

DEVELOPING A MODEL FOR EFFECTIVE CONSTRUCTION SITE LOGISTICS MANAGEMENT

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Abstract— The construction industry is often slower to adopt new technologies than other industries. Yet the construction industry shall embrace these technologies sufficiently in order to keep up with advances in other trades. One of the most crucial elements in construction management is productivity. And the adopting of new technologies such as mobile-based application can increase construction project productivity in such areas as materials management, tool use time, and labour motivations. During the project we studied and analyzed the data to investigate and improve the logistic situation at a construction sites situated in Pune. During the study we found that there is a lack of general knowledge regarding material and site logistics in construction projects in Pune. As a result, there are many unnecessary movements on site interrupting overall output on site and displacing direct value-added activities. Therefore, the purpose of this paper is by practical observations and site interviews, earlier studies, to investigate the existing logistic approach on the construction site, as well as to provide proper logistic strategy for improving construction process.

Keywords— Construction logistics management, advanced mobile-based application technologies, engineering, equipment, materials, project, site, transportation, technologies.

I. INTRODUCTION

Completing any construction project in a time with their numerous constraints requires the skillful integration of many aspects. One of these aspects, which play a crucial role in ensuring that construction projects are completed successfully, is labor productivity. Construction project sites are impacted by several factors that affect the efficiency of a workforce by reducing their overall productivity. Such a loss of efficiency interferes with the performance of an entire project, and reduces management's chances of meeting project quality, budget, and time objectives. Conversely, by increasing overall productivity through improving labor force productivity, construction companies would reap many more benefits from their projects. One of the most obvious causes of lost productivity is the poor management of materials, equipment, and tools—or “logistics management”. Hence, construction logistics can be defined as “the management of the flow of

materials, tools, and equipment (and any related object) from the point of discharge to the point of use or installation.

The previous investigation showed that in any construction project, the material costs generally occupies the engineering project construction cost 65%-70%, whereas the delivery of these generally accounts about 17%, i.e., the physical distribution expenditure will approximately contributes the Construction Project cost about 10% - 11%.^[2] The Construction Site Logistics mainly comprises of two major Factors- Material Logistics & Supply Chain Management.^[2]



Fig 1: Logistics Process of Construction Project

1.1 PROBLEM STATEMENT

Enhancing Construction is a dynamic, competitive, ever changing and challenging industry. There are large number of reasons which causes the delay in any Construction project. There are various point of views by which we can compare the conventional site logistic system, The construction Site Logistics process in Pune has the following basic characteristics:

A. The Distribution of logistics process

It includes the gathering physical distribution, all materials and the equipments are transported finally to construction site to complete the project using these materials. The owner or the investor are consumers, usually before the construction process starts, it is required to determine, the construction completed through the various quality testing department and so on examination, is considered qualified, considered the project to be completed. This creates the contrast with the Industrial enterprise's production physical distribution process. Generally Industrial enterprise's production physical distribution process not only includes the

inflow of material, but also includes the product outflow, every product by the plant production, assigns for many consumers or the producer. Some also have the characteristics of recycling physical distribution, thus, the physical distribution process circulation continues.

B. Major uncertainty and non-Uniformity

There is huge non uniformity in construction project production process and the transportation process, which results in frequent various project changes, causes the resources demand and supplies non-uniformity. There is high uncertainty in any construction logistic system, the perfect material forecast demand changes the plan with difficulty frequent, which causes the material demand uncertainty in huge amount, the very difficult traditional enterprise such to form the accurate material detailed list, simultaneously, is also not easy to control and maintained the stock accordingly. Thus these physical distribution plans frequently need to revise due to such influences.

C. flexible, complex and more diverse system

Any Construction project requires wide range of diverse materials. Some bulk materials includes steel, cement, sand, etc. requires large-scale logistics facilities and equipment to complete loading and unloading and need more space storage at site. Whereas, some materials require special packaging, loading, transport, unloading and storage systems at site. These factors have huge impact on any construction logistics. Packaging of materials, its transportation, warehousing and other technical requirements, increases the difficulty and makes the logistics system to make it more complex and diverse.

D. Storage /High costing issues

The storage space constrain is the main issue in almost all construction projects. The high land and operating cost are also some important factors to look for, especially in urban areas such as Pune. In case of Industrial projects or the Warehouse construction projects, it is generally temporary structure which gets removed after the completion of the said project which makes on-site storage costs particularly high.

II. NEED OF PROJECT

According to previous research the need for better logistics solutions in construction projects is evident. Poor logistics not only results in delayed projects but also gives a poor image of the construction industry.

At present, the material procurement process for construction projects in Pune is only connected or linked with contracts that being purchased at cheaper price with certain specified standard specifications. Many a times the supplier or

manufacturer is being asked to deliver these kinds of materials at lower rates. We found no motivation to work in developer's interest. Some advantages for individual firms in the supply chain comprises of:

1. Reduced real costs, with margins maintenance.
2. Incentive to remove waste from the process.
3. Greater certainty of out-turn costs.
4. Delivery of better underlying value to the client.
5. More repeat business with key clients.

We believe that our work will help the construction companies in Pune region to look on the logistics issue from another angle and realize the possibilities for further improvement within the field of material and Site logistics. This will probably contribute to more effective logistics solutions characteristics.

III. SCOPE OF PROJECT

The Study mainly focus on the studying the Construction Logistics Process and Investigate the Current Logistic Situation in Construction Industries in India. As well as we shall analyze and optimize the Material Flow and Site Transport. Most construction projects suffer from unnecessary activities on site. This indicates the need for improving construction logistics. Thus, the research questions that have been studied are:

1. How does construction logistics of an apartment building project work in practice?
2. How much time do construction workers spend on material handling?
3. How does the current logistics solution affect the construction process?
4. How to improve construction logistics in order to reduce the time workers spend on material handling?
5. To Propose/ Develop a systematic model for efficient logistic system.

IV. AIM AND OBJECTIVE

Aim of the study is to identify, rank and recommend the major causes of cost overrun and escalation in the construction projects. The certain main objectives of this study include:

1. To Study Construction Logistics Process as Well as To Analyze and Optimize the Material Flow and Site Transport.
2. To Investigate the Current Logistic Situation in Construction Industries.
3. To develop a model for Improvement in the site logistics.

V. METHODOLOGY

1. It consists of introduction, history, advantages and disadvantages, salient features. Also introduce the objectives of this study.
2. Literature review related to the project.
3. Study the Construction logistics process.
4. New methods for Construction Logistics.
5. Supply chain management.
6. Developing the logistics process.
7. Conclusion and lastly discussed on future scope of this project.

VI. DATA COLLECTION

The focus of our study is material deliveries, their storage and Logistics at Site. We have regularly visited the construction sites and did observations and documentations of all bigger deliveries to the site. This helped to investigate how material deliveries are handled when coming to site. We have also measured how long time does it take for workers to pick right material and move it to the right place.

Information comes from site observations where we, for the period of 6 month, chose to observe each bigger delivery to the construction site. We also followed workers who handled material deliveries. Time that it took for construction workers to carry materials has been documented. Observations have been done during the architectural stage of the project. During our study, interviews have been conducted with people involved in the project, both with workers, supervisors and managers.

Table 1: Project information

Project	1	2
Name of Project	Parkland	K11 La Vida
Location	Ghorpadi	Balewadi
Developer	YashVastu Developers	Kakkad Properties
Total B/u Area	9,47,000 Sqft	5,50,000 Sqft
Number of Buildings	Ph1 – 4 no's and Ph2 – 4 nos	2 nos with Commercial
Number of Floors	3P + 12 and 3P + 20	3P + 298
Number of tenements	700 nos	298 nos
Construction Period	June 2016 to Feb 2022	Aug 2018 to Dec 2020

6.1 Sample Observations

Table 2: Sample Data Observation

Sr No	Material	Project A	Project B
1	Type of Material	AAC Blocks	AAC Blocks
2	Quantity Required	2000 Nos	2500 Nos
3	Procured Quantity	2000 Nos	1500 Nos
4	Lead time required	7 Days	5 Days
5	Unit Price per Block	Basic Price – Rs 70 per Block Transport – Rs 0.30 per Block	Basic Price – Rs 69 per Block Transport – Rs 0.45 per Block
6	Time Taken to Deliver at site	9 Days	6 Days
7	Working Hrs. incurred for Unloading at site	8 Hrs.	6 Hrs.
8	Location of Unloading/ Storage	Unloaded at multiple locations as per its utilization	Unloaded at Ground Floor
9	Location where it is being used		At 10 th Floor

VII. NEW MODEL DEVELOPMENT

During the data collection and analysis, we observed that the current process was inefficient with respect to logistics management. There is no any tracking system for procurement of materials, their transportation and stacking at site. The initiation of Purchase orders, keeping track of all its implications during transport and receiving at site, keeping everybody involved well informed about order progress, and simplifying access to information were the major issues.

Therefore, we feel need to simplify and facilitate the communication process on construction sites and among the project participants such as Clients, Supplier, Managers, Contractors etc. The mobile application would be used to track the entire logistic process and to keep everyone involved in project well informed about status to minimize the flaws.

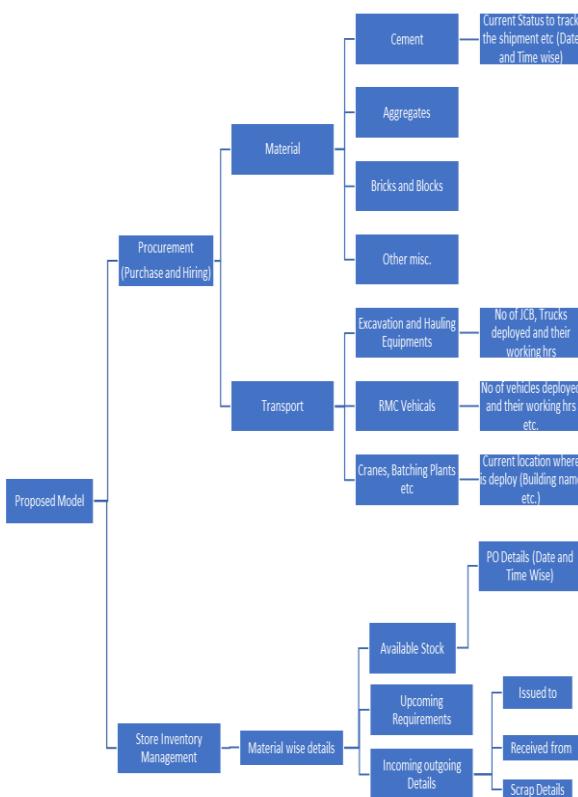


Fig 2: Schematic idea of proposed model

This model will help to,

- For procurement/ To order materials
- To Track, receive and accept shipments
- To update and Maintain Store inventory
- To manage and expedite the flow of information with all Participants of Project

VIII. CONCLUSION

The purpose of this study is to examine the current scenario of construction logistic processes in Pune area and to identify the factors required to make it more effective. During the study we observed that the construction logistics is somehow underestimated by construction companies and that can impact many factors including Overall Cost and time consumption,

material wastages, environment production, production time etc. of the project.

Thus, we felt to introduce an effective model in the form of mobile application which will facilitate the communication process among project parties. The application will enhance the communication process between project participants and will surely reduce most of factors that causes poor logistics management such as unavailability of material, double handling of material, the overlapping of activities, and the disturbances due to various equipments simultaneously. We believed that the application would help construction industry to enhance its site logistics management practices which ultimately improve the overall productivity of the project in given time.

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