INTERNATIONAL JOURNAL OF PURE AND APPLIED RESEARCH IN ENGINEERING AND TECHNOLOGY

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MATERIAL MANAGEMENT FOR CONSTRUCTION SITE –A REVIEW

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Accepted Date: 05/03/2015; Published Date: 01/05/2015

Abstract: The highly competitive environment, linked to the globalization phenomena, demands from industries more agility, better performance and the constant search for cost reduction. This goal can be achieved by improvements in internal materials handling management. Materials handling is intrinsically associated with production flow. This paper revealed the development in the material management on fast track construction using different research models and technologies. This literature review will definitely help to improve different material management for successful completion of construction project sites.

Keywords: Material Management, Construction, Cost Reduction

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Access Online On:

www.ijpret.com

How to Cite This Article:

Aditya Pande, IJPRET, 2015; Volume 3 (9): 294-303

PAPER-QR CODE

INTRODUCTION

Different researchers provide different definitions for material management. Therefore, different definitions can be found in different references. Basically, material management is concerned with the planning, identification, procuring, storage, receiving and distribution of materials. The purpose of material management is to assure that the right materials are in the right place, in the right quantities when needed. The responsibility of the material management department is flow of materials from the time the materials has been ordered, received, and stored until they are used with the basis of material management.

Construction materials constitute a major cost component in any construction project. The total cost of installed materials (or value of materials) may be 50% or more of the total cost (Stukhart 1995, Bernold and Treseler 1991), even though the factory cost may be a minor part of the total, probably less than 20-30%. This is because the manufactured item must be stored, transported, and restored before it is put in place or "consumed" at the site. The total cost of materials will include, in addition to the manufacturer selling cost, the cost of procurement (cost of placing processing and paying the material, physical distribution, the distributor's cost, and the transportation of materials), and the site-handling costs (cost of receiving, storage, issuing, and disposal). The efficient procurement and handling of material plays a key role in the successful completion of the work. It is important for the contractor to understand that there may be significant difference in the date that the material was requested or date when the purchase order was made, and the time at which the material will be delivered. These delays can occur if the contractor needs a large quantity of material that the supplier is not able to produce at that time or by any other factors beyond his control. Chandler (1978) states that, construction materials can be classified into different categories depending on their fabrication and in the way that they can be handled on site. He classifies the materials into five categories. They are:

- Bulk materials - these are materials that are delivered in mass and are deposited in a container.
- Bagged materials - these are materials delivered in bags for ease of handling and controlled use.
- Pelleted materials - these are bagged materials that are placed in pallets for delivery.
- Packaged materials - these are materials that are packaged together to prevent damage during transportation and deterioration when they are stored.
- Loose materials- these are materials that are partially fabricated and that should be handled individually.

Stukhart (1995) states that the main categories of materials encountered in a construction project are engineered materials, bulk materials, and fabricated materials.

- Bulk materials- these are materials manufactured to standards and are purchased in quantity. They are bought in standard length or lot quantities like pipes, wiring, and cables. They are more difficult to plan because of uncertainty in quantities needed.
- Engineered materials- these materials are specifically fabricated for a particular project or are manufactured to an industry specification in a shop away from the site. These materials are used for a particular purpose. This includes materials that require detailed engineering data.
- Fabricated materials- these are materials that are assembled together to form a finished part or a more complicated part. Examples of such materials include steel beams with holes and beam seats.

Stukhart (1995) defines material management as the activities involved to plan, control, purchase, expedite, transport, store, and issue in order to achieve an efficient flow of materials and that the required materials are bought in the required quantities, at the required time, with the required quality and at an acceptable price.

Importance of Materials for a Project

Problems related to managing the flow of materials can be found in every organization. The efficient management of materials plays a key role in the successful completion of a project. The control of materials is a very important and vital subject for every company and should be handled effectively for the successful completion of a project. Materials account for a big part of products and project costs. The cost represented by materials fluctuates and may comprise between 20-50% of the total project cost and sometimes more. Some studies concluded that materials account for around 50-60% of the project cost (Stukhart, 1995 and Bernold and Treseler, 1991). Materials are critical in the operations in every industry since unavailability of materials can stop production. Special attention should be given to the flow of materials once they are procured from suppliers. It is obvious that materials should be obtained at the lowest cost possible to provide savings to the company (Damodara, 1999). In the late 1970's, construction companies experienced an increase in costs and a decrease in productivity. Owners of these companies thought that these increases in cost were due to inflation and economic problems. Further research concluded that these companies were not using their resources efficiently and that the decrease in productivity was also attributable to poor management (Stukhart, 1995). Material management has been an issue of concern in the construction

industry. 40% of the time lost on site can be attributed to bad management, lack of materials when needed, poor identification of materials and inadequate storage (Baldwin et. al, 1994).

Benefits of Material Management

An effective material management system can bring many benefits for a company. Previous studies by the Construction Industry Institute (CII) concluded that labor productivity could be improved by six percent and can produce 4-6% additional savings (Bernold and Treseler, 1991). Some of benefits are:

- Reducing the overall costs of materials
- Better handling of materials
- Reduction in duplicated order
- Improvements in labor productivity
- Improvements in project schedule
- Quality control
- Better field material control
- Better relations with suppliers
- Reduce of materials surplus
- Reduce storage of materials on site
- Labor savings
- Stock reduction
- Purchase savings
- Better cash flow management

Development in material management

The lack of technological change is a primary argument supporting the belief that construction productivity has been declining since the 1960s (Rosefielde and Mills 1979). This belief in declining productivity, which influences workforce strategies, technology adoption, research programs, and industry perceptions, is based on a number of productivity studies using industrial and macroeconomic data. Studies completed in the 1980s reported that construction real output value added per work hour declined by an annual rate of 2.4 to 2.8% between 1968 and 1980. More recently, studies using industry data from the United States Department of Commerce and

the U.S. Bureau of Labor Statistics (BLS) indicate that construction's labor productivity declined from 1964 to 2000 at an annual compound rate of 0.72% Teicholtz 2000. Other evidence contradicts these measures. Previous research examined labor and partial factor productivity trends using microeconomic data for 200 activities Goodrum et al. 2002. The results indicated widespread improvement in construction productivity across multiple construction divisions, ranging from 0.2 to 2.8% per year between 1976 and 1998, especially in machinery dominated divisions such as site work. In addition to these measured improvements, there is also much anecdotal evidence shared by industry leaders that productivity has actually improved Bernstein 2003; Tuchman 2004. Some economists, researchers, and industry observers believe that little technological change occurs in the construction industry. Construction has not adopted assembly lines and robotics to the extent that other industries have; however, there have been significant technical advances in construction techniques, machinery, and methods. For example, advancements in on-board microprocessors and hydraulic controls allow excavator operators to more precisely control their boom and shovel position, to function with larger operating envelopes, to more accurately monitor engine and other system parameters, and to quickly diagnose critical system failures. Previous research indicated that many of the productivity improvements at the microlevel were related to changes in equipment technology Koch and Moavenzadeh 1979; Goodrum and Haas 2002; Goodrum and Haas 2004. However, one measure of technology advancement is expenditures on research and development R&D, and it is clear that construction lags behind other industries in this regard. According to a recent study by Hassell et al. 2001, the construction, building, and housing industry is believed to invest less than 0.5% of the value of its sales in R&D, while the national average is approximately 3%. The study examined R&D expenditures not only in regard to new developments in construction methods but also new developments in construction products. Thomas *et al* (2005) suggested that to fill a void created by the absence of fundamental principles of site construction management. Efficient material management is essential to managing a productive and cost efficient site. Nvon, *et al* (2005) studied that Materials resources constitute a large portion of a project's total cost and this makes them an important and attractive subject to control. Proper control and management of materials can meaningfully increase productivity by 6%, or more. Caldas *et al* (2006) suggested that automated tracking of materials on construction projects has the potential to both improve project performance and enable effortless derivation of project performance indicators. Caldas *et al* (2008) studied that Materials management is an integrated process that consists of the people, organizations, technology, and procedures used to effectively identify, quantify, acquire, expedite, inspect, transport, receive, store, and preserve the materials, equipment, and associated information across the life cycle of a capital project. The goal is to ensure that the correct quality and quantity of materials and equipment are procured in an effective manner,

obtained at a reasonable cost, and available when needed. The implementation of a comprehensive materials management program contributes to more-predictable project outcomes, reduced costs, improved productivity and quality, and a safer working environment. Goodrum *et al* (2009) studied that there have been substantial changes in both material technology and construction productivity over the past several decades. By analyzing the changes in both material technology and productivity among 100 construction activities from 1977 to 2004, this research examines the strength and types of relationships that exist within these two occurrences. Kasim *et al* (2011) studied that Construction materials usually constitute a major portion of the total cost in a building construction project. Despite the potential benefit of Inventory control technique, convincing construction organizations to embrace its use and implementation has proved a difficult task. This research seeks to identify the implementation of ICT in construction materials management processes and to investigate on the acceptance of contractors for ICT transformation to the materials management in construction projects. Vyas *et al* (2011) have suggested that there should be a centralized material management, system and Team co-ordination between the site and the organization. Also the proper control, tracking and monitoring of the system is required on construction sites. Mathew *et al* (2013) have shown that. The main problem of procurement is related to schedule delays and lack of specified quality for the project. To prevent this situation it is often necessary to dedicate important resources like money, personnel, time, etc. To monitor and control the process. A great potential for improvement was detected if state of the art technologies such as, electronic mail, electronic data interchange (EDI), and analysis were applied to the Procurement process. Patil *et al* (2013) mention that the efficient procurement of material represents a key role in the successful completion of the work. Poor planning and control of material, lack of material when needed, poor identification of material, re-handling and inadequate storage cause losses in labor productivity and overall delays that can indirectly increase total project cost. Pandey *et al* (2013) have studied, the economic growth as well as urbanization in developing countries have led into extensive construction activities that generate large amounts of wastes. Material wastage in construction projects resulted into huge financial setbacks to builders and contractors. In addition to this, it may also cause significant effects over aesthetics, health, and the general environment. These wastes needs to be managed as well as their impacts needs to be ascertained to pave way for their proper management, however in many cities of India wastes materials management is still a problem. They have discussing the method for the management and control of waste construction materials. Caldas, et al (2014) they have suggested that Materials management is an integrated process that consists of the people, organizations, technology, and procedures used to effectively identify, quantify, acquire, expedite, inspect, transport, receive, store, and preserve the materials, equipment, and associated information across the life cycle of

a capital project. The implementation of a comprehensive materials management program contributes to more-predictable project outcomes, reduced costs, improved productivity and quality, and a safer working environment.

Latest technologies used in material management

Nowadays new technology is adopt for improving proper material management system by using some software technology in construction industry the software are used liked System Application & product (SAP), Jovix™, ERP, and cloud computing technology used in ICT implementation.

SAP - System Application & Products

(SAP) is basically designed to create a common centralized database for all the applications running in all the departments in an organization. The kind of application you can manage includes –

- Logistics
- Finances
- Reporting, HR etc

The original name for SAP was Systeme, Anwendungen, Produkte (In German). The system comprises of a number of fully integrated modules, which covers virtually every aspect of the business management. The Key benefits of SAP are:-

It eliminates the duplication and redundancy in data.

Increases productivity, efficiency and better management of resources. Improves Customer Service through better Customer Interaction.

The potential benefit of SAP Technology

- Rapidly adopt new technologies and applications by using a flexible platform designed for change
- Extract value from big data using industry-leading business intelligence and in-memory computing
- Mobilize your workforce with secure access to business information and systems – on any device
- Boost business and IT efficiency with integrated on-premise and cloud-based platforms
- Take advantage of continuous innovation by tapping into the SAP ecosystem and channels

Cloud Computing With SAP

Tap into the rapid innovation that the Cloud enables and adapt your processes quickly to ever changing market dynamics and customer needs. Right now, you can manage your entire business – HR, finance, customers and procurement in the cloud with the most comprehensive cloud computing portfolio on the market. SAP gives you the cloud, your way. Choose your devices and your delivery method – private cloud, public cloud, or managed services. Go 100% cloud or create a hybrid environment with the unified SAP HANA Cloud Platform. See the full benefits of cloud computing. Take advantage of seamless integration, best-of-breed solutions, and expert consulting services – from the company that runs the world's largest cloud implementations.

Enterprise Resource Planning (ERP)

Enterprise Resource Planning (ERP) software has streamlined the inventory tracking process to a large degree by moving it from a paper file folder to a digital database. But if your inventory isn't next to the computer, you still have to write it down on a piece of paper, walk over to the computer, and then manually enter the data into the system. This takes time and opens the door to the mistakes that inevitably occurs with hand-written data. With the development of mobile technologies, materials management has finally entered the 21st century. Integrating the latest in barcode scanning, handheld printing, and mobile device technologies, ERP software is rapidly redefining the way companies perform the materials management process. The mobile materials management is giving manufacturers unprecedented levels of speed, visibility and control to shipment, purchase, order receipt, inventory, transport and more. With mobile material management system, all these activities are quickly and easily accomplished, and then wirelessly recorded and managed in the ERP system, thereby ensuring the accuracy and integrity of the data.

Jovix

Jovix™ is a solution to design and support complex multi-site material control processes for large, industrial construction projects. The Jovix™ platform drives value to construction by automating site materials management workflow processes and providing actionable, real-time information about the availability and location of materials, ensuring visibility and traceability throughout the Engineering, procurement and construction (EPC) material lifecycle. Jovix™ is proven to:

- Locate materials up to 9 times faster

- Increase direct labor productivity
- Eliminate the need for material re-orders

Jovix™ can be used to track material throughout the supply chain from fabricators and equipment manufacturers to marshalling yards to multiple warehouses and laydown yards along the way. The solution provides a single source of truth for the location and status of critical materials required on construction projects.

Conclusion

In this paper we have review and studied the development that is going in the material management on fast track construction. We also studied different research models of material management and also study about the recent-information technology is used in it. this literature review will help to improve different material management for successful completion of construction project sites.

REFERENCES

1. Chetna M. Vyas "Construction Materials Management on Project Sites" Department of Civil Engineering Vallabh Vidhya nagar, Gujarat, India National Conference on Recent Trends in Engineering & Technology May 13-14 2011

2. Paul M. Goodrum "Relationship between Changes in Material Technology and Construction Productivity" JOURNAL OF CONSTRUCTION ENGINEERING AND MANAGEMENT © ASCE / APRIL 2009

3. "Material management in Construction" Steve Varghese Mathew in International Journal of Research in Engineering and Technology, IC-RICE Conference Nov.2013

4. Narimah Kasim "ICT Implementation for Materials Management in Construction Projects: Case Studies" KICEM Journal of Construction Engineering and Project Management Online ISSN .Vol 6.pp 22-33. 2011.

5. Ashwini R. Patil "Analyzing Material Management Techniques on Construction Project" International Journal of Engineering and Innovative Technology (IJEIT) Volume 3, Issue 4, October 2013

6. R.K. Pandey, "Study of Management and Control of Waste Construction Materials in Civil Construction Project", Assistant Professor, Department of Civil Engineering, International Journal of Engineering and Advanced Technology (IJEAT) ISSN: 2249 – 8958, Volume-2, Issue-3, February 2013

7. Hisham Said, "Optimizing Material Procurement and Storage on Construction Sites" Journal of Construction Engineering and Management, Vol. 137, No. 6, June 1, 2011. ©ASCE, ISSN 0733-9364/2011/6-421–43

8. Carlos H. Caldas,"Materials Management Practices in the Construction Industry" Practice Periodical on Structural Design and Construction, © ASCE, ISSN 1084-0680/04014039(2008).