



A Critical Review of Material Management Practices for Enhancing Building Construction Project Performance

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Abstract- Material management is a crucial component of construction project management, as materials significantly influence project cost, quality, and completion time. Inefficient handling, storage, and procurement of construction materials often result in delays, wastage, and cost overruns. This review paper examines various material management strategies adopted in building construction projects, with a focus on planning, inventory control, transportation, storage, and handling of materials. Previous research highlights that effective material coordination from the design phase to project execution can substantially improve productivity and reduce losses. The study emphasizes the importance of adopting systematic inventory control techniques and modern management tools to enhance overall project performance.

Keywords: Material Management, Construction Projects, Inventory Control, Project Performance.

I. INTRODUCTION

Material management plays a vital role in the successful execution of building construction projects. Construction materials constitute a major portion of the total project cost, often exceeding half of the overall expenditure. Therefore, improper planning or control of materials can adversely affect project timelines, budgets, and quality standards. Material management can be defined as a systematic process that ensures the availability of required materials in appropriate quantity and quality, sourced economically, and delivered at the correct location and time.

Construction projects involve bulky, heavy, and expensive materials that require careful planning in terms of procurement, storage, transportation, and handling. Ineffective coordination among these activities often leads to issues such as material shortages, excess inventory, damage, and wastage. Hence, material management must be integrated throughout the project lifecycle, starting from the purchasing stage and continuing until project completion. Efficient material management not only minimizes costs but also contributes to timely project delivery and improved resource utilization.

II. COMPONENTS OF MATERIAL MANAGEMENT

The material management system in construction projects generally includes the following key components:

- **Purchasing:** Selection of reliable suppliers and procurement of materials at competitive prices.
- **Transportation and Handling:** Safe and timely movement of materials to the construction site.
- **Inspection:** Verification of material quality and quantity upon delivery.
- **Storage:** Proper arrangement of materials to prevent damage, theft, and deterioration.
- **Inventory Control:** Monitoring material usage to avoid shortages and overstocking.



III. PROBLEMS OF MATERIAL MANAGEMENT

Construction organizations frequently face challenges in managing materials effectively, particularly in large-scale projects. Common issues include inadequate planning, delayed deliveries, poor communication among stakeholders, insufficient storage facilities, and lack of security at construction sites. These problems can significantly affect productivity and project schedules.

Planning Issues

Poor material planning often results in incorrect estimation, improper scheduling, and delayed procurement. Such inefficiencies reduce labor productivity and may cause interruptions in construction activities.

Delivery Delays

Timely availability of materials is essential for uninterrupted workflow. Delays in material delivery due to supplier inefficiencies or transportation issues can negatively impact project completion time.

Storage Constraints

Construction projects require sufficient and well-organized storage spaces. Improper storage conditions may lead to material damage, quality degradation, and increased wastage.

Security Concerns

Lack of adequate security measures can result in material theft, unauthorized access, and financial losses. Effective security management is essential to maintain a safe and controlled construction environment.

IV. LITERATURE REVIEW

Several researchers have studied the role of material management in improving the performance of construction projects. Their findings emphasize that ineffective material planning and control significantly contribute to cost overruns and project delays.

Karoriya and Pandey (2018) focused on minimizing construction material wastage through systematic planning and control. The study emphasized that effective material handling and inventory control techniques are essential for completing projects within specified time, cost, and quality constraints [1]

Indrasan, Rajput et al. (2018) examined existing inventory control systems in construction organizations and proposed improvements using ABC and EOQ techniques. Their findings showed that scientific inventory management methods help minimize excess stock, prevent shortages, and control cost overruns effectively [2].

Jadhav, Magadum et al. (2018) conducted a case study on Indian residential construction projects to identify factors responsible for delays. Data collected through questionnaire surveys from contractors, consultants, and owners were analyzed using the Relative Importance Index (RII) method. The study recommended improved planning and coordination to minimize construction delays [3].

Mishra et al. (2018) applied the Innovation Action Research (IAR) methodology to address challenges in material information flow and scheduling. The research proposed integrating material planning from



the design stage to the construction phase to ensure timely availability of materials and improved project scheduling [4].

Mohopadkar and Patil (2017) emphasized that inventory management is a critical success factor in construction projects. Their study revealed that material costs account for approximately 60–70% of the total project cost. Proper implementation of inventory control techniques can therefore significantly reduce overall project expenses and enhance project efficiency [5].

Rajgor and Pitroda (2017) discussed the importance of material management during the construction phase, particularly in residential and industrial projects. The study identified key benefits of effective material management such as improved communication, reduced lead time, optimal resource utilization, timely material availability, and better production control [6].

Kulkarni et al. (2017) identified various factors influencing material management on construction sites. Their research highlighted that improper material handling and poor coordination create significant inefficiencies, ultimately affecting project performance and productivity [7].

Kumar, Lilhare et al. (2016) examined inventory management challenges in construction organizations and demonstrated the usefulness of ABC analysis in balancing stock availability and inventory costs. The study concluded that scientific inventory control methods assist managers in identifying critical materials and maintaining appropriate safety stock levels [8].

Soni et al. (2016) analyzed inventory control practices in residential construction projects and reported that the application of systematic inventory management techniques can reduce material costs by nearly 20%. The authors identified poor time management, inadequate cost control, and weak inventory practices as major reasons for project delays [9].

Madhavi, Mathew et al. (2013) investigated material-related problems in the construction industry and concluded that poor material management leads to increased project costs. The study highlighted that construction expenses are largely influenced by materials, manpower, machinery, subcontracting, and overheads. Improper handling and planning of materials create cost variations, whereas effective scheduling helps in controlling overall project expenditure [10].

AkuOkarocha (2013) analyzed factors affecting material management in building construction projects using both primary and secondary data. The study employed multiple regression analysis and concluded that effective material management plays a vital role in cost control, timely project completion, and prevention of project failure [11].

Hadi-Vencheh (2010) proposed an improved multi-criteria inventory classification method by extending the traditional ABC analysis. The study demonstrated that the enhanced Ng-model provides more accurate inventory categorization when compared with conventional ABC techniques, thereby supporting better decision-making in inventory control [12].

V. CONCLUSION & RECOMMENDATIONS

This review highlights that effective material management is essential for minimizing construction delays, controlling costs, and maintaining quality standards. Inefficient material handling and poor inventory control often lead to wastage, project delays, and financial losses. Implementing structured



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material management practices from the design stage through project execution can significantly enhance construction efficiency.

It is recommended that construction organizations adopt modern inventory control techniques such as ABC analysis to monitor material usage and reduce unnecessary stock. The use of project management software like MS Project and Primavera can further improve planning accuracy and coordination. Additionally, top management involvement is crucial in ensuring proper supervision of material related activities. By strengthening material management systems, construction projects can achieve timely completion, cost efficiency, and improved overall performance.

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