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Lean Construction Technology

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Abstract Lean Construction is an effective approach to improve efficiency, productivity, and waste reduction in the construction industry. This study investigates the use of Lean tools such as the Last Planner System, Takt time, and visualization techniques to improve project performance. The research highlights how Lean implementation can reduce waste, improve planning, and complete projects earlier than scheduled. A live case study of residential projects in Nashik was conducted to demonstrate the optimization of time and cost by reducing non-value-adding activities..

Key Words: Lean Construction, Waste Minimization, Last Planner System, Productivity

1.INTRODUCTION

Construction is a very old industry. The problems of construction are well-known. Construction productivity less than that of manufacturing. Occupational safety is notoriously worse than in other industries. Due to inferior working conditions, there are work force shortages in many countries construction sector. The quality of construction is considered to be insufficient. A number of solutions or visions have been offered to relieve the chronic problems in construction. Solutions are in the form of development of various specialized tools like CPM (Critical Path Method), Gantt charts, EVA (Earned Value Analysis), etc to plan and control projects which have proved to be ineffective for fast paced and change prone construction projects. We hear the term “lean” used very often today, usually associated with lean manufacturing, lean thinking, lean production, and lean construction. There are many arguments and debates on what each of these have in common or what their differentiators are. The single undeniable similarity is that they all use the word “lean”. So, what does “lean” really mean? The word “lean” has many meanings and uses. Another use of the word “lean” is to sway towards an opinion. This definition may be the most applicable for the industry use of “lean”, as a common factor in all lean thinking ideas or principles is that it requires adopters to “lean” or sway a new direction, and change their mindset and philosophy. This white paper will explore lean construction and how advances in technology are making implementation of lean construction practices achievable for the industry, with core functionality built into the products as standard out-of-the-box features.

2. NEED FOR LEAN IN CONSTRUCTION

Conventional managerial methods often violate flow design principles, leading to non-optimal flows and an expansion of Non-Value Adding (NVA) activities. There is a critical need to minimize "Muda" (waste) such as waiting time, rework, and excess inventory

3. RESEARCH METHODOLOGY

The methodology section outlines the plan and tools used for data collection and analysis..

- **3.1 Data Collection**:
  Data was collected from residential sites managed by Vecttor Buildtech Pvt. Ltd. and Jagtap Construction.
- **3.2 Lean Tools Applied**:
  - **Last Planner System (LPS):** Collaborative planning to smooth workflow and reduce uncertainty.
  - **Takt Time:** Defining the maximum time per unit allowed to produce a product to meet demand (T = Ta/Td).
  - **Value Stream Mapping**: Identifying steps from beginning to end to eliminate the 7 wastes.

4. RESULT AND DISCUSSION

The study analyzed excavation activities at two sites:

Case Study 1: Poor planning led to 24.794 m^3 of extra excavation, causing a wastage of 112 minutes and 1,400 Rs in extra costs.

Case Study 2: Extra excavation of 120.99 m^3 resulted in a 4-day delay and a loss of 7,920.84 Rs.

Comparison: By applying Takt time, the required pace was identified as 13.3 min/m^3 for Site 1 and 2.77 min/m^3 for Site 2 to meet deadlines

4.1 Results of Descriptive Statics Of Lean Construction Variables

Table 4.1: Descriptive Statics

Sr. no	Activites	Actual Time Taken By JCB	TAKT Time For JCB
1	Excavation Site (1)	5.17min/M3(11hr)	2.83min/M3 6hr
2	Excavation Site (2)	8.130min/M3 17.30hr	2.77min/M3 6hr

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