1	10	30	9	198	51	255	0.78	4
Q10	Your Building Construction Project Staffs Are Continuously Trained On Inventory Management Control Systems.	3	5	19	14	10	176	51	255	0.69	9
Q11	Adequate supervision	0	4	7	23	17	206	51	255	0.81	1
Q12	Clearly marking damaged and obsolete Inventory	0	5	12	21	13	195	51	255	0.76	5
Q13	The counting of the items and access to the tags for custody of the particular items	0	2	25	14	10	185	51	255	0.73	8
Q14	Prompt adjustment of records for inventory discrepancies after approval by a responsible official	0	0	18	27	6	192	51	255	0.75	7
Q15	The signing and dating of inventory count sheets by the person supervising the count	0	1	10	29	11	203	51	255	0.80	3

S/NO_	Section III: Level of Awareness of Materials Management practices	strongly disagree	disagree	neutral	agree	strongly agree	$\Sigma W$	N	H*N	RII	rank
	Practices	1	2	3	4	5					
Q16	Purchasing of materials	0	1	5	29	16	213	51	255	0.84	1
Q17	Material planning methods	0	1	7	32	11	206	51	255	0.81	4
Q18	Transportation of materials	0	1	12	19	19	209	51	255	0.82	2
Q19	Material handling	1	4	4	24	18	207	51	255	0.81	3
Q20	Inventory management	0	4	9	28	10	197	51	255	0.77	7
Q21	Warehousing management	1	4	9	29	8	192	51	255	0.75	10
Q22	Material waste control	0	5	14	17	15	195	51	255	0.76	8
Q23	Economic order quantity	0	2	8	28	13	205	51	255	0.8	5
Q24	Just in time method	0	5	4	33	9	199	51	255	0.78	6
Q25	Recovering and recycling of Materials	1	3	8	32	7	194	51	255	0.76	9

S/NO_	Section IV: Factors Associated With Inventory Management On Building Construction Projects.	strongly disagree	disagree	Neutral	agree	strongly agree	$\Sigma W$	N	H* N	R II	rank
	Problems	1	2	3	4	5					
Q26	Negligence	10	6	18	11	6	150	51	255	0.59	13
Q27	Insufficient storage space	5	10	8	21	7	168	51	255	0.66	4
Q28	Late delivery of ordered materials	1	8	12	25	5	178	51	255	0.77	11



Q29	Incompetent material suppliers are selected for the projects	6	7	15	18	5	162	5	1	255	0.64	8
Q30	Site access problem	5	12	19	11	4	150	5	1	255	0.59	3
Q31	Difficulty in managing materials among subcontractors due to the limited storage space on site	5	6	22	16	2	157	5	1	255	0.62	2
Q32	Damage to materials during transportation to the site	5	6	16	20	4	165	5	1	255	0.65	5
Q33	Lack of security personnel	10	4	14	16	7	159	5	1	255	0.62	1
Q34	Health and safety procedures implementation on site	3	6	17	21	4	170	5	1	255	0.67	3
Q35	Hindrance to work progress due to improper stocking of materials	6	4	19	18	4	163	5	1	255	0.64	7
Q36	Difficulty in coordinating sub-contractors materials on site	5	14	7	17	8	162	5	1	255	0.64	8
Q37	Rejection of materials due to non compliance to the specification	4	8	9	20	10	177	5	1	255	0.69	2
Q38	Conflict among sub-contractors due to acute space available for material	7	8	12	15	9	164	5	1	255	0.64	6
Q39	Accidents/ injury occurred at site	2	13	17	13	6	161	5	1	255	0.63	1

---

JIMMA UNIVERSITY  
JIMMA INSTITUTE OF TECHNOLOGY  
SCHOOL OF GRADUATE STUDIES  
FACULTY OF CIVIL AND ENVIRONMENTAL ENGINEERING  
CONSTRUCTION ENGINEERING AND MANAGEMENT CHAIR

**Questionnaires Survey**

Date: \_\_\_\_\_

Subject:- Request to respond to a questionnaire for MSc thesis work

Dear Respondant,

Thank you for agreeing to participate in this research study. My name is **Fatuma Umer**. I am MSc candidate at Jimma University, Jimma Institute of Technology, Faculty of Civil & Environmental Engineering. For the fulfillment of my MSc degree in Construction Engineering, I am working a research on the topic of **Assessment Of Inventory Management Practice On Building Construction Projects: A Case Of Jimma Town**.

The objective of this survey is to collect information on appropriate to assess the inventory management practices building construction projects in Jimma, Ethiopia. Your feedback is needed to help better understanding of inventory management practice On Building Construction Projects: A Case Of Jimma Town.

Your Participation in this research survey is completely voluntary and there are no direct benefits for your participation, but I appreciate your time and effort. The survey includes three open-ended questions which are intended not to take more than 15 minutes of your time. Questions can be skipped, and you can stop at any point. There are no foreseeable risks to your participation. To protect your confidentiality, no names or company affiliation will be collected.

If you have any questions regarding the questionnaire you can contact **Fatuma Umer** at Engfatima06@gmail.com;( +251925037760) or Alemu Mosisa (Assistant Professor) at alemu.mosisa@ju.edu.et.

### Section I: Respondent Information

**Instruction: Give your response by writing your Personal and organizational profile.**

Your firm's Role (owner, consultant, contractor, academia, supplier)	
Your Job Title/Position :( site/office engineer, project manager, supervisor, other...)	
Your education level (Diploma, Degree, Master's Degree, Doctorate's Degree.)	
Area of experience (educational, design, Construction, management, procurement)	
Years of experience:	

### Section II - Questionnaires about inventory management practice

Instruction: Rate the subsequent inventory management practices on your project and kindly specify the level of your agreement with the statement below once as per the scales provided.

Level of Agreement				
Strongly Disagree	Disagree	Undecided (Neutral)	Agree	Strongly Agree
1	2	3	4	5

**Instruction: Give your response by ticking ( ✓ □ ) once besides each choice.**

In table below stakeholder skills on inventory management practice are listed. According to your experience, to what extent do you agree with the following statements? Please indicate your level of agreement throughout the questionnaire by ticking (✓) in appropriate box.

<b>Questions related with inventory management Practice on building construction projects</b>					
I. stakeholders skills on inventory management practice	Level of Agreement				
	1	2	3	4	5
1. There are skilled and competent man powers in the construction projects store that use inventory management tools properly.					
2. The numbers of staff involved in construction project stock control activities are adequate.					
3. There are old aged employees who are assigned in areas which require extra energy and efforts in the store.					
4. Qualification is a prerequisite and matched with job requirements.					
5. Staffs are trained on inventory management control systems.					
6. There is adequate supervision					
7. There is clear marking of damaged and obsolete Inventory.					
8. There is counting of the items and access to the tags for custody of the particular items.					
9. There is prompt adjustment of records for inventory discrepancies after approval by a responsible official.					
10. There is signing and dating of inventory count sheets by the person supervising the count.					
<b>If you have any other stakeholder skill statements please specify. . .</b>	Please tick (√) on the box				
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>

---

### Section III: Awareness of material management practices

In the table below different types of material management practices are listed. Is there awareness about them in the construction projects? Please indicate your response by ticking (√) in the box.

**Strongly disagree = 1, disagree =2, neutral =3, agree =4 and strongly agree = 5**

Practices	Level of Agreement				
	1	2	3	4	5
There is awareness about purchasing of materials					
There is awareness about material planning methods					
There is awareness about transportation of materials					
There is awareness about material handling					
There is awareness about inventory management					
There is awareness about warehousing management					
There is awareness about material waste control					
There is awareness about economic order quantity					
There is awareness about just in time method					
There is awareness about recovering and recycling of materials					

**Section IV: Factors associated with inventory management on building construction projects.**

In the table below there are common identified factors that affect inventory management practice in building construction projects. Based on your experience, please specify your level of agreement on the factors by ticking (√) on the box.

**Strongly disagree = 1, disagree =2, neutral =3, agree =4 and strongly agree = 5**

Problems	Level of agreement				
	1	2	3	4	5
Negligence					
Insufficient storage space					
Late delivery of ordered materials					
Incompetent material suppliers are selected for the projects					
Site access problem					
Difficulty in managing materials among subcontractors due to the limited storage space on site					
Damage to materials during transportation to the site					
Lack of security personnel					
Lack of Health and safety procedures implementation on site					
Hindrance to work progress due to improper stocking of materials					
Difficulty in coordinating sub-contractors materials on site					
Rejection of materials due to non-compliance to the specification					
Conflict among sub-contractors due to acute space available for material					
Accidents/ injury occurred at site					

**Section V: Strategies for Inventory Control on Construction Projects**

In the table below strategies for inventory control are listed. Please choose YES/NO in the strategies that is best for construction projects.

<b>STATEMENTS</b>	<b>YES 1</b>	<b>NO 2</b>
Always Better Control (ABC).		
Economic Order Quantity (EOQ).		
Re-order Point (ROP).		
Fist in First Out (FIFO).		
Last in First Out (LIFO).		
Just in Time (JIT).		
Perpetual inventory review.		
Periodic inventory review.		
Electronic inventory control system.		
Inventory fixed ordering.		
<b>If you have any other strategies, please specify. . .</b>		

---

## Section VI Interview Questions

**Project Name:** \_\_\_\_\_

**Name of the organization:** \_\_\_\_\_

**Respondent's Name (optional):** \_\_\_\_\_

**Position/role:** \_\_\_\_\_

**Date and time:** \_\_\_\_\_

The interviewee is a member of the organizations and previously involved or still involved in the project.

### Introduction

Good morning/Good afternoon Mr./Ms. (Name of respondent) my name is **Fatuma Umer**. Before starting my question, I would like to thank you for your voluntary participation in this research. The interview will divided into two sections and will last approximately 30 to 40 minutes. This semi-closed interview, which is forwarded to the stakeholders who are involved in the building construction project, is part of this academic research that aims **to assess inventory management practice on building construction projects: a case of jimma town**.

In the long term, this research help to better understanding of inventory management practice which helps the stakeholders to reduce project downtime, to reduce project cost variance, to reduce all wastes of construction projects and maximize the value of projects.

All information you provide will be kept in strict confidentiality and only used for academic research. Please feel free to answer the questions with what you know and what you think in your mind. I value your participation and thank you for the commitment of time, energy, and effort. The content of this interview is confidential. It will not be disclosed to anyone without your permission. After the research, everything (recordings, notes, etc.) will be discarded.

Additionally, my supervisor will be the only access to the analyzed information.

The following questions are about inventory management practice on building construction projects that are adopted from various kind of literature.



---

1. What inventory management practices effectively implemented on your project?

---

---

---

2. Does the organization understand the benefits of implementing inventory management system?

---

---

3. Does your organization properly prepare policies and procedures in writing, and recording materials to be correctly understood by concerned bodies?

---

---

4. What kind of method (system) that your company used to alerts the user when inventory levels are below or above certain levels? Is there any software /technology /?

---

---

5. Do you believe that the management and board of management aware of the current material shortage? If so, why remedial action was not taken for a long period of time?

---

---

---

6. Does the current inventory management and control practice of the company enables to maintain the required inventory sufficiently?

---

---

7. What are the major factors that affect the company's inventory management practice in your organization?

i. \_\_\_\_\_

ii. \_\_\_\_\_

iii. \_\_\_\_\_

iv. \_\_\_\_\_

Sample for reliability test

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	
R1	4	4	5	4	4	5	4	3	3	4	40
R2	5	5	4	4	4	5	4	3	3	4	41
R3	4	4	1	5	3	5	5	5	5	5	42
R4	4	4	3	4	4	5	5	5	4	4	42
R5	4	1	3	4	4	4	4	3	3	4	34
R6	4	5	4	4	5	5	2	3	3	3	38
R7	4	5	4	4	5	5	2	3	3	3	38
R8	2	1	2	1	2	3	2	3	3	2	21
R9	4	4	4	5	3	5	5	4	4	4	42
R10	4	4	4	5	3	5	5	4	4	4	42
R11	4	4	4	5	3	5	5	4	4	4	42
R12	3	3	1	3	1	5	3	3	5	5	32
R13	1	2	2	3	1	4	3	3	3	3	25
R14	4	3	4	4	3	3	3	3	3	4	34
R15	5	5	1	3	4	4	3	3	3	5	36
R16	5	4	3	4	4	3	3	3	4	4	37
R17	4	4	4	4	5	4	4	4	4	4	41
R18	4	4	4	4	4	3	3	3	4	4	37
R19	4	4	3	4	4	4	4	4	4	4	39
R20	4	4	4	4	3	4	4	3	4	4	38
R21	4	3	4	3	4	4	4	3	3	4	36
R22	4	3	2	3	3	4	4	2	3	3	31
R23	4	3	4	4	3	4	3	4	4	4	37
R24	3	4	2	3	2	4	4	3	4	3	32
R25	4	4	3	4	5	4	4	5	4	5	42
R26	3	3	3	4	3	3	4	3	4	3	33
R27	4	2	2	4	1	2	3	3	4	5	30
R28	4	4	2	4	3	4	4	4	3	4	36
R29	3	3	4	4	3	4	4	3	3	4	35
R30	3	3	4	4	3	4	4	3	3	4	35
R31	4	4	4	4	3	4	3	3	3	3	35
R32	4	4	4	4	3	3	3	3	4	3	35
R33	4	4	3	3	3	4	3	4	4	4	36
R34	4	4	2	4	3	4	2	3	4	4	34

R35	5	4	4	5	4	5	4	4	4	4	43
R36	4	3	3	4	3	4	4	4	4	4	37
R37	5	5	2	4	5	5	4	5	4	4	43
R38	3	3	2	3	2	2	2	2	3	3	25
R39	5	5	3	4	5	5	5	4	4	4	44
R40	5	5	3	4	5	5	5	5	4	5	46
R41	4	4	4	2	2	2	4	5	5	4	36
R42	5	5	4	5	5	4	5	3	3	5	44
R43	4	4	5	5	5	4	5	3	3	5	43
R44	5	5	1	4	3	4	4	4	4	4	38
R45	4	4	5	4	4	4	5	5	5	5	45
R46	5	4	3	4	3	4	4	5	5	5	42
R47	4	3	2	3	4	3	3	3	4	3	32
R48	5	5	2	5	4	5	4	5	4	4	43
R49	4	4	3	4	5	5	5	5	4	5	44
R50	4	4	3	5	4	5	5	4	4	4	42
R51	5	5	5	3	2	2	5	4	5	4	40
	<b>0.6</b>	<b>0.9</b>	<b>1.2</b>	<b>0.6</b>	<b>1.2</b>	<b>0.8</b>	<b>0.9</b>	<b>0.7</b>	<b>0.4</b>	<b>0.49</b>	<b>28.4</b>