# Comparison of Material Procurement Methods of a Construction Projects-Case Study

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***Abstract**: Procurement Process is the process required to supply equipment, materials and other resources required to carry out a project. This process usually involves sub-processes such as acquisition, purchasing, logistics, monitoring, quality assurance and contract administration. An important factor that affects the performance of construction projects is the improper handling of materials during site activities. This an effort to analyze the Process analysis of material Procurement management by generating strategies to improve the procurement process in commercial projects. To avoid delays mainly the material planning to be carried out on time with the relevant material details material approval, material lead time, and material delivery and to be properly tracked. One or combination of Information and Communication Technology helps in effective management of materials at various stages of construction. Application of ICT enables the maximum accuracy of estimation of requirements and it is made sure that required amount of material is procured at the project site avoiding the wastages and difficulties in storages etc.*

**Key words: Material procurement, procurement process, management of construction material, procurement methods.**

## 1. INTRODUCTION

Construction projects can be accomplished utilizing management processes. These processes include planning, organizing, executing, monitoring, and controlling. During any construction project the three inter-related factors of time, money, and quality need to be controlled and managed. Successful completion of projects requires all resources to be effectively managed. Materials management is considered as a means to achieve better productivity, which should be translated into cost reduction. Procurement is the acquisition of goods or services at the best ownership cost, in the right quantity and quality, at the right time and place for the organization. Various problems are present in the material procurement during every stage of the project life and the reasons of these problems are presented material procurement management system of the contracting organizations. Materials represent a major expense in construction, so minimizing procurement costs improves opportunities for reducing the overall project costs. If materials are purchased too early, capital may be held up and interest charges incurred on the excess inventory of materials. Materials may deteriorate during storage or get stolen unless special care is taken. Delays and extras expenses may be incurred if materials required for particular activities are unavailable. Ensuring a timely flow of materials is the key challenge in the material Procurement management in material management

Material procurement and storage on construction sites need to be properly planned and executed to avoid the negative impacts of material shortage or excessive material inventory on-site. Deficiencies in the supply and flow of construction material were often cited as major causes of productivity degradation and financial losses. Ordering smaller quantities of material more frequently minimizes the locked-up capital in material inventories; however, it increases the probability of material shortages and project delays. On the other hand, ordering larger quantities of material less frequently minimizes the probability of material shortage and project delays; however, it increases the cost of locked-up capital in large inventory buffers on-site. Construction planners need to consider this critical trade off during the planning of material procurement and storage on-site.

A number of research studies were conducted to investigate the procurement and storage of construction material on-site. Existing material procurement studies focused on:

(1) Investigating the impact of material procurement and supply decisions on construction labour productivity

(2) Formulating the principles of site material management and storage

(3) Applying “just-in-time” strategy in construction projects

(4) Implementing 4-dimensional (4D) visualization to manage and control material supply and storageon-site

(5) Developing decision support systems for economical material supplychains and

(6) Developing data exchange and integration standards in construction supply chains. Other research studies investigated material storage on-site as part of construction site layout planning assuming predetermined sizes of material storage areas. Despite the significant contributions, these studies did not investigate the critical and mutual interdependencies between (1) material procurement planning; and (2) dynamic material storage and site-layout planning. Existing material procurement models focus on procurement decisions without considering the availability of material storage space on dynamic construction site layouts. On the other hand, existing dynamic site layout planning models focus on-site layout decisions without considering the impact of material procurement decisions on inventory levels and storage space needs. Overlooking these critical interdependencies between material procurement and site-space availability can lead to serious project problems including material shortages, improper storage, poor and unsafe site layout, and productivity losses. Accordingly, there is a pressing research need to investigate and model the critical inter dependencies between material procurement and material storage decisions. The objective of this paper is to present the development of a construction logistics planning model that is capable of integrating and optimizing critical planning decisions of material procurement and material storage on construction sites.

### 1.1 Objectives

1. To study the material procurement of construction site.
2. To identify the factors affecting the material procurement.
3. To apply inventory techniques as ABC analysis and EOQ analysis to avoid stock out.
4. Discussion and suggestions to minimize the cost of inventory.

### 1.2 Scope of the Study

Procurement is the act of obtaining or buying goods and services. The purpose of procurement is to meet the users requirement. the requirement including any specified level of quality or standards of service, must be tested critically for need, cost effectiveness and affordability under whatever arrangement are in place for financial approval and the separation of functions. The process includes preparation and processing of a demand as well as the end receipt and approval of payment

## 2. STUDY OF MATERIAL PROCUREMENT

### 2.1 Introduction

This chapter consist the study of material procurement at construction site. The construction industry different from material supplying, manufacturing industry. Material demand problem sometimes occurs due to external events, such as delays in permit, inspection, material quality, availability of material, labor, weather, etc., that can affect the project completion date. Different construction phase specified requirements and project delay in any event based influence the planning phases. The construction major to the two common constrain limitations resource availability and work availability. Work availability process in construction project internal or external depended. The nature related of work dependence normally not control. If as the construction management not fulfill the resource management, the resource management enormous number of resource management and procurement studies.

### 2.2 Concept of Material Procurement:

Procurement is a term describing the purchasing process for goods and services. In building construction, material procurement is the process by which the materials required to construct a building are selected, ordered, invoiced, paid for and delivered to the site. A procurement team, or one or more construction buyers may be responsible for procurement activities for products, materials, plant and subcontractors. They typically work for the main contractor (although sub-contractors may also have buyers on large projects) to ensure that supplies are provided in accordance with the project programme, specification and budget. For more information see: Construction buyer Materials will typically be ordered from the supply chain, often from external suppliers with whom the team may have had past successful dealings, or who may be specified in the contract documents. Procuring materials is a crucial aspect of the construction process as contractors will normally be inundated with requests from suppliers for the provision of goods and services. They must therefore order materials that align with both the client's and contractor's objectives.

The Objectives of material procurement are stated as buying the best item at right Quality, Quantity, Time and Cost. The planning of material procurement and supply in the construction process is accomplished by identifying the optimal ordering period of each material that is changing dynamically to consider the fluctuating demand over the project duration. The construction duration is divided into stages that can be specified by project planners to account for the

changing demand rate of materials and site space availability. Material procurement in each stage is formulated as a fixed-ordering period (FOP) system that replenishes the inventory at the beginning of fixed intervals when new orders are acquired to cover the demand for the succeeding intervals. Accordingly, procurement decision variables are represented by the fixed-ordering period of each material in every construction stage. A preliminary set of these procurement decisions is generated during the planning phase established on the initial construction plan. During the construction phase, the model can also be used to update the generated optimal logistics plans to consider any changes in schedule, site layout, or procurement decisions that may occur during the actual progress of construction operations.

Project management for procurement is usually divided into four major processes: planning, selection, administering and closing procurements. The first part, planning, involves the creation of the official procurement management plan. The decisions made involve which items will be internally procured and which items will be externally outsourced. This information, in turn, will heavily impact the project's budget and financial scope. Sample procurement documents will be prepared and criteria frameworks will be developed to create a selection of potential vendors. This selection matrix is based on the project's scope, schedule, and requirements. Risk factors and budgetary constraints are also considered.

## 3. LITERATURE REVIEW

Material management is important component in construction industry. Various authors have different contribution in their own respective inventory control technique. Purpose of this chapter in report is to highlight the work done on inventory control technique and gives some useful terms which will useful further in this report.

The following are the previous research review based on impact of material management and material procurement on construction project:

**S. Kamalaeaswari (2015) :**

Author states that, in the construction industry to manage a productive and cost effective site, efficient material management is very essential. An important factor that affects the performance of construction projects is the improper handling of materials during site activities. This an effort to analyze the Process analysis of material Procurement management by generating strategies to improve the procurement process in commercial projects. The methodology was applied to study several projects under execution, obtaining important data about the current situation of the procurement process in these projects. From the information gathered from these sources, and from the literature, improvement strategies were obtained and a proper strategic approach to the material Procurement process was proposed. To avoid delays mainly the material planning to be carried out on time with the relevant material details material approval, material lead time, and material delivery and to be properly tracked. One or combination of Information and Communication Technology helps in effective management of materials at various stages of construction. Application of ICT enables the maximum accuracy of estimation of requirements and it is made sure that required amount of material is procured at the project site avoiding the wastages and difficulties in storages etc.

The methodology was based on the literature review, study of cases, casual interviews, surveys, and the analysis of information sources. The study of cases was focused on going commercial building construction projects from which it was possible to obtain specific information regarding the Material procurement process. Identification of the Major problem involved in the material procurement management systems carried out through different literature case studies, case studies and study of Material Procurement management Process processed for the base building construction and the interior fit out of commercial building projects.

**Khaled El-Rayes (2011):**

Author describes, efficient planning of materials procurement and storage on construction sites can lead to significant improvements in construction productivity and project profitability. Existing research studies focus on material procurement and storage layout as two separate planning tasks without considering their critical and mutual interdependencies. This paper presents the development of a new optimization model for construction logistics planning that is capable of simultaneously integrating and optimizing the critical planning decisions of material procurement and material storage on construction sites. The model utilizes genetic algorithms to minimize construction logistics costs that cover material ordering, financing, stock-out, and layout costs. The model incorporates newly developed algorithms to estimate the impact of potential material shortages on-site because of late delivery on project delays and stock-out costs. An application example is analyzed to demonstrate the capabilities of the construction logistics planning model in simultaneously optimizing material procurement decisions and storage layout plans

**T. Subramani(2018)**

Author describes, Good project management in construction means efficient utilization of labor, material and equipment. Development of labor productivity have to be a first-rate and chronic challenge of those who are accountable for cost control of constructed facilities. Material handling, which includes procurement, inventory, shop fabrication and field servicing, requires special attention for cost reduction. The use of latest equipment and progressive strategies has made feasible wholesale adjustments in construction technology in current a long time. Groups which do no longer recognize the effect of diverse innovations and feature now not adapted to changing environments have justifiably been compelled out of the mainstream of construction activities. The frequent problems of construction industry, customers have an essential position to play. With the aid of its procurement methods, the purchaser impacts the manner a construction project is done, because the tactics affect the form of the project delivery system. What sort of procurement procedures are perceived rational, for one, depends at the underlying assumptions about the characteristic of procurement. A recognized guideline in Lean construction (LC) is that production must be conceived along with transformations (T), flow (F), and value generation (V). Alternatively, it is visible necessary to recognize and cope with the risk of value loss with an identical diligence as the other issues had been to date. Materials management plays an important role in project planning and control. Materials represent a major expense in construction, so minimizing procurement or purchase costs.

**Ankitkumar Patel (2019)**

Author describes that, Inventory is important especially in construction project as the proper amount of inventory will ensure that all construction activities will be able to carry out according to the planned schedules. . Majority of companies, business and organization has suffered with improper application of material management techniques. Nearly 60% of money is allotted for the inventory in a project. The main objective of this research is to study the existing material management system of commercial building. Finally to implement a material management system with application of various inventory control techniques. There are many modern control techniques are available like Always Better Control(ABC), Economical order Quantity(EOQ), Fast-moving slow-moving Non-moving(FSN), High Medium Low(HML), XYZ, Seasonal off seasonal(SOS), Vital Essential Desirable(VED), Government ordinary local foreign(GOLF), Scare Difficult Easily(SDE) Analysis.

**RakeshNayak*et.al*(. 2016)**

Author suggested that, construction management of the materials on building construction sites. It deals with, procurement practice method of material on construction site. Construction materials management is a critical component of the construction industry. Materials management is an essential function in terms of productivity improvement in construction projects. It is defined materials management functions which include materials and planning take off, vendor valuation and selection, purchasing, expenditure, shipping, material receiving, inventory and warehousing, and distribution of building materials. Got better scheme of material management in the industries of construction to building construction projects also doing survey of industries and find out the various plane to management of construction material.

It suggests that, Construction material constitutes a major cost component in any construction project. The total cost of material may be 54% 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

**Hemsworth Martinez-LorenteClavel . (2006)**

Author stated that Standardization of materials is one important purchasing department decision. The primary objective of this study is to examine empirically the impact of standardization of materials and purchasing procedures on purchasing and business performance. The results of this research indicate that standardization in purchasing has a significant positive effect on both purchasing and business performance. They gave some points for a better understanding of how standardization in purchasing, operationalized as standardization of materials and purchasing procedures, can impact a firm's purchasing and business performance. Thus, standardizing materials and purchasing procedures is important and may help firms to meet their materials expenditure targets, and increase the quality of materials, on-time delivery from suppliers, and inventory performance.

**4. Conclusion**

This study will show either similarities or differences or both with the purchase situations and the methods of material procurement at construction sites. This study will help out to consider the better and effective method of procurements as well as the necessity to determine the impact of material requirement planning on construction projects.

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