

Lean construction management between resource-saving aspirations and reality

Challenges and optimisation strategies for saving time, human and material resources in the construction process

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ABSTRACT: This master's thesis deals with the integration of Lean Construction Management at STRABAG AG, Tyrol/Vorarlberg directorate in Zirl. The aim of the thesis is to work out the differences between theoretical methods of lean management and the practical application in real construction projects and to analyse and present the possibilities and opportunities arising from LCM. The research focusses primarily on the potential of LCM to increase efficiency, reduce costs and conserve resources, as well as the resulting challenges.

KEYWORDS: Construction management, construction execution, LEAN, LCM, construction processes, resource efficiency

1 INTRODUCTION

The construction industry is facing a variety of challenges: rising prices, tight deadlines, a shortage of skilled labour and, at the same time, the need not to neglect the quality of projects. In addition, more and more people are involved in construction, making communication and processes more difficult. [1, p.137-138] The entire construction industry has not only been facing this problem since today, but the development towards it began several years ago. The solution seems to lie in Lean Construction Management (LCM), which has developed from the established lean management of the automotive industry, known as 'The Toyota Way.' [2, p.5] The company STRABAG has increasingly focused on LCM, which has led to the creation of numerous specialised lean departments at various locations, including Zirl (Tyrol/Vorarlberg directorate). For STRABAG in particular, it is extremely important to remain competitive and to constantly optimise its own construction work. It is therefore essential to address the issue of lean and to maximise productivity.

2 MAIN PART

After the implementation of lean management in the production of cars was more than successful, other industries naturally became aware of it and so more and more productions became 'lean'. Especially in mass production and in protected environments such as industrial halls, these principles could be applied quickly.

In the construction industry, the implementation is much more complex, as protected conditions such as halls are rarely found. So what is the definition of LCM? "With Lean Construction Management (LCM ®), Drees & Sommer project managers transfer the successful model of lean management to construction projects and construction sites. By concentrating on processes, workflows and information and material logistics, these can be stabilised and accelerated. On the construction site, the aim is to avoid waiting times and fault repairs. No work should be done twice or unnecessarily. The right part must be at the right place, in the right quality, at the right time and in the right quantity [...]" [3, p.226]

The focus is primarily on the main principles of lean management:

- Define customer value (Value)
- Identify the value stream (Value Stream)
- Optimise flow - avoid waste (Flow)
- Pull principle (Pull)
- Perfection (Kaizen) [4]

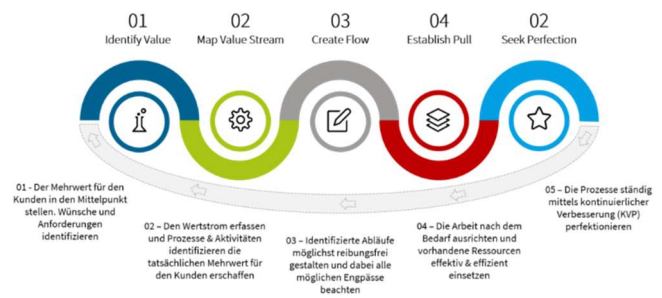


Fig. 2 1: The 5 principles of lean management [5]

Several LCM methods are derived from these principles and are used in the construction process.

2.1 Last Planner System (LPS)

The LPS integrates the five central lean principles by identifying the added value for trades and customers and optimising the processes for value generation. It promotes collaborative planning by all project participants within an integrated team and plans production according to the pull principle. This approach focuses on the overall project and aims to realise smooth workflows, resulting in comprehensive production planning from which scheduling and resource planning can be derived. [6, p.38]

2.2 Process analysis/value stream analysis

Process analysis or value stream mapping is a key element within lean management and therefore also in lean construction management. This technique visualises the flows (movements) of materials, people and general information about the analysed process or construction process in the form of diagrams. [7, p.365]

2.3 Cycle planning

In cycle planning, the principle of an assembly line from automobile production is transferred to construction projects. The construction work is divided into smaller, logically delineated performance units in order to define the time required for the completion of such a unit. This is known as the cycle time. These regular time units allow for a daily review of progress in terms of adherence to schedules, quality and cost control. [8, p.48]



Fig. 2 2: Visualisation of cycle planning

2.4 5S

5S is designed to stabilise, maintain and improve the safest and best working environment and is a systematic and structured workplace optimisation originally developed and applied by Toyota. Simply put, the 5S methodology helps a workplace to remove items that are no longer needed (Sort), organise items to optimise efficiency and flow (Systemise), clean the area to make problems easier to spot (Clean), introduce colour coding and labelling to ensure consistency with other areas (Standardise) and develop behaviours that keep the workplace organised in the long term (Self-discipline). [9, p.34]

3 INTERVIEWS

The survey was conducted using a standardised questionnaire containing both closed and open questions. Furthermore, the questions were used to collect qualitative and quantitative data simultaneously in order to obtain a comprehensive picture of the opinions and experiences of the interviewees.

The results showed that the understanding of LCM is more pronounced among group leaders and site managers than foremen. It was also found that cycle planning and 5S are the only methods that are known. Despite the awareness of the advantages, such as time and cost savings, the implementation in the daily construction work is a challenge, as there is resistance to new methods and coordination with subcontractors is considered to be very difficult. LCM is predicted to have a future in construction, but there are concerns about its feasibility.

4 SOLUTIONS

In order to facilitate implementation at STRABAG, there are now several approaches that should be pursued in the future. On the one hand, the training of all persons, but especially that of the foremen, must be promoted, as this group has a poor understanding of LCM. On the other hand, regular support from LEAN experts is also needed to provide ongoing assistance to the operational unit. Another important point is the use of digital tools to make implementation easier and, above all, more flexible in order to increase the adaptability of the methods. The last and most important point, however, is the promotion of openness to new methods and technologies, whereby

open communication and a willingness to innovate play a major role.

5 CONCLUSION and OUTLOOK

The work illustrates that the use of lean construction management brings a significant improvement in efficiency and resource utilisation. The interviews have shown that there is an enormous discrepancy between theoretical principles and practical application. Implementation is hampered primarily by resistance to change and the complexity of construction projects, but measures such as regular training, digital tools, cultural change and open communication help to ensure successful implementation in construction.

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