

# Inventory Control Management for Construction Industries using SPSS Software

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## ABSTRACT

*Inventory means maintaining stock of a company. The concept of inventory management has been one of many analytical aspects of management. This involves optimising the resources available to store various materials. Lack of inventory may lead to stock outs, resulting in production down time, but a very high inventory on the other hand may lead to an increased production costs, due to high cost of an inventory transportation.. Improper handling and storage of inventories in construction site lead to the project delay . Construction materials account 60% of the total expenditure of a project. So only proper handling and storage may be required is compulsory. Efficient material management plays a key role in the successful completion of the project within estimated cost and time. In this paper current practice of construction material management to construction project and inventory control techniques such as ABC classification and EOQ analysis are performed to maintain the inventory an optimum level. S curve analysis is performed to measure the fluctuation between the estimated material cost and market material cost. Total expenditure of inventory is less after the adoption of inventory control techniques . The principle target of the investigation is to dissect the stock administration control at the construction site with the assistance of SPSS program.*

**KEYWORDS:** Inventory Management, Construction, ABC Analysis, EOQ Analysis

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## I. INTRODUCTION

The term inventory refers to the goods or materials used by firm for production or sale. Inventories are the physical stocks of items that a manufacturing or service organisation keeps in hand for efficient running of its office or manufacturing activities. Inventory consists of raw materials , work in progress and finished goods. Inventory control is the course along activities with the purpose of getting to the right inventory in the right place at the right time and in the right

quantity and it is directly connection to the production function of any organisation. The need for the project is to present the problems ,facing by the companies in material requirements and to provide proper material management. Nearly 60% 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. For data analysis inventory model like ABC analysis and EOQ analysis will be applied on acquired data Also qualitative analysis which

include S – curve analysis will be used to differentiate between planned and actual consumption of materials. Material management is an essential tool which will be improving the productivity of a construction industry. Construction management is the overall planning, sourcing, purchasing, moving, storing, coordinating and controlling the project from starting to the end. The objective is to produce a functionally and financially feasible project. The construction industry is consistent with five major sectors, such as residential, environment, heavy civil, Industrial and commercial.

## II. CONSTRUCTION INVENTORY MANAGEMENT

Construction inventory management is a means by which construction companies and suppliers can keep track of materials, work force, equipment and plant. This is particularly important when a construction company has multiple projects to manage, as efficient scheduling can become very complicated.

A well managed inventory can be critical to profitability as delayed, misplaced or lost items can incur avoidable delays and unnecessary costs. A project time line, planned in advance, with the full of the required materials, labour, equipment and so on is a vital part of the project planning process. This might also include,

- An inventory tools including manufacturer details, instructions, parts requirements and so on.
- A consumable inventory ( i.e. nuts, bolts, screws, nails, drill bits, wire, batteries and so on) with a system that alerts when supplies are lower.
- Automatic scheduling of preventive maintenance for tools, plants and equipment helping to ensure that unnecessary down time for repairs is avoid.
- Radio frequency identification (RFID) and barcode solution.

## III. ABOUT SPSS SOFTWARE

SPSS is a widely used program for statistical analysis in social science. It is also used by market researchers, health researchers, survey companies, government, education researchers, marketing organizations, data miners, and others. The original SPSS manual has been described as one of "sociology's most influential books" for allowing ordinary researchers to do their own statistical analysis.<sup>[4]</sup> In addition to statistical

analysis, data management (case selection, file reshaping, creating derived data) and data documentation (a metadata dictionary was stored in the data file) are features of the base software.

### Statistics included in the base software:

- Descriptive statistics: Cross tabulation, Frequencies, Descriptive, Explore, Descriptive Ratio Statistics
- Bivariate statistics: Means, t-test, ANOVA, Correlation (bivariate, partial, distances), Nonparametric tests
- Prediction for numerical outcomes: Linear regression
- Prediction for identifying groups: Factor analysis, cluster analysis (two-step, K-means, hierarchical), Discriminate.

## IV. SCOPE AND OBJECTIVE

The objective of this paper is to study the different literatures about inventory management and identify the importance of inventory management and also the factors affecting inventory management.

The scope of paper includes

- To study the Various inventory control systems, inventory models useful for day to day material management.
- To study the application of inventory management systems to control the cost of a construction project.

## V. LITERATURE REVIEW

Literature survey aimed to identify the importance of inventory management in construction industry.

1. Ujjavala patel(2017), "Application Of Inventory Material Management Techniques In Construction Projects"

Briefly summaries the importance to manage all the materials from design to Construction stage. Poor handling of materials affects the project cost. S- curve analysis is performed to the deviations of planned material cost and actual material cost. The economic order quantity is done to reduce wastage on Construction site. He suggested inventory carrying cost is increasing in actual site as per EOQ rate of interest is decreased.

2. Kuo En .F. Weizhen and Lon Chen S.P,(2012), "An ABC Analysis Model For The Multiple Products Inventory Control"

This paper describes an Always Better control (ABC) classification is a method of classifying inventory items according to the dollar value to a

firm . Class A items ,though smaller values ,but tends to generate higher sales value, followed by the class B items .The class C items are of a very large volume ,but generate a small sales value.Class A items normally range from 5% to 20% of all inventory items and account for between 50% and 80% of sales value. The class B items normally range from 20 % to 40% of all inventory items account for 20% to 40% of sales value .The class C items normally constitute 50% to 70% of all inventory items and account for 5% to 25% sales value

3.Dinesh Dhoka ,(2013),“ABC Classification For Inventory Optimisation”

This paper describes Inventory Classification is very important to manage inventory efficiently. For inventory optimization and Inventory Forecasting, products need to be classified appropriately. There are several methods used for categorization of products and items in inventory. ABC Analysis is based on Pareto Analysis which says 20% of the items contribute to 80% of sales. It implies that a small portion of items in Inventory contribute to maximum sales. 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.

4.Soni,(2016),“Analysing Inventory Material Management Control Technique On Residential Construction Project”

This study explored the current practice of Material Management in construction industry and analyzed using ABC, SDE, & EOQ inventory control technique. The purpose is to find out the ways of managing the inventory properly, so that there would be a little impact on the profits.They conclude that ABC analysis provides identifying those items that make the largest impact on a company's overall inventory cost performance. SDE analysis is very useful in knowing present day scarcity of materials, in lead time and deciding upon purchase strategies. EOQ maintains the sufficient material safety stock in period short supply and reduced material wastage. Economic Order Quantity total investment is reduced and no of order is more in a year. So, Rate of Interest is increasing in actual site ordered material.

5.Sayali Sudhir Mahagankar,(2017),“Application Of ABC Analysis For Material Management Of a Residential Building”

This work mainly deals with the material management which is an integral part of the project management. From the result of ABC analysis they concluded that material management in construction of a project is of high importance as the material contributes to 62.87% of the total construction cost of the project. Proper application of material management technique reduces the wastage of materials on the site.

6.Kumar et al. ,(2013) ,“An ABC – Analysis For The Multiple Products Inventory Management”

Studied that Inventory constitutes the most significant part of current assets of larger majority of Indian manufacturing industries. In the Manufacturing company can be evaluated and understood using inventory management technique ABC (Always Better Control) analysis Data collection is mainly through the interviews with the manager, annual reports, sales report, purchasing report of the company and the related journals. After data collection they concluded that future performance and past result projected investment and purchasing capacity and minimum and maximum inventories to investigate the potential for alternative stocking levels arrangements that would reduce investment liability and associated carrying costs.

7.Angel et al., (2014),“Inventory Management – A case Study”

Carried out the ABC (Always Better Control) analysis technique for the inventory control system is first used to identify the most important multiple products and then the Economic Order Quantity (EOQ) of each product is developed to find their inventory model equation individually. They have carried out the major use of materials like Cement and sand, Gravel, Bricks and Steel. They have found that Materials management unit should also pay attention to sales growth over the years and thus take into consideration. The sales and marketing department of the company should pay closer attention to the growth pattern of inventory usage and incorporate it in sales forecasting technique.

8.Ashwini.R.Patil,(2013),“Analysing Material Management Techniques On Construction Project”

This study explored current practice of Material Management on construction field is suitable analysed using ABC & EOQ inventory control techniques and S curve analysis. They describe various problems of administrative causes, consultant's causes, contractor's faults, and

unavailability of resources and also conclude that the total cost of material may be 50% of total cost. Administrative causes are 30% which affects directly on contractors rework, 5% reasons due to unavailability of material

9. Kulkarni Sharma Hote et al., (2017), "Factors Affecting Material Management On Construction Site"

They worked on the analysis of factors affecting effective materials management in building construction projects. They studied on nine different small, large & medium firms in Maharashtra. By studying gathered data, factors were found out affecting material management. They concluded that the large firms are good & capable enough in applying material management techniques on construction sites. Medium firms have some technical as well as some seasonal problems as they do not use any software. Small firms lack behind in material management as compared to medium & large firms due to lack of knowledge about material management. Use of software like MSP, PRIMAVERA, ERP, SAP, etc. should be done to avoid manual errors in material management.

10. Anup Wilfred, (2015), "An Empirical Case Study Of Material Management In Residential Project"

According to this literature if the material management is not properly managed it will create a project cost variance. Project cost can be controlled by taking corrective actions towards the cost variance. Material management deals with principles and practices which effectively optimize the cost of materials used in the project. Material management is the line of responsibility which begins with the selection of suppliers and ends when the material is delivered to its point. ABC analysis helps in rationalizing the number of orders and reduces the overall inventory even though overall purchase orders are the same, the average inventory can be reduced substantially. The Cost Variance values for the Class A materials is a tool to measure the profit and it has a positive value. It indicates the project has a cost under run i.e. the cost incurred is less than the planned or budgeted cost. This S Curve analysis recognizes that there is too much increase in material cost during actual execution.

11. M. Kameshwar, (2017), "Effective Inventory Management System In Construction"

This paper describes that the need for the effective inventory management in construction. The results by implementing EOQ policy saves the total cost. Safety stocks had been computed for an

excess lead time of 30 days to be maintained throughout the project. An inventory modelling has been done for multi-item joint replenishment.

12. Ngwu Okolie Ezeokonkwo et al., (2015), "Appraisal Of The Effects Of Material Management On Building Productivity In South East Nigeria"

Identified the key areas where material management is deficient so that improvement could be made in order to increase productivity. The data collected formed the background of the structured questionnaires for proper analysis and recommendations. Eighty-seven out of ninety questionnaires launched to the sites were properly completed and returned. The material schedule would further assist in material scheduling – identifying materials required and making deliveries at scheduled times and dates. Since the problem areas have been identified, measures should be taken by contracting organizations to upgrade their performance. This could be achieved by engaging full time estimators or Quantity Surveyors and material controllers.

13. Anuprakash N, (2013), "Study Of Stock Management practices In Construction Companies"

By this journal the author conducted questionnaire survey and observed that almost 60% of the companies maintain stock for cement based on the fund available. They consider that maintaining below 5% cement stock will make them profit. Only 60% of companies used skilled and trained professionals for stock management. Almost all companies say that maintaining stock will fetch them profit.

14. T. Subramani, (2018), "Analysing Inventory Material Management Control Techniques On Residential Construction Project Using SPSS"

This journal shows that material quality plays an important role. The total cost of the material can also be 50 percent of overall value, in order that it is critical for contractor to consider that timely availability of material in project site. This project is a questionnaire based survey. And they give the factors affecting the performance of construction projects.

15. S. Sindhu, (2014), "Performance Analysis Of Inventory Management System In Construction Industries In India"

This journal explains the result of some points focused mainly in construction industries. Some of them are involvement of contractor in material management, need for stock management, managing stock in growth of company, importance

to stock comparing other works, maintaining safety in storing. The purpose of this study is to make sure the application of Just In Time concept at construction industry.

## VI. CONCLUSION

Inventory management deals with material procurement. From this literature study how to done the inventory control techniques and importance of inventory from design to construction stage is known. In ABC analysis A category represent 70% of the money value, B category represent 15% of the money value, C category represent 5% of the money value. EOQ analysis is mainly done to reduce the total cost of inventory. S - curve is for calculating the deviations.

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