LEAN CONSTRUCTION: A TIME AND COST SAVING METHOD FOR MANAGING PROJECT

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Abstract

Projects are thought of as transient production systems that must be planned, created, and delivered within a certain window of time. Many scholars have argued that fast-track projects with intricate, lengthy supply chains cannot be handled in the traditional manner because they are complex, fast-moving, and unpredictable. Engaging several parties and undergoing numerous, significant process design modifications have complicated flow management that has utterly failed. The work breakdown structure, critical path technique, and earned value management are some of the tools and conceptual models of construction management that have come under fire for not being able to adequately handle the current, particular issues that projects face. Consequently, a multitude of wastes are characteristic of this business, such as overproduction, lead times, transportation, improper processing, inventories, needless movements, rework, and making do wastes. Therefore, in order to assist project teams in addressing the problem of wastes in projects, it is necessary to develop reliable and useful models and methodologies. Lean Construction (LC), or the use of lean production processes in the construction sector, is the only way to do this. This essay discusses the LC approach as a reliable project management methodology and the significance of putting it into practice.

Keywords: *Lean Construction, Project Management, Time and Cost Saving.*

INTRODUCTION

Projects are thought of as transient production systems that must be planned, developed, manufactured, and delivered within a certain window of time. Many researchers have argued that rapid, complex, and uncertain projects cannot be managed in the traditional ways. They have also claimed that complex flow management has failed miserably in fast track projects with lengthy, intricate supply chains with numerous participants and subject to numerous, extensive process design changes (Ballard and Howell, 1994). Because of this, the sector is known for its delays and often has cost and schedule overruns (Sorooshian, 2014).

The construction business is generally known to have a relatively high degree of wastes and non-value-added operations. Numerous studies conducted in different nations have verified that wastes in the building sector account for a comparatively high proportion of production costs. The industry's overall performance and productivity have been negatively impacted by the large amount of wastes found in the construction sector. To address this, considerable steps must be done (Aziz and Hafez, 2013). The Lean Construction Institute (2014) said that the construction sector accounted for around 57% of wasteful productive time.

These wastes have been linked to the

shortcomings of the technologies used today for project management as well as the project teams' incapacity to use innovative and forceful methods to address the problems the industry confronts. Ballard and Howell (1994), Koskela (2000), Koskela and Howell (2001), and Johnston and Brennan (1996) all claim that the normal project management and construction methods are insufficient for addressing the issues facing the sector.

However, the fundamentals of lean manufacturing concepts and practices provide the means of reducing or doing away with waste entirely in the sector. Lean construction has embraced the idea of flow and value creation while challenging the conventional understanding of labour flow and work flow dependability, which were thought to be the primary drivers of construction activities. Lean construction basically seeks to minimize workflow losses that traditional approaches are unable to completely eradicate. This essay aims to prove that lean construction offers a fresh and reliable strategy for addressing the wastes in the construction sector that the established project management models have been unable to contain.

OBJECTIVES

1. To study about the importance of lean construction.

2. To review the lean construction technology in project management.

LEAN CONSTRUCTION

Production gains have allowed the manufacturing sector to achieve a number of performance improvements during the last 20 years. The use of the "Lean Production" production philosophy, which emphasizes on-going process improvements via the removal of various wastes, is a key component of this achievement. Lauri Koskela advocated for a paradigm change to a more resilient system in the 1940s by developing and implementing production philosophies and techniques in the building sector, which gave rise to a recently accepted idea (Koskela, 2000). Lean construction, however, did not get any traction until the middle of the 1990s. Since then, it has become a novel idea in both the field of construction management and the actual field of building.

There are two LC interpretations, however they differ somewhat. One reason is the application of lean manufacturing techniques and instruments to the building industry.
Remarkably, the alternative interpretation regards lean production as a theoretical driver behind the theory-based building method; hence, LC (Koskela and others, 2013). However, according to (Ballard and Howel, 2004), this LC technique has four roots: The following are the main points of concern: i) the Toyota Production System's completion; ii) projects' subpar performance; iii) attempts to theoretically create project management; and iv) the identification of anomalous (difficult to define) facts.

Lean concepts are equally relevant in the manufacturing and construction industries, notwithstanding the differences in supply chains and operations. Having said that, lean can be used in any business since it is as much a concept and culture as it is a set of guidelines or procedures. In other words, lean manufacturing approaches may be used in service-oriented, manufacturing, and other environments. This is due to the fact that all systems include certain degrees of waste, and whether a service is being rendered, a material is being processed, or a product is being produced, some amounts of the components are considered trash. Thus, in every system and in any sector, the techniques for system assessment, waste identification and removal, and client need focus are applicable. LC aims to achieve the same goals as lean manufacturing, including pull production control, continuous flow, continuous improvement, decrease of variability, waste removal, and cycle time reduction (Aziz and Hafez, 2013).

The five (5) guiding principles of lean methodology, when applied, minimize waste and increase profit. These guidelines are:
(a) Value specification: Clearly define what adds value from the client's point of view; (b) Value stream identification: Clearly identify all the steps in the processes (value stream) that provide precisely what the customer values and eliminate everything that detracts from that;
(c) Flow: Take steps to guarantee continuous flow in the value stream;
(d) Pull: This refers to producing just what the client requests precisely when they need it; and
(e) Perfection: Constantly aim for perfection by meeting client expectations and needs by eliminating waste.

By eliminating waste from the value chain, lean manufacturing principles have the ability to reduce production costs for businesses. Consequently, several sectors, like as the construction industry, have used lean manufacturing production theories (also known as process improvement) to address the obstacles they face in their operations, leading to LC. There is enough evidence of the lean manufacturing philosophy's potential impact on the efficiency of the construction sector (Abdul Rahman et al., 2012).

(i) Producing more than is necessary or sooner than is reasonable are examples of overproduction. This often leads to problems with both quantity and quality; an organization knows that it will lose some units throughout the manufacturing process and thus sends extra to ensure that the customer's requirement is satisfied. This might lead to improper utilization of resources, labour hours, or equipment. Understanding the equipment process capacity of the manufacturing machines and using the error proofing technique (Pokayoke) may help address the overproduction problem.

(ii) Idleness, which is mostly brought on by inadequate material flow levelling, synchronization, and work speed by unique equipment or groups, is synonymous with waiting. Additionally, waiting happens whenever there is a pause in the processing or movement of items. Perhaps the waiting for engineering, maintenance, raw materials, designing, quality assurance results, inspections, confirmation orders, and so on is what causes the inactivity. Linking the processes together and maintaining their flow can significantly decrease the waste that results from waiting.

(iii) Transportation (Material/Equipment Movement) deals with transferring materials or equipment inside a location when a process flow problem or a poorly designed working environment cause several stops and starts in a production cycle. One of the main factors leading to needless transportation may be the working conditions at construction sites. Additionally, improper handling techniques, the use of insufficient tools, or damaged passageways may also lead to this kind of waste. It is important to remember that relocation should have a purpose since there are costs associated with moving items. Interruptions in the work process flow might drive up transportation expenses considerably. Waste of labour hours, waste of site space, waste of energy, and the possibility of material waste during transit are some examples of these wastes.

It has been shown that properly rearranging the machines inside an industrial facility from a functional to a cellular architecture may assist cut down on waiting times and work in progress (WIP) in addition to transportation-related waste. The building sector may also benefit from this, as well, since a well-planned site layout can save needless material transfer.

(iv) Processing (Excessive Processing/Over processing), this happens when conversion or processing activities don't, in the eyes of the customer; add value to the product or service. The on-going source of this is the work's poor quality. Rework pertaining to surface finishes or works is the most obvious example of over-processing. To assist in identifying and eliminating the sources of this waste, techniques like Pokayoke (Mistake Proofing), 5 Whys, and Statistical Process Control (SPC) might be considered. Altering the building technique may also prevent this waste.

(v) Inventory (Stock/Storage Waste) is defined as inventory that is either superfluous or needless, leading to material waste (losses resulting from inadequate stock conditions at the location, theft, degradation, vandalism), as well as fiscal losses due to capital exposure. Since there is no value activity involved in stocking inventory, having too much of it is considered waste. In addition, inventory incurs expenditures, takes up space, and negatively impacts capital. Organizations often make extra arrangements in order to fulfil requests. The reasons for inventory difficulties might stem from subpar manufacturing methods and poor resource planning, as well as uncertainties around quantity predictions.

(vi) All activities requiring stretching, bending, lifting, walking, and reaching are considered motion, which is defined by ergonomics. The motion waste that workers produce at work is mostly related to their pointless or ineffective motions. This waste might be the result of improper workspace layout, out-dated tools, or subpar work practices. It is also seen a waste of time and effort to travel a great distance inside a work site in order to complete tasks. Avoidable motions have the potential to cause or worsen accidents, injuries, and the associated expenses. The goal of lean thinking is to reduce bad housekeeping, disorganized work areas, misaligned equipment, and subpar or inconsistent labour practices. Consequently, a well-planned work environment would reduce the amount of time that employees spend moving about inactively or ineffectively, which would save money. Thus, it is important to evaluate and rethink activities or vocations that need frequent movements in order to reduce motion and the expenses that go along with it.

(vii) Producing Defective items (Rejects/Unacceptable/Unnecessary Work), this occurs when partially or fully processed items do not meet quality standards. This is the regular waste that the construction industry produces when parts or finished goods fall short of requirements. Errors may lead to rework or the usage of subpar or superfluous materials in the structure; an example of this would be very thick plastering. The price to deliver a prize product is the same as the price of a product that is declared faulty.

WHY USE LEAN CONSTRUCTION

Because the construction industry is so important to the country's economy and because it supplies nearly every other industry with goods and purchases inputs, cutting or eliminating waste in the sector could save a significant amount of money for both the industry and society as a whole.

The following are only a few of the points made to emphasize the significance of lean construction and the reasons the construction sector has to implement it.

- It is essential to highlight that value is the actual cost to the customer for the project's delivery and installation.
- LC is a method for designing a production system with the intention of minimizing waste in terms of time, materials, and labour while producing the greatest amount of value possible (Koskela et al., 2002).
- Once again, early in the project, the collaboration of all project participants the client, the architect/engineer, facility managers, end users, and others is necessary to build the production system to achieve the stated aims. This extends beyond the terms of the contract for design-build or constructability assessment, whereby facility managers and contractors just react to designs rather than participating in and influencing the designs (Abdelhamid et al. 2008). By uniting and involving every project participant, LC makes this feasible. By integrating many processes carried out concurrently by multidisciplinary teams, LC aims to enhance customer satisfaction via concurrent engineering (or design), which optimizes product engineering cycles for effectiveness, quality, and functionality (Aziz and Hafez, 2013).
- Furthermore, LC essentially aims to summarize the advantages of the Master Builder idea. LC recognizes that accessible methods will affect realized aims, and that desired ends impact the ways to reach these purposes (Abdelhamid et al., 2008).

- Strong supply chain alignment that minimizes waste and maximizes value is necessary to provide dependable and predictable production system flow on project sites. Lean production and manufacturing methodologies, with their many applications, have shown to be very efficacious in addressing wastes within supply chain delivery systems.

CONCLUSION

Through a thorough literature review, this article was able to prove that the project management models and techniques now in use or that have been adopted have not been able to deliver projects on time, which has resulted in waste in the construction sector. Additionally, the study covered LC, its tenets, and industrial waste. As the authors have shown, LC offers a fresh and reliable strategy for handling trash in the construction sector. A few examples that emphasized the significance of LC application were used to show this.

Ultimately, the study demonstrated that the use of lean methods and tools by industry professionals and project teams would reduce or eliminate waste, improve output, and result in significant cost savings for both the sector and the general public. It is anticipated that the foundational information offered by this article will further our understanding of delay management and waste reduction techniques and function as a standard for ongoing performance enhancements in the construction sector.

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