

Application of Material Management Techniques

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Abstract— Cost is one of the main challenges for the construction manager, where the success of a project is judged by meeting the criteria of cost with budget, schedule on time, and quality as specified by the owner. Cost budget is prepared by the various factors and the main factors is the materials that are used in the construction. In which, poor strategy or incorrect budget or improper material management can easily turn an expected profit into loss. To overcome this problem the inventory material management techniques are very useful.

Keywords: Material Management, Material Management Techniques

I. INTRODUCTION

Construction industry plays a major role in development and achievement of the goals of the society. Construction is one of the largest industries and contributes to about 10% of the gross national product (GNP) in industrialized countries (Barrie and Paulson, 1993). Construction industry has complexity in its nature because it contains large number of parties as clients, contractors, consultants, stakeholders, shareholders and regulators. Construction is a unique industry that by nature is risky since most projects must be priced before they are constructed, whereas in other industries the selling price is based on known manufacturing costs. The success or failure of a project relies on the accuracy of several estimates done throughout the course of the project. The use of various new innovations and deployment of project management strategies has made it possible to undertake projects of mega scale. The performance of the construction industry is affected by national economies. The development of construction industry is a measurement tool of countries development, it's gives indicators about the economic situation.

Cost is one of the main challenges for the construction manager, where the success of a project is judged by meeting the criteria of cost with budget, schedule on time, and quality as specified by the owner. In which, poor strategy or incorrect budget or schedule forecasting can easily turn an expected profit into loss. Therefore, effective estimating is one of the main factors of a construction project success. Accordingly, cost estimate in early stage plays a significant role in any construction project, where it allows owners and planners to evaluate project feasibility and control costs effectively. In addition, the cost of a building is significantly affected by decisions made at the early phase. While this influence decreases through all phases of building project.

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A. Material Management

Material management is an approach for planning, organizing, and controlling all those activities principally concerned with the flow of materials into an organization.

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.

Material management is concerned with the planning, identification, procuring, storage, receiving and distribution of material. Materials represent a major expense in construction, so minimizing procurement cost improves opportunities for reducing the overall project cost. Material management is the process to deliver right material at right place at right time in right quantity so as to minimize the cost of project.

B. Importance and functions of Materials for a Project

Efficient materials management in construction project environment calls for an integrated approach covering various functions such as materials planning, purchasing, inventory control, store-keeping and warehousing, handling and transportation, codification and standardization and the disposal of surpluses. When these functions are not properly managed, materials shortages, surpluses, and cash flow problems are likely to occur. Costly labor delays result when the required quantity or quality of materials is not available when needed and it increases the project cost and time. Effective materials management undoubtedly has the positive impacts on project overall cost, schedule, safety, and quality.[2]

functions of material management are identified as The Material Planning and controlling.

- Material planning is of utmost important.
- Purchasing
- Stores and inventory control:
- Arranging transportation in the most economical way for the incoming and outgoing of the materials.
- To develop coordination between various departments.

C. Components of Material Management are:

- Material estimation, budgeting, planning and programming.
- Scheduling, purchasing and procurement
- Receiving and inspection.

- Inventory control, storage and warehousing
- Material handling and transport
- Waste management
- Make and Buy Decisions
- Coding and Classification of Materials
- Forecasting and Planning

D. Objectives of Materials Management

To fulfill all these objectives, it is necessary to establish harmony and good co-ordination between all the employees of material management department and this department should have good co-ordination with the other departments of the organization to serve all production centers.[2]

- Buying or Purchasing
- Efficient materials planning
- Procuring and receiving
- Quality assurance
- Supply and distribution of materials

II. LITERATURE REVIEW

A. A review on material management through inventory management

Study: Effective construction materials management process is a key to success of a construction project. Costs for materials handling, may range from 30-80% of total construction costs. Therefore, there is a need for efficient materials management in order to control, productivity and cost in construction projects. The review has been carried out to explore the local practice in the construction materials management and develop a construction materials management system to facilitate the management of construction materials mainly in the building construction.

B. Study of Material Management Techniques on Construction Project

Study: This paper prepares the Materials management tracking system and techniques such as S curve analysis, ABC analysis and EOQ analysis for a building construction project in construction industry. This 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. 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. Materials management is an important function in order to improve productivity in construction projects. The total cost of material may be 52% of total cost; so that it is important for contractor to consider that timely availability of material is potential cause of successful completion of project.

C. Use of Various Techniques of Material management for Construction of Industrial Building

Study: The cost, time & quality are the important objective of material management. Cost is an important parameter of any project. The material availability at right cost is key for economy of project. If material is purchased too early, capital gets tied up as well as, interest charges incurred on excess

inventory of material. On other hand if material availability at site is delayed it will affect scheduling of activities.

The objectives of project are as follows:

- To determine effective material cost from total project.
- Find out the benefits of material management & various techniques if would have used in Indus Construction Company.
- To study inventory control techniques.

D. An Empirical Case Study of Material Management in Residential Project

Study: This study is an attempt made on studying and assessing the material management principles and practices in a residential project. In this paper study is about all the problems occurring in the organization because of improper application of material management. And analyzed using different techniques ABC analysis to classify the materials therefore a methodology is made to classify the materials and S-Curve analysis are taken up to measure the variations.

1) ABC Analysis

From the ABC analysis following conclusions can be made,

- Class A materials – 4 items (70% of AUV)
- Class B materials – 9 items (25% of AUV)
- Class C materials – 20 items (5% of AUV)

E. Construction materials management on project sites

Study: The goal of materials management is to ensure that construction materials are available at their point of use when needed. The materials management system attempts to ensure that the right quality and quantity of materials are appropriately selected, purchased, delivered and handled on site in a timely manner and at a reasonable cost. Materials management is the 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, are obtained at a reasonable cost and most importantly are available at the point of use when required. Thus, Materials management is an important element in project management. Materials represent a major expense in construction, so minimizing procurement costs improves opportunities for reducing the overall project costs.

F. Construction costs analysis and its importance to the economy

Study: The construction industry plays an important role in the economy since it provides demand for the production of goods and services from other related industries. Activities of the construction are also very vital to the achievement of national socio-economic development goals of providing shelter, infrastructure and employment. In accordance to literature review, the construction activities affect nearly every aspect of the economy and that the industry is one of the driven factors of the economy growth, especially in developing countries like India.

G. Cost benefit analysis for Construction Projects

Study: Another demand of today's society is that it wants to be benefited from the schemes whether directly or indirectly. It is often observed that a benefit to one part of society is not necessarily a benefit to the whole of the society. Of course, by benefiting some sectors of the community, often incurs

costs to the other sectors. For example, a factory may provide employment but at the same time also causes pollution and devaluing of local house prices, due to noise, increased road transport etc. The objective can be achieved by adopting the Cost Benefit Analysis (CBA), since it is concerned with evaluating schemes for the whole society and not just for isolated sectors.

H. Cost estimation of Construction Projects

Study: Generally, the process of awarding any construction contract is based on competitive bidding. Contractors will be invited to submit their bids to the owner who normally awards the lowest bid to construct the project. Previously, both the owner and contractor have to access the construction cost of the proposed project. This is achieved through a construction cost estimate.

The preparation of any type of cost estimate depends on the experience of the estimator, the tools used, the time spent, and the information available. Usually the preparation of an estimate starts by breaking down the project into components, then taking off the quantities of the elements of each package and next pricing them all. The success of a contractor depends upon cost obtain a job estimates of projects, not only of but also to construct to lose the job; the result of a low estimate could be to win the job, but to lose money in the construction process.

I. Estimating Building Construction Costs

Study: In Economics, technical efficiency is defined as the ratio between obtained results to costs incurred (Farell, 1957). Thus, a production unit is said to be technically efficient if it obtains optimal results from certain specific initial costs or if it is capable of minimizing those costs in order to achieve a result specified beforehand. If the production is distributed in the market according to its demand, thereby reaching a maximum benefit, the distribution efficiency is considered optimal. Therefore, economic efficiency is defined as the product of technical efficiency by distribution efficiency.

J. Enhancing the Success of Civil Infrastructure Project Implementation; By Adequate Cash Flow Distribution for Civil Bulk Item Inventory Using ABC Analysis: An Approach for Increasing Country Economy.

Study: In this paper highlight case of civil infrastructure projects especially resident complex and other govt. funded projects where the incurred cash flow in complete loss and utilized resources go in vain. Cash flow analysis not only determines actual profit at the end of the project, but also estimates required cash resources or cash balances at the end of every month. Cash flow analysis is important in managing a construction project; however, it requires extensive information that is not immediately available to the general contractor.

III. CONCLUSION

This study clearly indicates that the managing of all the materials from the design stage to the construction stage is important. The total cost of material may be 50%-55% of the total cost of the project, so that it is important for contractor to consider that timely availability of material is potential cause of successful completion. The above study helps to classify

materials that are more valuable by using the inventory management techniques such as ABC analysis, EOQ analysis and s-curve analysis.

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