

# Lean Construction Technology

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**Abstract:** Construction is a very old industry. The problems of construction are well-known. Construction productivity lags 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. By embedding these lean principles in the software, technology is creating lean tools that will become a major differentiator in shifting the construction paradigm, and delivering maximum value to the industry.

**Keywords:** Lean construction technology.

## 1. Introduction

Lean is producing what customer needs, when he needs and in what quantities he needs while optimizing resources. Lean construction is a translation and adaption of lean manufacturing principles and practices to the end-to-end design and construction process. Lean construction emphasizes on process improvement rather than concentrating on the final product by increasing Value Adding activities (VA) and reducing Non-Value Adding activities. The construction process is a set of activities, each of which is controlled and improved. Conventional managerial methods, like the sequential method of the project realization or the CPM network method, deteriorate flows by violating the principles of flow design and

improvement. They concentrate on conversion activities. The resultant problems in construction to compound and self-perpetuate. In project control, fire-fighting current or looming crises consumes management resources and attention so totally that there is a little room for planning, let alone improvement activities. As a consequence, it leads to non-optimal flows and an expansion of Non-Value Adding activities.

## 2. Methodology

Literature review pertaining to the need of need of lean in residential construction project. This chapter presents an outline of the methodology used to achieve the research objectives stated in chapter. In this chapter the methodology used in the study has been outlined. The steps followed in the methodology adopted for this research are explained sequentially in order to provide a total picture of the thesis.

The aim of the study was to learn more about the subject under study and with an anticipation of generating insight within the field of lean and the construction industry. The chosen investigation design was the study of construction processes at a construction engineering project

### A. Lean techniques used for data collection

#### 1) Last Planner System (LPS)

One of the most effective ways to increase efficiency of construction industry is to improve planning and control process. In Lean Construction, planning and control are considered to be complementary and dynamic processes maintained during the course of the project. Planning defines the criteria and creates strategies required to reach project objectives, control makes sure that each event will occur following the planned sequence. Re-planning must be done when the previously established sequences are no longer applicable or convenient. Feedback facilitates learning when the events do not occur as planned [15,45]. One of the best known Lean techniques is the Last Planner System which has been demonstrated to be a very useful tool for the management of construction process, and continuous monitoring of the planning efficiency, to assist in developing foresight, smoothing workflow variations, and reducing/removing uncertainties plaguing construction processes.

#### 2) Pull Planning

A Phase Pull Plan is prepared by a project team in a

collaborative fashion to display the activities necessary to complete a phase of work and identify the best sequence to complete those activities. The phase typically is defined by an “end” target or event – pouring slab on grade, ready to erect steel, or (in the case of a design phase) target cost agreed upon, permit package issued, etc. The team works backwards (pulls) from the end date to the start of the phase to identify the activities necessary to reach the “end” target. The team pays special attention to the “handoffs” – what is necessary to be completed in one activity before the next one can begin. The actual time or duration of a phase is based on the master schedule or the team’s best estimate – phases can be measured in hours for a shut-down, weeks for a typical construction activity, or months if the team is developing an overall project plan.

### 3) Value Stream Mapping

Value Stream Mapping is a more in-depth technique designed to set out each of the steps from the beginning to the end of a specific process (including how much inventory, rework and waiting there is within a process) and includes:

- Teaching the crew(s) working in the area/on the task about the 7 wastes.
- Asking the Team Leader/Superintendent to Go & See the work site and spend some time (~1-3 days) mapping out each step of the process, engaging with the crew.
- Using post-it notes to display these steps up on a wall, including data for each step:
  - Number of people doing the work
  - How long it takes

- Any rework seen
- Any inventory seen between steps
- Any waiting between steps

### 3. Conclusion

- The industry struggles with inefficient processes leaving much to be desired in order to meet this challenge the construction industry must become more efficient by using fewer resources. Small changes in the operational costs by reducing waste, which improves the efficiency, can make substantially changes in profit.
- Previous researchers have identified the problems of how the construction industry works today and pointed to possible solutions by using the lean philosophy and tools along with solutions that are part of what is known as ‘lean construction’

### References

- [1] Greg Howell and Glenn Ballard; “Implementing Lean Construction: Understanding and Action.”
- [2] Sir John Egan 'Rethinking Construction': The Report of the Construction Task Force, 1998.
- [3] Implementing Lean Construction Concepts in a Residential Project Article · January 2008.
- [4] O. Salem, J. Solomon, A. Genaidy, and M. Luegring, Site Implementation and Assessment of Lean Construction Techniques.
- [5] Harsha N, A. V. Suresh and Nagaraj N, “Implementation of Lean Concepts in The Construction Engineering Project.”
- [6] Abdul Mannan Hussain, Apoorva Mercy Nama, Asra Fatima, “Barriers to Implement Lean Principles in the Indian Construction Industry.”
- [7] Aakanksha Ingle, Ashish P. Waghmare, “Advances in Construction: Lean Construction for Productivity enhancement and Waste minimization.”