

# An Examination of the Application of Lean Management in Web Sites for Construction and its Implications

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**Abstract:** *A useful management approach for raising productivity in the construction industry is lean construction. In order to implement lean management concepts on construction sites worldwide, much study has been conducted recently. The lean approach is difficult to use in the construction industry for numerous reasons. This study focuses on a number of lean management studies that have been carried out on construction sites throughout the globe, the findings of those studies, and an analysis of the significance of adopting lean management in such settings.*

**Keywords:** Lean management, construction sites, review paper, efficiency, waste reduction, process optimization

## I. INTRODUCTION

Lean manufacturing principles provide the foundation of the notion of lean building. Ohno developed the lean idea for the Toyota Production System (TPS). Lean is an approach to thinking that increases value and reduces waste. The application of operational research, practical design and construction development, and lean manufacturing ideas and practices to the whole design and building process is known as lean construction, or LC. LC is now one of the main strategies for raising productivity in the building industry. Waste reduction is a top concern for LC both in terms of technology and operations. In addition, it aims to foster a collaborative environment among supply chain managers and eliminate toxic connections from the process. During the building process, these wastes are produced by every operation. Waste is any construction-related process or activity that costs money but neither directly nor indirectly raises the project's value. These construction-related occupations may be classified as non-value-adding or value-adding. Construction waste may result from flaws, alterations, reworking operations, design errors, and the use of extra resources. As such, it is critical to guarantee that waste production is kept to a minimum throughout all of the many stages and activities associated with building. Inventory, motion, waiting, rectification, over processing, and overproduction are only a few of the many wastes in the construction industry. These might all happen on building sites in one form or another.

## II. LITERATURE REVIEWS

The following lists the literature from several studies done all around the globe, along with reviews of those studies: -

**Oguntona and Aigbavboa (2018)** The title of the investigation was "An Assessment of Lean Construction Practices in the Construction Industry". The aim of this study is to assess the performance of the construction industry and the degree to which LC approaches boost output. An structured poll was sent to construction sector employees. To do a quantitative data analysis, we used the mean item scores of the variables that we had chosen. Waste reduction, effective material administration on site, improved lifetime cost, improved project coordination, improved on-site safety, and greater productivity are the six benefits of using LC techniques, according to the evidence. Because using LC technology will result in improved productivity, construction projects will be successfully finished.

**Abbasian Hosseini and Nikakhtar (2012)** addressed the subject of "Flow production of Construction Processes through Simulation and the Implementation of Lean Construction Principles." Discrete-event simulation is being used in this study to explore the possibility of applying lean principles to the construction process. Strong 3D animation is a

feature of the general simulation software used in this study, ARENA. The data required to create the simulation model was obtained from the construction site. According to the study's findings, simulation might be a helpful tool for testing and adapting lean construction concepts before they are put into practice. The results showed that lean ideas enhanced the performance of the selected processes by reducing the total project time and increasing process efficiency.

**Amin Nikakhtar and Abbasian Hosseini (2015)** The research project was titled "Application of lean construction principles to reduce construction process waste using computer simulation: a case study". The main objective of this study is to use a case study (the reinforcing process) to investigate if lean construction ideas may reduce waste in the building process. Computer simulation is used to display the results prior to putting lean principles into practice in real life. The results show that many types of waste in the construction process may be reduced by using lean construction ideas via computer modeling.

**Luis Alarcon and Loreto Seguel (2002)** went over "Creating Incentive Plans for Lean Construction Implementation." This research outlines the process a group of Chilean construction companies used to choose organizational and personal rewards that would promote dedication to implementing internal improvement projects. The diagnosis's result and the study that followed it made it feasible to identify change agents that support organizational changes and validate opinions and conclusions obtained from early experiences adopting lean improvement approaches in Chilean construction enterprises.

**Sepani Senaratne and Duleesha Wijesiri (2008)** An investigation titled "Lean Construction as a Strategic Option: Testing its suitability and Acceptability in Sri Lanka" was conducted. It is possible to argue that implementing lean construction in a new setting is a strategic decision if appropriate acceptability and application research is done beforehand. This study set out to find out whether lean building is suitable and acceptable in Sri Lanka. An opinion poll was used in the study to collect empirical data using the Delphi approach. The findings indicate the frequency and underlying reasons of waste-producing flow operations in Sri Lanka's construction industry. According to the study, lean construction is suitable and acceptable in the context of Sri Lanka. It also offers a way to use an opinion poll to assess lean construction in a new industry.

**O Salem and J Solomon (2005)** "Site Implementation and Assessment of Lean Construction Techniques" was the subject of a research. The purpose of this research is to evaluate the efficacy of a few lean construction techniques, namely those that are applicable to medium-sized construction companies. A field investigation was carried out to assess the efficacy of many lean construction methodologies, such as the 5s process, fail safe for quality, daily huddle meetings, greater visualization, final planner, and first run studies. Direct observations, interviews, surveys, and documentary analysis were some of the techniques used to acquire the data. Performance criteria and the lean implementation measurement standard were used to assess the lean construction tools' efficacy. It was discovered that first run studies, daily huddle meetings, enhanced visualization, and final planner produced more fruitful results than anticipated.

**Fiona Keru Mwacharo (2013)** addressed "Challenges of Lean Management: Examining the obstacles and formulating a suggestion for Lean Management Techniques." The purpose of this study is to identify the primary obstacles to applying lean management approaches and to formulate a management strategy for these obstacles. A questionnaire and interviews with representatives of several Finnish enterprises were used in a qualitative study. According to the survey, the biggest issue facing the firms was that, at least initially, their employees were unmotivated or unwilling to embrace change. Keeping Lean was another problem. Since lean management is intended to be an ongoing process that never stops, some businesses find it difficult to maintain.

**Saad Sarhan (2018)** "Institutional Waste within the UK Construction Industry: An Exploratory Study" was the title of a study done. The construction sector in the UK is often accused for being confrontational, wasteful in comparison to other sectors, and incapable of learning and development. The purpose of this research was to identify the wastes that result from the design and implementation of building projects by investigating the institutional, procurement, and commercial contexts. In order to investigate the institutional elements affecting construction procurement and to provide a thorough comprehension of the effects of current construction procurement arrangements on project performance and results, a reflexive grounded-theory technique was used. 24 senior professionals in the UK construction sector were interviewed in-depth and iteratively, and their supporting material was reviewed as part of the

data collection process. The results show that institutional wastes may be reduced if the building process is carried out according to a suitable plan and with strong leadership from the start.

**Carlos T Formoso and Lucio Soibelman M (2002)** titled "Material Waste in the Building Industry: Main Causes and Preventions" research. It is well acknowledged that material waste is a significant issue in the construction sector, with significant ramifications for the efficiency sector and the environmental effects of building projects. The primary findings of two research investigations that looked into the presence of material waste at 74 construction sites spread throughout several Brazilian areas are presented in this study. The primary reasons of waste in the industry are examined, along with some average numbers for the waste of various important building materials. The findings show that there is a significant amount of material waste in the Brazilian construction sector and that the frequency of waste varies greatly throughout projects. By putting in place low-cost preventative measures, largely connected to management changes, the majority of this waste may be prevented.

**Azam Forsberg and Lasse Saukkoriipi (2007)** analyzed the topic of "Measurement of Productivity and Waste in Relation to Lean Thinking." This work aims to provide a review of the literature on productivity and waste measurement. This study emphasized how the Swedish construction sectors are using the lean mindset to save waste and boost efficiency. The results show that costs such as labor pay and material costs are hard to manage due to the high demand for construction brought on by Sweden's recent robust economic development. Therefore, raising human performance may increase labor productivity.

**Sven Bertelsen (2004)** titled "Lean Construction: Where are we and How to Proceed?" and carried out research. The research aimed to define the state of the art and provide a concise summary of the progress made over the previous 12 years. The main goal is to start a conversation about the next endeavors in the context of lean construction. The article suggested that a new research agenda be created, starting with a lean knowledge of the building process as it is seen on construction sites and ending with an understanding of the nature of this process as a complex system. Within the categories of managing the project delivery, eliminating waste in providing the value, and optimizing value for the customer, elements are delineated and study topics are defined.

**Carlos Torres Formoso and Eduardo Luis Isatto (1999)** "Method for Waste Control in the Building Industry" was the topic of discussion. The purpose of this study is to report the early findings from a research project that is now underway to create a waste management strategy for construction sites. Through the practical implementation of some of its ideas, the research also hopes to contribute to the consolidation of the Lean Construction theory. The conclusions focused on the need of including waste management into the process of production planning and control.

**K P Ramaswamy and Satyanarayana N Kalidindi (2016)** "Waste in Indian Building Construction Projects" was the subject of a research. The Indian construction sector has many obstacles, including poor productivity, a shortage of trained labor, and delays in project completion and cost estimates. The study's primary goal is to look at waste in the Indian construction sector, with a particular emphasis on building projects. The research included six active projects, and the wastes found were measured in terms of project costs by data collection methods including work sampling and direct observations. Records were also kept. The findings demonstrated that waste from labor and equipment engaged in non-value-added activities was much greater.

### III. CONCLUSION

Waste reduction, effective material management on site, improved lifetime cost, superb project coordination, improved on-site safety, and greater productivity are the six benefits of using LC techniques. The successful completion of construction projects will come from increased productivity brought about by the use of LC methods. It also showed how lean principles, by reducing project length and increasing process productivity, enhanced the effectiveness of the selected processes. Furthermore, it illustrated how different types of waste in the building process may be eliminated by using lean construction concepts via computer modeling. It was also found that the first run studies, the final planner, the daily huddle sessions, and the improved visualization delivered better outcomes than expected. In order to minimize institutional wastes, the building process should also be conducted from the beginning with careful planning and leadership. By improving human performance, labor productivity may be raised. The waste from labor- and equipment-related non-value-added activities was much more than the material waste generated at the sites. Another method to avoid this is to develop LC behaviors.

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