
EVALUATIVE ASSESSMENT OF CONSTRUCTION EQUIPMENT MANAGEMENT PRACTICES AT PROJECT SITE

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ABSTRACT

This paper explores the research and development activities conducted over recent decades concerning construction equipment management practices. It examines the challenges posed by inadequate material handling at construction sites and focuses on analyzing the factors influencing efficient material management in building projects. Effective materials management plays a pivotal role in project management and control, significantly enhancing productivity in construction. To ensure successful project execution, it is essential to have materials delivered to the right location at the right time. Studies reveal that construction materials and equipment often constitute over 60-70% of a project's total cost. Poor handling and maintenance of these materials can lead to substantial cost overruns.

Implementing robust materials management practices is crucial for optimizing construction projects. A well-structured materials management program ensures timely delivery and utilization of materials and equipment, which enhances planning, boosts labor productivity, improves scheduling, and reduces project costs. Furthermore, proper upkeep of materials contributes to greater productivity, cost efficiency, and timely completion of construction projects. Maintenance issues related to materials and equipment are among the primary causes of delays in construction projects. Thus, adopting effective materials management strategies is vital for the success of all construction projects.

This review focuses on various material management methods applied at construction sites, highlighting their benefits and limitations. It underscores the need to study and implement effective practices for material management across the construction industry.

Keywords: Civil Material, Construction Materials, Construction projects, Construction site, Material Management.

1. INTRODUCTION

Materials management encompasses the planning, execution, and oversight of both on-site and administrative activities within the construction industry. The success of construction projects relies on having skilled personnel, appropriate equipment, and timely access to resources to meet budget and schedule requirements. The overall project cost in construction is typically distributed among key components such as materials, labor, and equipment. Effective materials management ensures the proper quality and quantity of resources are obtained at the right time and cost to meet project demands seamlessly.

The primary goal of this study is to ensure the availability of materials in the correct quantity and at the right location to satisfy project requirements precisely when needed. Materials account for a significant portion of construction costs, and optimizing their management can lead to substantial cost savings, thereby improving overall project efficiency. Proper materials management plays a pivotal role in the successful execution of construction projects. Construction companies must possess a clear understanding of management techniques and their applications to achieve project goals effectively. Poor maintenance of construction equipment and materials can result in increased costs and delays.

An efficient materials management system reduces storage-related risks such as deterioration and theft and ensures a smooth flow of materials, which is critical to project success. Effective management involves evaluating and measuring the performance of all tasks associated with materials handling, ensuring each step aligns with project goals. Performance measurement serves as an indicator of system efficiency and varies depending on project type and scale. By segmenting the materials management system, performance can be optimized, leading to better scheduling, increased labor productivity, and minimized project costs.

In essence, materials management is the strategic process of acquiring, utilizing, and controlling resources at the appropriate cost, time, and quality to achieve optimal outcomes. It integrates procurement, transportation, and inventory control, ensuring seamless coordination from suppliers to end users. Moreover, materials management involves

overseeing related functions such as purchasing, inventory management, warehousing, and staff training to support operational efficiency. The materials management department is critical for any organization, contributing to production, marketing, and quality control while maintaining cost efficiency.

This review identifies key factors affecting materials management at construction sites and proposes actionable recommendations to address these challenges. It examines materials management practices across small, medium, and large-scale construction companies, analyzing their effectiveness. The study concludes with proposed solutions to overcome common obstacles, aiming to enhance materials management processes and improve construction project outcomes.

2. LITERATURE REVIEW

Researchers study construction material management at construction sites and they bring different results to it. From those studies, R K Das and he said it was important to maintain all materials from the design stage until the construction phase was completed [1]. He noted that it is important to develop new approaches to material handling in fast-track construction projects to improve the efficiency of the production process. Again, R K Das, Statistics, Civilized Equipment Management Profits for the construction industry [2].

According to another study by Ashwini Patel, construction materials are a major expense in any construction project. The total cost of the material may be 50% of the total cost; It is important to consider the timely availability of contractor material as a factor in the successful completion of any project in the operation of a construction project [3]. According to Madhav Infra., project costs fluctuate frequently. Materials, equipment, manpower, subcontractor overhead costs and general condition [4]. Therefore, if content management is not handled properly, it can create a big change in project cost. Project cost can be controlled by taking corrective action towards cost difference. Allocating important resources such as money, staff, time, etc. is very necessary to process monitoring and control. Kamal Construction' Engineer, He explained that for greater efficiency and effectiveness on the construction site, changes in material management processes are needed for overall improvement in material management [5]. Improper handling of construction materials affects the overall performance of construction projects in terms of cost, time, quality and productivity. Materials management can be defined as the process of planning, estimating materials, estimating materials, sourcing, purchasing, transporting, storing and controlling materials, reducing waste, and coordinating material use. Optimizes profitability by reducing costs. Construction materials cost 60% to 70% of a project or direct facility, with the remaining 30% to 40% labour costs. As project management, special training sessions should be arranged on site to keep workers updated on the latest technologies. The plant and machinery should be inspected regularly to prevent any failure. Workers and contractors must be sent in the proper manner to perform a task. Regular inspections should be kept in the plan to correct any errors. Proper monitoring of the site should be done to improve the performance level.

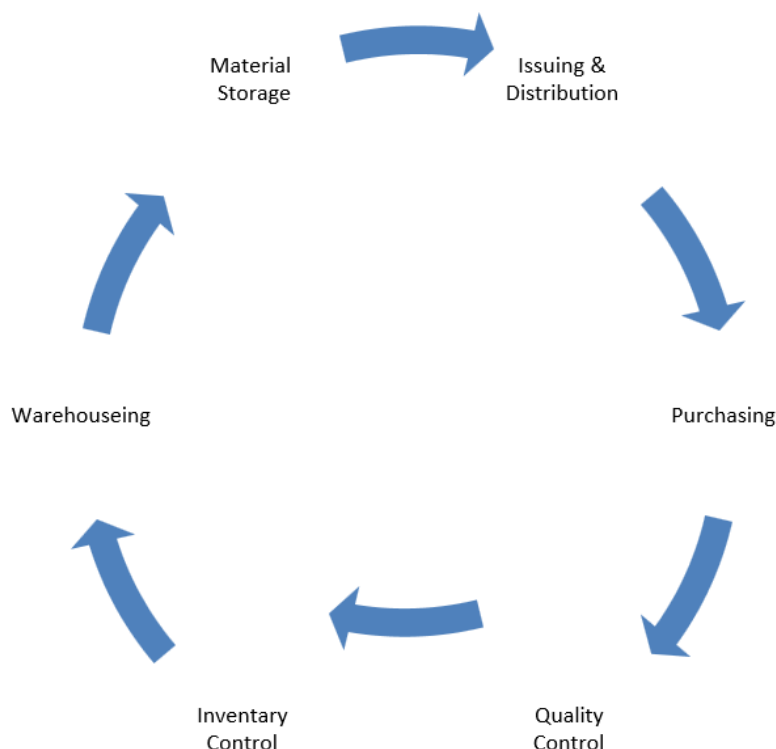


Figure 1 Flow of Material Management

3. METHODOLOGY

3.1 BENEFITS OF MATERIAL MANAGEMENT

Content management offers many benefits for all functions that integrate with building materials. It improves labour productivity, improves project scheduling, improves quality control, improves field materials control, establishes better relationships with suppliers, achieves better management, minimizes excessive delays, reduces construction quality, overall cost, minimizes technical issues, and eliminates overall project costs. decreases. Etc. There are some advantages of material handling.

Furthermore, in order to fulfil the objectives of content management as mentioned above and to fulfil the primary goals and objectives, the tasks of content management are classified as primary and secondary tasks. Its main functions are requirements planning (MRP), procurement, inventory planning and control, identifying and maintaining the flow and supply of materials and quality control. Some secondary functions of authentication, evaluation and planning content management. Responsibility for material management begins with the flow of materials, including the manufacturing, finishing, receiving, and storage processes. Meaning, to make site maintenance for fast track projects less costly, there must be an integrated material handling process for the end user of the material from the design stage. The effective collection of materials represents a key role in the successful completion of the work, to ensure that the materials are available in their use when needed. The three key steps that make up the key to successful content management are the purchase, use and storage of materials.

Questionnaire survey was conducted in Mehsana, Gujarat. Through research, major delays or incompleteness of the project can be resolved through proper advance planning and the purchase of materials can be frequently checked to minimize more than the cost of the project. Madhav Infra. did a case study on materials management at the construction site. The aim of the study is to understand all the problems that occur in the organization due to improper application of materials management. Analysis of site and maintenance, inventory control, procurement processes, collection and tracking and cost. Stocks are analysed by FIFO (First in First Out Method). The cost is estimated by ABC analysis. From the analysis, the data was implemented and new relevant technical implications such as PDA (Personal Digital Assistant) were introduced to assist us in proper scheduling and financial control.

R K Das made clear the benefits of content management to the organization through his paper. The author points out that the objective of material management is to supply raw materials regularly, maintain a high inventory turnover, provide purchasing economies and reduce waste, and reduce the total cost of acquisition and contribution. And maintain a high level of coordination. User section. The main advantages of material management are that high investments in stocks do not go unnoticed, material shortages do not lead to stagnation, productivity improves, inventory losses are reduced and waste is reduced.

3.2 Basic Constituents of Material Management:

As we have seen before, materials are an important factor in planning and control in the construction industry and this represents a major cost to the industry. Therefore, there are four basic components to managing materials: Purchasing, Material handling, Storekeeping and Recycling or Disposal. Material assessment, budgeting, planning and programming, scheduling, collection and procurement and inspection, inventory control, storage and storage and waste management are its other basic components.

Finally, systematic operation, reduction in cost management, reduction of overall cost of the project, increased labour productivity, time management, quality control, better relationship with suppliers and better relationship with customers are the characteristics of content management.

Data collection and analysis

This review includes a questionnaire and survey study with previous written papers and research papers related to data collection. A total of 15 companies (5 small, 5 medium and 5 large) were randomly selected for this review. Data collected from the questionnaire survey and related data were systematically and properly studied. According to the data collected, it was found that there are some defects in the materials management system of the three-dimensional construction companies, which are affected by the management system.

4. OBSERVATION AND DISCUSSION

Observation

From the investigation, it appears that only large organizations use specific content management practice and that somehow, they prepare material data sheets for content management and that they have technical people for any rules or management and management. The person initiates the appropriate action to solve the problem. On the other hand, medium and small companies are less involved in content management practice. Back then, some large companies did

not have a content management technical department, especially for small and medium-sized production companies. But in comparison, any type of large construction company is better at materials handling practice and management techniques than medium and small companies. However, they still face a lot of problems for proper maintenance and control over site tasks. Lack of material management can eventually lead to work delays, increased project costs, loss of productivity and material waste and affect the quality of the project.

5. DISCUSSION

As we have seen from the above observations and the three companies, the first large companies have better content management practice. However, due to materials, poor quality control teams, shipping issues and some seasonal issues of the industry, the delivery time was delayed, but it has better content management practice than medium and small firms and is encouraging. In some parts of the study, moreover, at the above points, they are presenting warranty claims to their customers and they use the principles of timely delivery (OTD). Initial deliveries without customer consent are defined as OTDs or delivered on time. However, according to the study, 80% of construction equipment management practices of large companies are used. The remaining 15% are not using the methods properly, but somehow, they are trying to use the management methods. Other companies are called medium companies. There is a big gap between large and medium-sized companies. From the outset, this intermediary company has been doing medium construction work based on its capacity. Therefore, we cannot expect large content management practice like large companies. Through investigation, 60% of the management tool used in the industry. The remaining 40% is reduced in volume somehow. However, in comparison, medium companies have less regulatory practice than larger ones. It affects the overall performance of buildings. In practice, we follow this from large and medium enterprises in the industry. The third and final companies are called small companies. Of these companies, from the data collected, only 40% of companies have management practice. This 40% is the average price for all small firms. In general, due to this low regulatory policy of the industry, structural factors affect buildings well. Small firms in the industry include the following. Construction delays, quality control, material shipment problems, material seasonal issues, cost overruns, labour strikes, communication problems and rising material prices are some of them.

The following chart shows the diversity of construction management tools in different organizations



As we have seen from the above discussion, and from the chart, there is a big gap between the firms. The large firm has high material management practice. And we concluded that large firms were somewhat good and capable enough in managing materials in construction sites. And they use some techniques on materials management practices. Due to the material management techniques, OTD or on time delivery is highly applicable in large firms. On time delivery is a measure of process and supply chain efficiency which measures the amount of finished goods or services delivered to customers on time and in full. Medium firms have somewhat good but it still needs improvements. Medium firms have technical as well as some seasonal problems as they don't use any other techniques on the management of materials. Here, they used techniques of material management but lower than that of large firms. The cause of it is may be from cost or may be from working background of the site. And the last one is called small firms. It has very poor strategies in material management practice and it needs highly improved techniques. It has very poor management practice compared to medium & large firms. It is due to lack of skill man power, and may be has a limited power of working. And maybe they do not have enough efficiency to protect and to follow the well-being of the materials.

6. TECHNIQUES OF MATERIAL MANAGEMENT

S curve analysis was performed to examine deviations in scheduled project progress. Then tracking should be done and the fault should be detected in the first step. A. K. Patel (2021) performed S Curve analysis using MSP software. S curve analysis was performed to compare schematic and actual material consumption. The deviation curve is a representation of the project path in the S-shaped graph, created by the increasing cost of some parameters against time. This analysis

was done to compare the planned and actual costs for the materials. The author concludes that differences in materials can lead to purchases of materials that affect the budget of the project. EOQ analysis was performed after the project delay. Delays in scheduled projects. EOQ analysis was performed to mitigate the rising cost of the project. Ashwini R. Patil (2013) carried out this method and found consistent order quantities. You often need to know the order quantities to buy the required items in a timely manner. In addition, an order of frequency can also be obtained. Q, Economic order quantity C_0 = ordering cost C_u = item cost S = total consumption I = inventory carrying cost using formula, inventory total cost and financial order quantity found. The cost obtained after receiving the EOQ analysis is lower than receiving the EOQ. Therefore, the cost is reduced and this analysis is recommended.

7. CONCLUSION

The following results were resolved from the study: A centralized content management team should coordinate between the site and the organization. Requires proper control, tracking and monitoring of the system. Create awareness and accountability in the organization. Effective integration is required in all aspects of content management practices. The appropriate materials management system has increased the overall efficiency of the industry by 35%. MMP is very important for the success of any mega project. This minimizes the difference between a successful project and a project full of delays and claims. It can be used to improve efficiency and reduce costs. It is used to control direct costs. This reduces the risk of inventory loss. And in general, it is the tool used to complete a project successfully and it leads to minimizing time and cost losses.

8. RECOMMENDATION

The following recommendations have been addressed for construction companies of all sizes:

Work site management staff should pay more attention to content management, sometimes using software to avoid manual errors in content management, avoid delays due to rejection of materials by the quality control department or seasonal issues. Construction companies should store additional essential materials such as steel, cement etc. for emergency purpose, to avoid communication problems, all indents, requests, notes and records should be kept in written form. Equipment such as conveyor belts, trolleys, cranes, etc. should be used to reduce wastage due to improper handling of materials. Then, it is recommended to prepare and follow the given procedure to implement content management effectively. Implementing a given process in content management is crucial for any mega project to be successful. To fill the gap between a successful project and this will reduce delays and clogged claims. It is used to improve efficiency and reduce costs, control direct costs, reduce the risk of inventory losses and is commonly used to control process cycles. This is called a Vale device and it loses direct labour time.

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