A PRACTICAL APPLICATION OF LEAN MANAGEMENT IN CONSTRUCTION INDUSTRY

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Abstract— Waste is one of the main problems plaguing the construction industry. The need for identifying the sources of waste and eliminating them has resulted in the extension of the concept of lean and the development of lean principles and tools, especially for the construction industry. In order to improve the efficiency and reduction of waste, the lean construction has been introduced as a new management principle for better implementation. Currently many construction companies like USA, UK, Australia, Brazil, and Singapore are started to implement the lean construction to obtain better result from their current projects. There are many challenges to implement the lean concept in construction industry. In India, the implementation of lean management in construction industry is a major task. Due to lack of attention and illiterate towards the lean management principle the owner, contractor, engineers etc. are still developing stage to implement this principle in their project. This paper presents the possibilities of using lean management principle in construction industry, which can surely increase the quality of work and rate by eliminating the wastage of materials. Most of the lean construction tools selected for the project are either ready to use, or are recommended with some modifications. A summary of the results is provided, and future research needs are outlined.

Keywords—Lean; Construction; Tools & Techniques and Implementation

1. INTRODUCTION

Lean construction is a philosophy based on the concepts of lean manufacturing. It is about managing and improving the construction process to profitably deliver what the customer needs. The core idea is to maximize customer value while minimizing waste. Lean means creating more value for customers with fewer resources. A lean organization understands customer value and focuses its key processes to continuously increase it. The ultimate goal is to provide perfect value to the customer through a perfect value creation process that has zero waste. Lean management is an important constituent of lean thinking. Implementation of lean in any organization in traditional means does not guarantee right focus nor help sustaining lean initiatives. If no action is taken to change the management process, people and products are likely to see failure of lean implementations. Many people on lean journey fail to apply lean in a holistic manner. Usually they start with applying tools without proper guidance and leadership the company cannot move to the next level. Thus a management system that specifically meets the needs of a transforming organization is very much essential.

2. OBJECTIVE

The main objective of this paper is to improve the quality of the project and profit by minimizing the waste. There is so much waste in Construction Industry that there is a great profit opportunity to those who go Lean. The benefits of lean construction techniques have been demonstrated by the improved performance of many projects at each and every project phase. Lean construction may require more time in the design and planning phases, but this attention eliminates or minimizes conflicts that can dramatically change budgets and schedules. Customer needs to be a shift in everyone’s way of thinking; owners must be the agents of change and must demand change; lean must become the new culture of the industry.

3. LITERATURE SURVEY

Salem et al (2006) studied construction projects in which specific lean construction elements were tested. Each technique was evaluated in terms of its impact on the performance of the project. Based on the findings of the study, a new “Lean assessment tool” was proposed to quantify the results of lean implementations. Daeyoung Kim et al (2006) aimed at assessing lean construction from the viewpoint of the various project participants and identification of benefits and barriers associated with lean implementation at the site. Xiaoming Mao et al (2008) used computer simulation techniques into the framework to virtually simulate and assess the efficiency and effectiveness of the reengineered construction process that was achieved based on lean principles. This chapter gives idea about how lean management has been applied till now in construction industry worldwide. The case so taken gives a depiction of benefits that can be achieved upon implementing lean with appropriate tools. The analysis of the evidence obtained from implementation of Lean Construction practices in many projects analyzed in the various journals demonstrates the effectiveness of the proposed practices and their multiple benefits. These studies show the difficulties and barriers for implementation, productivity improvements, variability reduction and effectiveness of implementation strategies of lean. It also provides recommendations for future implementation and research.

4. RESEARCH METHODOLOGY

In order to achieve the research objectives that have been set, it is important to clearly define the path in which the research
can be accomplished. The following methodology is the proposed one to analyze and implement the lean management in construction industry. The following methodology shows figure was proposed one to analyze and implement the lean management principles in construction industry. Lean techniques aim to minimize waste of materials, time, and effort in order to generate the maximum possible amount of value.

**A. QUESTIONNAIRE SURVEY**

From the literature collection and from the case studies, the questionnaires were examined and the questions were framed in accordance with the situation of the project. The preliminary structure of this questionnaire is consists of 37 questions and its categorized under six criteria according to its type of waste. The design for this questionnaire such as, 1) YES  2) MODERATE  3) NO will be applied for this questionnaire. In this step the questions which are prepared are to be evaluated by means of conducting interview with the persons who are all involved in a project like top management peoples, contractors , engineers etc.

**B. IDENTIFICATION OF WASTE**

In this step, the wastages which produced during the project are to be identified and examined, causes are analyzed. Based on the questionnaire survey collected from the companies they are cluster together and formulated related to their usage and divided in to six categories as follows,

- Design and Documentation
- Procurement
- Material handling, Storage & Transportation
- Operation
- Residual
- Other

5. WORK STRATEGY

The study will be conducted using structured survey questionnaire. The questionnaire distribution will be done randomly using two approaches, namely via postal mail as well as direct visitations to the respective firms. The Questionnaire is of Objective type. Hence at present, 35 construction companies were contacted with the questionnaire and 30 of these companies responded. Respondents were requested in the questionnaire to identify the major waste attributes in waste generation on sites by responding on a 3-point rating scale as: 3 - Yes, 2 - Moderate, 1- No.

The pie and bar chart prepared by using quantitative method. The following pie and bar chart showing the percentage of waste occurred in construction industry. The questionnaire survey was carried out among 30 companies. The following result are obtained based on the questionnaire survey is shown in figure for each wastes.

![Fig.5.1 Waste due to Design & Documentation](image1)

![Fig.5.2 Waste While Procurement](image2)
6. ANALYSIS USING SOFTWARE
From the gathered data from all sites has to be analyzed by using SPSS Software version 22 and Statistical Methods and each waste parameter to be given grading parameter upon the points gained by various companies. According to that, various tests to be conducted such as, One sample test(ANOVA test) Friedman’s Test

From these about tests, the total percentage of wastages can be calculated.

7. CONCLUSIONS & RECOMMENDATIONS
Based on the work carried out it is found that Friedman test gives the Ranking in which they are prioritize the causes of the construction waste that are generated in the construction industry which is accepted by the companies according to the responds of the various project participants in construction industry. The primary objective has been achieved to the responds of the various project participants in construction industry. Based on this study, the following recommendations are offered to support the effort of implementation of lean management in construction industry. The according to the result, the lean tools and Techniques (5s techniques, last planner, increased visualization, huddle meetings, first-run studies, just-in-time and fail-safe for quality) has been applied and suggestions were provided to implement the lean tool for reducing the wastes that generated during the progress of the project as well as increasing the profit of the project in the construction industry.

REFERENCES