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TRACKING OF MATERIAL MANAGEMENT ON SITE BY USING ANALOGY BASED SYSTEM

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Abstract: Effective material management is crucial in construction and industrial projects, as it directly impacts costs, timelines, and project success. Traditional material tracking methods can be inefficient and error-prone, often leading to delays and budget overruns. This study proposes an analogy-based system for material tracking, designed to improve accuracy and efficiency on construction sites. By drawing comparisons to established logistics and inventory management practices, the system leverages technology such as RFID tagging, GPS tracking, and real-time data processing to monitor material movement and usage. The analogy-based approach helps adapt proven strategies from other industries, like retail and manufacturing, to suit the unique demands of a construction site. Implementing this system not only enhances accountability and reduces waste but also provides stakeholders with transparent, up-to-date information, improving decision-making and resource allocation. Field trials demonstrate the system's effectiveness, indicating significant potential for broader adoption in the construction industry to streamline material management and support project objectives.

Index Terms **- Component, formatting, style, styling, insert.**

1.1 INTRODUCTION

The supply of building materials is one of the main problems when planning construction on site. Due to the lack of space on the construction site in the city centre, almost every construction site has problems with the supply of material, how to manage the amount of material, delivery time and storage area during construction activities. For example, an inappropriate storage area will lead to misplacement of materials. Moving misplaced materials wastes a significant amount of time, reduces construction efficiency and leads to financial burden. The goal is to ensure that the project workforce receives the right materials in the right quantities and in the right places at the right time. Additionally, most site layout planning for a project is based on the contractor's previous experience and is designed only once before actual construction begins, without considering the dynamic nature of supply issues such as changes in material requirements, quality, and availability. on site in successive phases of the project. The Current research on on-site material handling using

Radio Frequency Identification (RFID) technology to track on-site material to confirm material requisition; which initiated the development of a new congested construction logistics planning (CLP) system that enables optimal use of the interior spaces of buildings. It includes the relocation of some non-critical activities to create more internal space for material storage; develop a systematic procedure and a computer tool for optimizing the delivery and inventory management of materials as part of a comprehensive material management system in construction projects; and the second is about optimizing the material layout on site, developing a material management system based on RFID and DPS, and realizing real-time material management, which creates a material layout evaluation model (MLEM) based on material accessibility, classification concept for space integration. and time to improve material availability and reduce time wastage; presented the development of a new Congested Building Logistics Planning (CLP) model, which is able to model and use the interior spaces of buildings under construction to create optimal logistics plans; uses a genetic algorithm (GA) to efficiently place structural materials and minimize excessive movement of structural materials. Most studies have focused on one or two issues, i.e. material quantity, lead time and storage space. Although they have proposed relevant solutions, a project-level scheme requires simultaneous consideration of these issues. Existing solutions are based on a one-time optimization of the assumed scenario without taking into account the dynamic nature of changes within the construction schedule. The reason for these difficulties lies in the fact that there is no information integration tool that underlies information sharing in on-site material supply management. BIM technology provides a potentially valuable tool for generating solutions to problems encountered on site during material delivery. BIM is a highly integrated project information tool that is used to build a model on project data with a range of project-related information and then use the information model to support project design, construction and operations. A suitable onsite supply model can realize a reasonable arrangement of on-site materials and help improve production efficiency. This article describes the use of BIM technology to create a dynamic model for the supply of materials to a construction site with respect to material quantity, lead time and storage area based on a construction schedule.

1.2 Scope Of The Work

To create a systematic procedure and a computer tool for optimizing the supply and inventory of building materials as part of a comprehensive system of material management in construction projects. A newly designed approach that uses Genetic Algorithms (GA) to optimize material delivery schedules and related inventory control.

1.3 Methodology Scope

The first step is to find a gap between the existing method and another method using a technological tool for material tracking and management, which includes the collection of information about the material management currently present on the construction site, its regulation and the tracking process. The research described in this paper aims to develop a comprehensive, informative and practical BIM-based model for construction site material supply. The model correlates dynamic material requirements models with the site layout and generates site drawings at all levels as well as a material supply schedule. Information about the dynamic material requirements model (4D model) is obtained from the construction schedule and from the building design information. The construction schedule, which is the core of the entire model, is necessary to determine the delivery time of the material. At the same time, it can support the building design process to confirm the number of required materials at each stage of construction. The site layout model comes from linking the 4D model and field information. The location information includes static and dynamic information and is the basis for confirming the material storage area. Static information refers to the site drawings (including building location, access routes, location of major equipment and workplaces, etc.) of each phase generated by the building design and converts the site drawings into polygons that represent the total area of the site. A case study approach was adopted to explain the dynamic model of material supply at the construction site, which was developed based on a detailed literature review and site survey. In the case study, design and construction data were obtained from the project's general contractor, and CAD drawings and construction schedule were obtained from the project owner and contractors. The research consists of two main parts: (1) Material supply management requirements for construction sites; (2) Creating a dynamic model based on BIM. Validation of the proposed model is obtained through a case study of the perimeter shell construction at the Wuhan International Conference Centre. The work on the outer shell was completed without delay due to the control of material supply at the construction site. A brief explanation and application of the two-phase approach of this research is presented in the following sections

1.4 Material Supply Management Requirements for Construction Sites

1.4.1 Functional Analysis

The main functions of material supply management on the construction site include the following parts: • Material delivery time management is to determine the material delivery time at each stage of construction and allocate materials for proper delivery based on the construction schedule. • Material quantity management is to determine the quantity of materials used at each stage of construction and deliver the required quantity of materials to the construction site according to the building design and construction schedule information. • Material storage area management is to ensure that the exact placement of materials in the storage yard can be arranged according to site conditions.

1.5 Problem Statement

To study current material tracking practices and develop an analogy-based system to track material management on site.

1.6 Objectives

The objectives of this research work are

• To collect the information of factor affecting to maintain proper availability of material on site.
• To establish a model to regulate the material flow in proper time by managing placing order and payment.
• To generate an analogy-based system which will optimize the order and follow the process of reclamation also.
• To compare the results after using the system with the site results without using the analogical system.

CONCLUSION

The case study above concluded that large firms are good enough and capable of using material management techniques on construction sites. Medium-sized companies have some technical and seasonal problems because they do not use any software. Small firms lag behind in materials management compared to medium and large firms due to lack of knowledge about materials management.

The following recommendations have been made with respect to all sizes of construction companies:

- Top management should pay more attention to material management to manage the existing plant. Utilization of software like MSP, PRIMAVERA, ERP, SAP etc. was used to avoid manual errors in material management.
- Avoid delays due to rejection of materials by quality control department or seasonal issues, construction companies should store extra materials like steel, cement etc. for emergency purposes and this tracking is possible with advanced material management tools.
- To reduce wastage due to improper material handling, material handling equipment such as conveyor belts, trolleys, cranes, etc. should be used and economic order quantity should be used for inventory value analysis.
- Before placing any order, every construction firm should use the EOQ technique to reduce project cost overruns.
- Finally, a satisfactory approach to optimizing and resolving material delivery schedules and associated inventory levels. However, it is believed that more complex projects with multiple materials involved could still be optimized within a reasonable processing time.
- These are the following major factors to the organization supply chain collaboration:

Improved customer services, improved quality assurance and benefits to the client.

- These are the following major factors that affect the development of a successful supply chain relationship with clients: Creating standardization of processes, top management support and reliability of supply.
- These are the major factors that benefit to using Supply chain management: Cost saving, better quality and quantity of information and financial management.

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