

Implementation of Lean Construction Tools in Indian Construction Industry

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Abstract: *Indian construction industry still follows the primitive work pattern, which generates poor management in resources, waste management, over budgeting and schedule lagging. To eliminate all the above-mentioned issues, construction industries are now adopting sophisticated tools and techniques like lean construction tool (L.P. S). Lean construction is as an effective management tool to enhance the productivity in construction field. Large research is being done in recent past and is an ongoing process to adopt lean principles from manufacturing industry to the construction industry. In this paper 3 construction companies were visited, and questionnaire survey analysis were done in order to find out the main barriers faced by the company for the effective implementation of lean. Barriers like Wastes in the construction site, management related wastes and resource related waste were graphically plotted and analyzed. Suitable lean construction tools required were implemented.*

Keywords: Lean construction tool, Last planner system, 5s process, Increased visualization

1. Introduction

Lean in its simplest form means eliminating waste from every aspect of the work process while ensuring that value-adding activities are completed in the most efficient and time-effective manner. Lean has been successfully applied in all sectors of business, service and project delivery, resulting in improved performance in quality, time, cost and bottom line profit. Lean also helps organizations to develop their people, at the same time creating a culture of continuous improvement. When used to improve the delivery performance of a construction project, ideally Lean should be applied right from the start of a project to help define efficient processes and practices, not only for the construction process but for pre-construction processes as well. In this paper efforts are made to understand the concept, implementation of lean methods in construction industry. Lean construction is all about reducing the cost by waste minimization and efficient work place and engaging people in innovations. It also improves the growth of productivity level in construction sector. It is the collection of data to change the delivery and design processes in the construction industry. The construction industries transform their forms from conventional approach to lean management approach. It increases the quality of the work and eliminating the wastes in the industry.

2. Aim

The aim of our research is to find out the barriers in the construction sector for the implementation of lean concept by questionnaire survey,

- Necessary lean tool can be implemented in the construction sector
- In order to minimise the waste and duration of the project period when compared to conventional method, the usage of lean construction should be adopted.

- The understanding between the contractors, labors and the client can be improved which enhances the smooth functioning of the business.
- The quality of the construction should be achieved efficiently.

3. Scope

The scope of our project are as follows

- To eradicate the waste completely during construction and to increase the profit
- To reach this lean concept all over the developing countries
- To improve the value creation that is what the client really wants successfully from the owner

4. Advantages

The points that enhances the view of lean construction are as follows

- Continuous improvement in construction industry
- Focus on smart work through company's management rather than hard work by adopting strategic plans for future
- Reduces waste production in the field which is useful in increasing the profit
- Reduces the cost of the project
- Customer satisfaction can be increased
- Better and smooth communication among owner, customer, labors and overall Productivity increases

5. Companies Visited

3 Construction companies were visited and their waste categories in the construction site, management related jobs and resource related works were analyzed and graphically plotted. The companies selected to propagate a study on the conventional method of construction and the understanding

of lean concepts in business administration are as the following,

- Kinz Constructions
- A.R.K Constructions
- Video Constructions

The questionnaire has been raised to the companies and the highlighted problems faced by them are analyzed properly. The respondent plays an important role in answering the questions based on their real time experience. The exclusion of non-value adding activities is very important on the business phase. The idea of the organization plan should be considered as a part of managing power. The build in character of the project work with respect to customer satisfaction is found out through this experiment. The completion of work within the time and job satisfaction along with perfection in the work up to expectance level is very much required for a business to run successfully.

5.1 Kinz Constructions

Kinz is one of the blooming companies in Malappuram, it has some uncertain conditions which requires additional care to get rectified. In this construction, frequent waste categories are identified such as Rework, material wasted, Excessive supervision, Excessive surveillance and delays are highly occurred in their working environment. According to their Management related, Unnecessary requirement, poor management control and poor planning are found. In their Resources related, shortages, misuse, availability of resources are major problems faced.

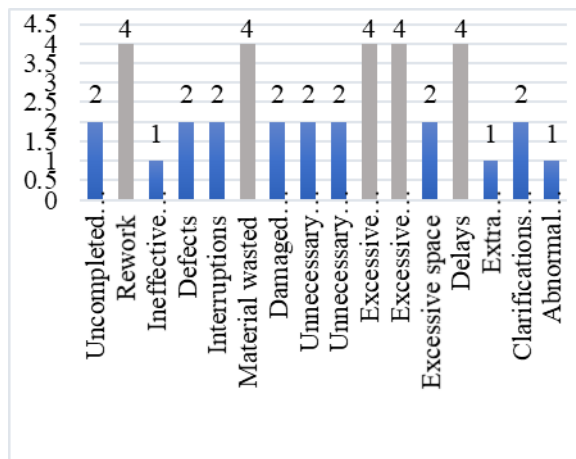


Figure 1: Chart of Waste categories in the construction site at Kinz

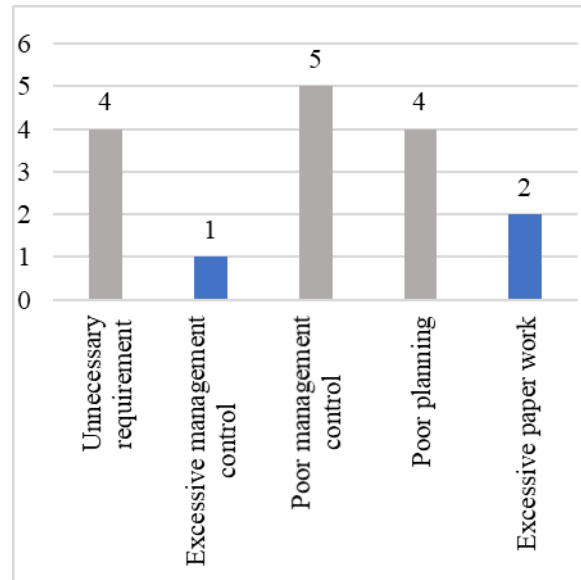


Figure 2: Chart of management related jobs at Kinz

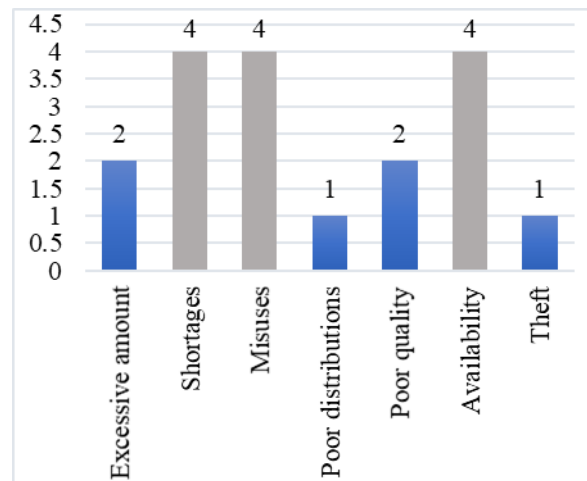


Figure 3: Chart of resource related works at Kinz

5.2 A.R.K Constructions

In this construction, only the delaying of project and completion of the project would be delayed sometimes. It is due to the situation across the work when it was adopted. Except the delaying other categories were slightly varied but no problem evolved due to their proper planning. The unnecessary labor movement and unnecessary material handling are the other issues. According to their Management related, the poor management control and poor planning occurred. In their Resources related, excessive amount was needed due to material cost in the market, shortages and availability is also considered as a major issue.

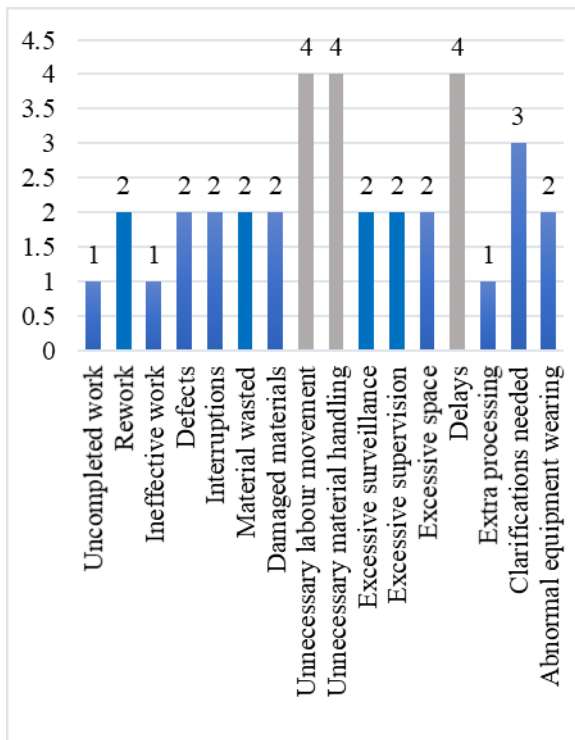


Figure 4: Chart of Waste categories in the construction site at A.R.K

materials, unnecessary labour movement and material wasted during construction. As a result of all these delay for the completion of projects were occurred. According to their Management related, poor management control and poor planning is occurred. Also, the bureaucracy and paperwork are necessary. In their Resources related, the major problem was excessive amount is required to complete the project due to market price values. Due to this, shortages occurred, and misuse and theft are further other issues.

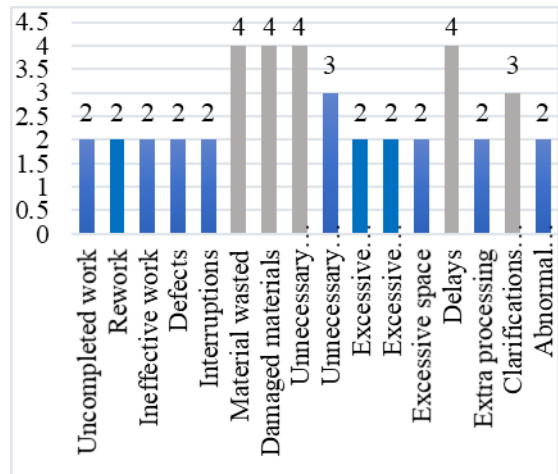


Figure 7: Chart of Waste categories in the construction site at Vidcko

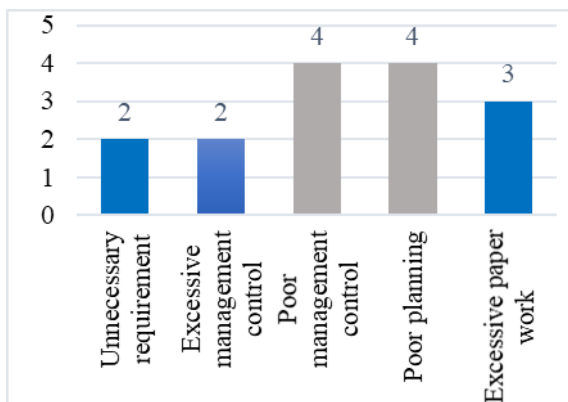


Figure 5: Chart of management related jobs at A.R.K

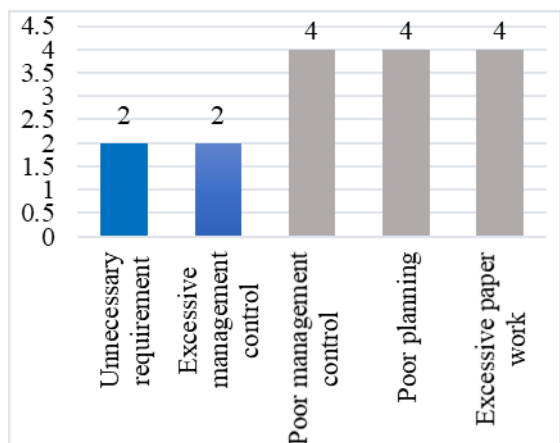


Figure 8: Chart of Management related jobs at Vidcko

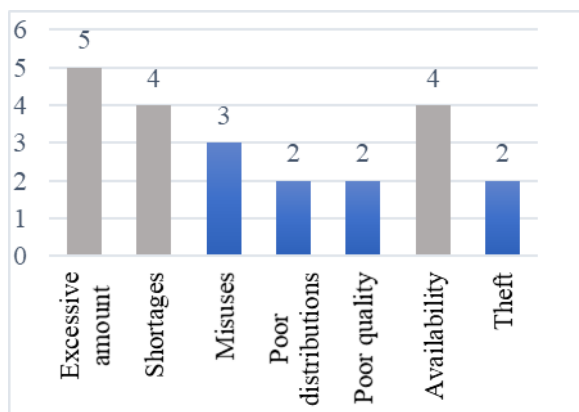


Figure 6: Chart of resource related jobs at A.R.K

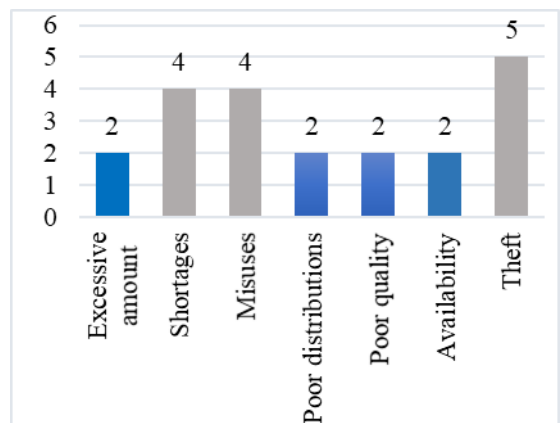


Figure 9: Chart of resource related jobs at Vidcko

5.3 Vidcko Constructions

In this construction company, the major frequent waste categories identified in their environment were damaged

5.4 Lean Construction Tools Implemented

- Last planner
- Increased visualization
- First Run Studies
- 5s Process
- Daily Hurdle Meetings
- Total Quality Management

5.4.1 Last Planner System

Production planning system designed to produce predictable work flow and rapid learning in programming, design, construction and commissioning of projects is known as Last planner system. In USA it is known as pull planning system and in UK the system is well known as collaborative system. The team that are ambitious, challenged and ready to change with the circumstances suits this kind of system. A strong reinforced coaching is required for adoption of this last planner system. The idea of the work flow according to the schedule is insisted into the minds of the workers through orientation programs. The implementation of the techniques are evaluated from the result. The co-operation of the labors with the team leaders or engineers is very much required for the greater improvement of the process. The process involved in Last Planner system are as the following

- Master schedule
- Phase schedule
- Look ahead schedule
- Weekly work plan

5.4.2 Increased Visualization

The increased visualization is generally done to enhance the quality of the project along with the safety factor. It comes under controlling process in a firm. The standards are established and the measure of actual performance is taken into account. The actual performance of the work is compared with the standard schedule. The results of the comparison are considered and corrective actions are made to control the prospect. The control made over progress helps in enhancing productivity standards, cost standards, time standards and quality standards. The supervisor should possess the ability to use the power and also the ability to handle the labours with good motivation. The power of motivation can encourage the working denomination with full involvement. The empowered lay man is responsible the safety note in the construction site. The various process involved in the increased visualization are as the following,

5.4.2.1 Safety commitments

The safety commitments are vital role for the workers in their working environment. The need for safety lies a significance for the life issues. Some of the rules to be adopted by the management are as follows,

- Restriction on entry to site of non-essential personnel
- Establish controlled entry points to site
- Coordinate operations of various trades working in the same areas
- Provide fundamental site rules and orientation training to all persons at risk
- Establish adequate lay down areas
- Everyone is obligated to refuse unsafe work

- All injuries are preventable
- All levels of supervision are accountable for safety performance
- Our work is never so urgent or important that we cannot take time to do it safely

5.4.2.2 Safety signs

The most popular construction site warning signs are,

- Construction site keep out warning signs
- Danger Men at work warning signs
- Asbestos removal in progress warning sign
- Movement and equipment warning sign

5.4.3 First Run Studies

First run studies (as lean construction defines) are used to redesign critical assignments, part of continuous improvement effort and include productivity. Studies and review work methods for redesigning and streamlining the different functions are involved. The criteria or change occurs by first run studies are,

- Actions on the site
- Team effort
- Knowledge
- Communication
- Relation with other tools

5.4.4 5s Process

The objective of 5S is to create a neat and orderly workplace with “a place for everything and everything in its place”. The material, man power, machine, money and method are the basic 5Ms involved in any construction process. The key elements of any 5S program are,

- **Sort-** go through the tools, materials and equipment and keep only what is necessary to complete the work. All else is eliminated or stored offsite
- **Shine-** clean up the workplace so it is an efficient place where people are proud to work
- **Set in Order** – label and organize the space so it’s clear where everything belongs. A “shadow board” for tools hung on the wall is a perfect example of this.
- **Standardize** – use standardized work to keep the space organized and maintain the progress
- **Sustain-** sustain the improvement by empowering individuals to take responsibility for the space and develop new improvements regularly.

5.4.5 Daily Hurdle Meetings

The main approach dealt in lean construction is daily huddle meetings which is contributed to increase work flow ability. The major reasons for adopting huddle meetings in construction site are as follows,

- Field office huddles generally takes more time. Trade crew leaders need to leave the place of the work, travel to the field office and once the huddle is complete travel back to the place of the work for inducing correct way of approach in the construction. Lean thinkers will recognize that extra travel as waste of time and money. An additional time consideration is that field office meetings are often sit-down meetings, and sit-down meetings have a way of inviting necessary conversation with the workers.

- Field office huddles limit the opportunity to see concerns first hand. If a trade crew leader needs help with completing an operation or making an adjustment to the workflow for the following day it is much easier to work through and agree on an adjustment when everyone can directly see the work.
 - Huddles in the field make the daily planning and learning more visible to the crews. It's important for people to see that workflow reliability is a concern and that leaders are engaged in supporting the work of the crews. People cannot see that when the meetings are behind closed doors.
 - Huddles in the field are one more opportunity to be in the field observing the work. Seeing what is happening in the field is a far better way of understanding how to improve workflow than seeing what is happening on a computer screen or plan table.
 - Huddles in the field are an opportunity to mentor newer and assistant superintendents. Many projects will require more than one daily huddle at certain stages of the construction. This is a chance for the senior superintendent to let fewer senior members of the team gain leadership experience.
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5.4.6 Total Quality Management

The quality of the project can be increased by improving supervision at the site and by using good quality materials. Setting objectives of the project according to the work requirement and future goals is very important. The availability of the material at the work place itself or nearby is the important factor to be considered on planning. The reduction of cost is the main aim of the owner, but good quality materials may lead to increase in the investment for a project. This can be avoided by making bond between the builders and the suppliers. The performance depends upon the quality of the material used.

6. Conclusion

The issues in conducting the work can be rectified by the different tools such as

- Last planner system for production planning and designing (which is also called as collaborative planning).
- Increased visualization for safety commitments.
- 5S process for sorting, shining, set in order, sustain and standardize.
- First run studies for planning, doing, acting and checking.
- Total quality management for commitment of labors with respect to various work specifications.

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