

A Study Of Inventory Management System In Construction Industry

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ABSTRACT

Inventory management system involves procurement, storage, identification, retrieval, transport and construction methods. Each is indelibly linked to safety, productivity and schedule performance. The main objective of Our study is to analyze the inventory management control adopted and the effective utilization of inventory at the construction site. ABC analysis is one of the conventionally used approaches to classify the inventories and the case study of a company is collected. The tracking and locating of materials in construction jobsites has increase a great concern among construction entities. The improper handling and storage of materials in construction site has made it difficult to track and locate materials when the time they are needed. These findings may reflect the main factors that will affect the inventory management system which able to achieve the improved efficiency of project management and to reduce the waste of materials in the respective region of construction industries.

Keywords: Study, Inventory, Management System, Construction, Industry.

1. INTRODUCTION

The term inventory refers to the goods or materials used by a firm for the purpose of production and sale. It also includes the items, which are used as supportive materials to facilitate production. Nearly 60% of money is allotted for the inventory in a project. Inventory constitutes one of the important items of current assets, which permits smooth operation of production and sale process of a firm. Inventory management is that aspect of current assets management, which is concerned with maintaining optimum investment in inventory and applying effective control system so as to minimize the total inventory cost. Materials Management is related to planning, procuring, storing and providing the appropriate material of right quality, right quantity at right place in right time so as to co-ordinate and schedule the production activity in an integrative way for an industrial undertaking. Inventory Management is simply the process by which an organization is supplied with the goods and services that it needs to achieve its objectives of buying, storage and movement of materials. Inventory is seen as incurring costs, or waste, instead of adding and storing value, contrary to traditional accounting. Inventory management is the supervision of non-capitalized assets (inventory) and stock items. A component of supply chain management, inventory management supervises the flow of goods from manufacturers to warehouses and from these facilities to point of sale. A key function of inventory management is to keep a detailed record of each new or returned product as it enters or leaves a warehouse or point of sale.

1.1material Management

Construction material constitutes a major cost component in any construction project. The total cost of installed material may be 50% or more of the total cost. The goal of material management is to ensure that the materials are available at their point of use when needed hence, efficient procurement of material represents a key role in the successful completion of the work. Materials management is a critical component of the construction industry. As such, organizations need to understand the effects of proper materials management techniques on the effectiveness of project execution. Extensive literature and reports deplore the lack of efficiency and productivity in the construction industry. Too often, construction projects suffer from delays, budget overruns, and claims. A properly implemented materials management program can achieve the timely flow of materials and equipment to the jobsite, and thus facilitate improved work face planning, increased labor productivity, better schedules, and lower project costs.

1.2 Concept Of Just In Time

Just in Time (JIT) production is a manufacturing philosophy which increases speed of production. JIT Concept is, —Company produces only what is needed, when it is needed and in the quantity that is needed|. The company

produces only what the customer requests, to actual orders, not to forecast. JIT can also be defined as producing the necessary units, with the required quality, in the necessary quantities, at the last safe moment. It means that company can manage with their own resources and allocate them very easily.

2.METHODOLOGY

Figure.1 shows Methodology adopted in this study.

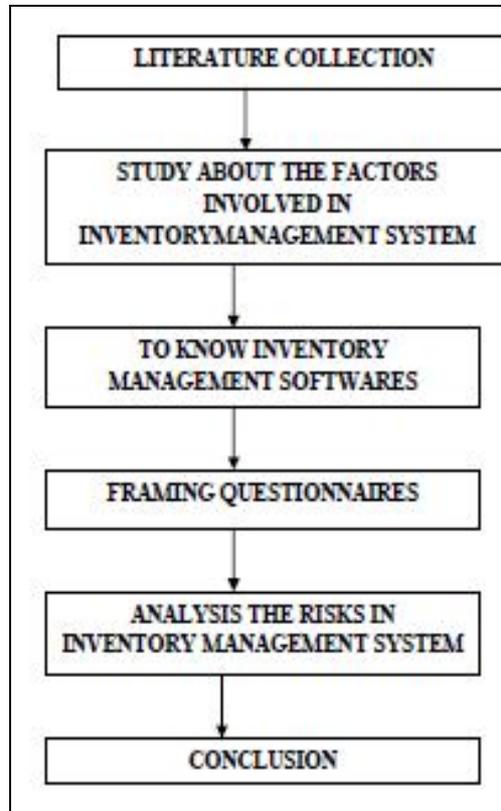


Figure. 1 Methodology Chart

Methodology can be defined as systematic and purposive investigation of facts with an objective determining the effective relationship among such facts and research between two or more phenomena. The questionnaire survey method was administered to collect data. The respondent have been ask to express their opinion on the variable at 5-point scale, ranging from strongly agree to strongly disagree. Furthermore the questionnaire item drawn from different sources and condent validity of the questionnaire has been checked by consulting with experts and a modification has been made in the questionnaire to suit the requirement of the study.

2.1 Analysis Of Site And Management

The analysis was done to understand what are all the problems occurring in the company because of improper application of material management. The solutions that provided in this work. may cost a lot in the beginning, but it will help the company in the long run by providing solutions to the key problems like lack of specification, delay, improper procurement etc. According to the problems that generally occur in the site due to the improper material management, was categorized each problem and created a cause-effect diagram, where factors such as, inventory, purchase, procurement, were all generally addressed to procurement cycle. For this purpose, the study was done by visiting the site. Site survey was done and prepared questionnaires accordingly and problems to each above mentioned groups were analysed and solutions thus were given. From the questionnaires prepared and the answers thus obtained from them were categorized into each class of problems. From those classes it was understood that lack of technological implications and scientific approach were lacking with respect to the procurement process. Thus the problems were pointed out to them and they agreed to each above mentioned problems that were occurring in their site and thus corrections would be implemented by them in their next oncoming projects.

2.2 Analysis On Inventory Controlling

In the inventory process, the methodology adopted was preparing questionnaires and allocating marks for each, by categorizing them into each of their subsystem problems, such as supply, materials and equipments, weightages were given substantially. Then, based on this the solutions were offered in the form of cause – effect diagram and flow charts, graphs were also prepared, depicting problems such as delay, lack of specification, excess and lack of inspection.

2.2.1 Inventory Planning

Production planning requires purchase and inventory.

- Planning decisions for an organization to control expenses and finances.
- To get the purchase benefits, discounts, reduced transportation and ordering cost the bulk purchase may be economical. Inventory of such materials are stored for longer time

2.3 Analysis On Cost

2.3.1 Abc Analysis

This is most popular inventory control technique adopted as Pareto's Law. Large amount of capital is invested in purchase of costly items in small number. Eighty percent of the cost of materials purchased is required for only Twenty percent costly items for efficient inventory control in stores where the large number of materials are to be handled, the classification of them is necessary to take particular care of costly items, which are less in number. The ABC analysis is commonly used in most of the organizations.

3.INVENTORY MANAGEMENT

Inventory management is the practice overseeing and controlling of the ordering, storage and use of components that a company uses in the production of the items it sells. Inventory management is also the practice of overseeing and controlling of quantities of finished products for sale. Successful inventory management involves creating a purchasing plan to 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. Two common inventory-management strategies are the just-in-time (JIT) method, where companies plan to receive items as they are needed rather than maintaining high inventory levels, and materials requirement planning (MRP), which schedules material deliveries based on sales forecasts.

3.1 Different Types Of Inventory

Inventory of materials occurs at various stages and departments of an organization. A manufacturing organization holds inventory of raw materials and consumables required for production. It also holds inventory of semi-finished goods at various stages in the plant with various departments. Finished goods inventory is held at plant, FG Stores, distribution centers etc. Further both raw materials and finished goods those that are in transit at various locations also form a part of inventory depending upon who owns the inventory at the particular juncture. Finished goods inventory is held by the organization at various stocking points or with dealers and stockiest until it reaches the market and end customers. Besides Raw materials and finished goods, organizations also hold inventories of spare parts to service the products.

3.2 Techniques Of Inventory Control System

Some of the most important techniques of inventory control system are: 1. Setting up of various stock levels. 2. Preparations of inventory budgets. 3. Maintaining perpetual inventory system. 4. Establishing proper purchase procedures. 5. Inventory turnover ratios. and 6. ABC analysis.

3.2.1 Setting Up Of Various Stock Levels

To avoid over-stocking and under stocking of materials, the management has to decide about the maximum level, minimum level, re-order level, danger level and average level of materials to be kept in the store.

These terms are explained below:

3.2.2 Re-ordering level

It is also known as '_ordering level' or '_ordering point' or '_ordering limit'. It is a point at which order for supply of material should be made. This level is fixed somewhere between the maximum level and the minimum level in such a way that the quantity of materials represented by the difference between the re-ordering level and the minimum level will be sufficient to meet the demands of production till such time as the materials are replenished. Reorder level

depends mainly on the maximum rate of consumption and order lead time. When this level is reached, the store keeper will initiate the purchase requisition.

3.2.3 Maximum Level

Maximum level is the level above which stock should never reach. It is also known as '_maximum limit' or '_maximum stock'. The function of maximum level is essential to avoid unnecessary blocking up of capital in inventories, losses on account of deterioration and obsolescence of materials, extra overheads and temptation to thefts etc. This level can be determined with the following formula.

$$\text{Maximum Stock level} = \text{Reordering level} + \text{Reordering quantity} - (\text{Minimum Consumption} \times \text{Minimum re-ordering period})$$

3.2.4 Maintaining Perpetual Inventory System

This is another technique to exercise control over inventory. It is also known as automatic inventory system. The basic objective of this system is to make available details about the quantity and value of stock of each item at all times. Thus, this system provides a rigid control over stock of materials as physical stock can be regularly verified with the stock records kept in the stores and the cost office.

3.3 Factors Considered In Inventory Management System

3.3.1 Cost Factors

Differentiation of currency prices has been ranked by the owners respondents in the 4th position. It has been ranked by the consultants' respondents in the 3rd position and by the contractors' respondents in the second position. It is not surprising to find out differentiation of currency prices is more important for contractors than for others because this factor affects contractors' profit rate and cost performance. The cash flow of a project has been ranked by the owners' respondents in the second position. It has been ranked by the consultants' respondents in the 4th position and by the contractors' respondents in the 3rd position. Cash flow is more important for owners and contractors than for consultants, because it can give an important evaluation for the owners' and the contractors' cost performance at any stage of project. Material and equipment cost has been ranked by the owners' respondents in the second position, but it has been ranked by the consultants' and the contractors' respondents in the 5th position. This indicates that this factor is more important for owners than for others. Material man, equipment cost is one of the project cost components that affects owners' liquidity and project budget.

3.3.2 Time Factors

According to owners, consultants, and contractors, the average delay because of closures leading to materials shortage was the most important performance factor, as it has the first rank among all factors with RII = 0.941 for owners, 0.896 for consultants, and 0.943 for contractors. Local construction projects suffer from complex problems because of closures leading to materials shortage. These problems can be considered as an obstacle for time performance of projects. Unavailability of resources as planned through project duration has been ranked by the owners' respondents in the 3rd position. It has been ranked by the consultants' respondents in the 2nd position and by the contractors' respondents in the 3rd one. This factor can be considered as important for 3 parties and scores a similar rank from all of them. This factor directly affects the project performance such as time. If resources are not available as planned through project duration, the project will suffer from the problem of time performance. Average delay in payment from owner to contractor has been ranked by the owners', consultants', and contractors' respondents in the 3rd position.

3.3.3 Quality Factors

Unavailability of personnel with high experience and qualifications has been ranked by consultants' and contractors' respondents in the first position and by owners' respondents in the second one. This factor is very important for 3 parties because availability of personnel with high experience and qualifications assist them to implement their project with a professional and successful performance. Participation of managerial levels in decision making has been ranked by the owners', consultants', and contractors' respondents in the 4th position. This factor scored the same rank from all parties because sharing the managerial levels with decision-making will lead to better implementation and performance of a project and will satisfy the 3 parties to a greater degree.

3.3.4 Productivity Factors

Sequencing of work according to schedule has been ranked by owners, consultants, and contractors in the first position. This factor is the most important one for 3 parties because sequencing the work according to schedule assists them to conduct a project according to scheduled time for project completion. Management-labour relationship has been ranked by owners' and contractors' respondents in the 2nd position and by consultants' respondents in the 3rd one. This factor

is considered as important for 3 parties as management-labour relationship can assist them by strong coordination and motivation between labour level and managerial level.

3.3.5 Client Satisfaction Factors Leadership skills for project managers have been ranked by owners', consultants', and contractors' respondents in the 1st position. This factor is the most important one for 3 parties because leadership skills for project managers affect the degree of project performance and client satisfaction. Number of reworks has been ranked by owners', consultants', and contractors' respondents in the 5th position. This factor has the same rank for 3 parties because number of reworks affect the relationship between them. Number of disputes between owner and project parties have been ranked by owners' respondents in the 2nd position and by consultants' and contractors' respondents in the 4th position. This factor is more important for owners because disputes between owner and project parties will affect relationships between them and the degree of client satisfaction will be affected.

3.3.6 Regular And Community Satisfaction Factors

Neighbours and site condition problems have been ranked by the owners' and contractors' respondents in the 1st position and by the consultants' respondents in the second one. This factor is more important for owners and contractors because it is strongly related to client satisfaction and contractors' performance. Quality and availability of regulator documentation has been ranked by the consultants' respondents in the 1st position and by the owners' and contractors' respondents in the 2nd position. Quality and availability of regulator documentation is more important for consultants because it affects the performance of consultants and community satisfaction.

3.3.7 People Factors

Belonging to work it has been ranked by the owners, consultants, and contractors respondents in the first position. This factor is the most important one for 3 parties because belonging to work usually improves productivity and performance of project. Iyer and Jha (2005) are in agreement with our result as this factor is important for three parties because belonging to works improves productivity and performance of a project. Employees' motivation has been ranked by the owners' respondents in the 2nd position. It has been ranked by the consultants' respondents in the 3rd position and by the contractors' respondents in the 4th position.

4. INVENTORY MANAGEMENT SOFTWARE

Inventory management software is a computer-based system for tracking inventory levels, orders, sales and deliveries. It can also be used in the manufacturing industry to create a work order, bill of materials and other production-related documents. Companies use inventory management software to avoid product overstock and outages. It is a tool for organizing inventory data that before was generally stored in hard-copy form or in spreadsheets.

4.1 Features

Inventory management software is made up of several key components, all working together to create a cohesive inventory for many organizations' systems. These features include:

- Organizing, updating and analyzing inventory data are some of the features that is incorporated with quality inventory management software. It becomes very easy to track and understand how long it takes to process orders or perhaps the shipping of an order as well; all of it is done with the help of inventory control software. Planning a construction company's workflow is a crucial factor and it becomes much easier to maintain it if the inventory management software is integrated with construction ERP.
- Construction companies are often found troubled with respect to the buffer stock. With the help of a well-organized inventory control module, buffer stock can be managed and estimated to meet unforeseen demands. This significantly minimizes the work interruption caused due to lack of materials.

4.1.1 Order Management

Should inventory reach a specific threshold, a company's inventory management system can be programmed to tell managers to reorder that product. This helps companies avoid running out of products or tying up too much capital in inventory.

4.1.2 Asset Tracking

When a product is in a warehouse or store, it can be tracked via its barcode and/or other tracking criteria, such as serial number, lot number or revision number. Systems. for Business, Encyclopedia of Business, 2nd ed. Nowadays, inventory management software often utilizes barcode, radio-frequency identification (RFID), and/or wireless tracking technology.

4.1.3 Service Management

Companies that are primarily service-oriented rather than product-oriented can use inventory management software to track the cost of the materials they use to provide services, such as cleaning supplies. This way, they can attach prices to their services that reflect the total cost of performing them.

4.1.4 Product Identification

Barcodes are often the means whereby data on products and orders is inputted into inventory management software. A barcode reader is used to read barcodes and look up information on the products they represent. Radio-frequency identification (RFID) tags and wireless methods of product identification are also growing in popularity. Modern inventory software programs may use QR codes or NFC tags to identify inventory items and smart phones as scanners.

5. INVENTORY MANAGEMENT SYSTEM IN CONSTRUCTION INDUSTRY

5.1 Materials Planning And Control

Based on the sales forecast and production plans, the materials planning and control is done. This involves estimating the individual requirements of parts, preparing materials budget, forecasting the levels of inventories, scheduling the orders and monitoring the performance in relation to production and sales.

5.2 Purchasing

This 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.

5.3 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. Stores is also responsible for the physical verification of stocks and reconciling them with book figures.

5.4 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.

5.5 Control Of Construction Waste

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 (S. Sanmath 2011). Construction waste can also be reduced by using waste management system on project.

6. DATA COLLECTION

The research design used in this project is analytical in nature and the procedure using which the Researcher has to use facts or information already available and analyze this to make a critical evaluation of the performance.

6.1 Data Collection

In this research few methods of data collection are used which can be divided into two parts such a) Primary source & Secondary Sources.

6.1.1 Primary Sources

Primary sources are those sources which gives pre idea about research. It also gives theoretical and practical concept.

Literature Review: To know the current practices of Construction material management, literature review has been carried out thoroughly.

Interviews: In order to find the observations, Interviews have been carried out with project manager, Billing Engineer & Store In charge.

Tender Document: This is a very important source of primary data because this document gives the tender quantities for the live project.

6.1.2 Secondary Sources

Secondary data are collected through those data which are already in presence for specific purpose.

MRN: MRN means —Material Requisition Note|| is that source which gives an idea about requirement of material.

Ledger Register: This provides the information regarding the order of material and Cumulative quantity of material till date.

Daily Material Report: This report gives information regarding daily material consumption & stock available for further use for the project.

Running Amount Bill: This is very important source of secondary data which gives the actual executed quantities required for the project.

7.CONCLUSION

A questionnaire-based survey was used to elicit the attitude of owners, consultants, and contractors towards factors affecting the performance of construction projects. They should be more interested in conformance to project specification to overcome disputes, time, and cost performance problems. Quality materials should be of a greater interest for contractors in order to improve cost, time, and quality performance. For implement inventory management system the remedies are, Involvement of contractor's in material management they should maintain the stock list & purchase list and the calculation of materials usage also storing materials in safety. Inventory management system is considered to perform a key role in an organization, which is responsible to complete the company's project in a specific budget within a certain period of time. It is very clear that inventory management of any construction will undergo intense stress in their work environment.

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