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Analyzing the Big Room concept through a case study

Reka Zsofia PAP [1]

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Abstract: The application of lean principles in construction project management is paramount for achieving optimal efficiency and minimizing waste. This study provides a comprehensive exploration of the innovative Big Room concept, serving as a collaborative hub where project stakeholders converge to streamline design and construction processes. Through a detailed examination of a real-life case study, we meticulously analyze the effectiveness, advantages, and obstacles encountered during the implementation of the Big Room methodology throughout the project lifecycle. By offering profound insights and practical recommendations, this research aims to enlighten and empower lean construction practitioners striving for excellence in project management.

Keywords: lean construction; visual management, efficiency; construction management; innovation; process management;

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[1] Faculty of Economics and Business, University of Debrecen, Debrecen, Hungary

INTRODUCTION

Continuous improvement is essential for long-term corporate success. Diverse corporate challenges demand varied tools and methods for systematic improvement. Examining value creation, loss reduction, and adopting a holistic process and product perspective allow for interpreting development effects at both company and individual levels. In the construction industry, facing internal and external pressures like financial crises and heightened quality expectations, it is crucial to explore innovative management practices and production control due to its historically low productivity and high levels of waste (Aureliano et al., 2019). In response to these challenges, the construction industry seeks innovative approaches to enhance efficiency and mitigate waste. One such promising concept is the Big Room, a collaborative space where project stakeholders collectively optimize design and construction processes.
This article aims to delve into the intricacies of the Big Room concept, utilizing a real-life case study for a comprehensive analysis from construction industry in Hungary. By investigating the efficiency, benefits, and challenges associated with implementing the Big Room throughout the project lifecycle, we aim to provide valuable insights into its transformative potential in construction project management.

History of Lean Manufacturing

The unbroken popularity of Lean Management in recent decades is indicated by the fact that today a significant part of formal production systems is based on lean principles, methods, and tools (Netland, 2015), even here in Hungary (Kovács, 2014;). The overall idea is to identify the customers' value and thereby reduce waste. In these formal production systems with a lean spirit, mainly production-related techniques are present (Kovács, 2004) and the five principles of lean are value, value flow, flow, traction system and continuous improvement (Womack, Jones, 1996). Practical experience shows that the success of adapting and sustainably "operating" lean does not depend on specific knowledge-based and easily accessible lean tools. In addition to the Toyota Production System (Liker, 2004), Toyota's success as a model company for lean spirituality is due to the Toyota leadership model (Liker & Convis, 2012), which "passes on" lean spirituality at the individual level and the level of organisational routines. Previous empirical research has also examined the study of behaviour and value in a lean environment (Gelei et al., 2013; van Dun, Hicks, Wilderom, 2016).

Lean thinking aims to distinguish between value-adding and non-value-adding activities, eliminating losses such as unnecessary transportation, excessive machining, and redundant processes (Womack, 1990). Its roots trace back to the Middle Ages, but the modern concept evolved in the 20th century. While Henry Ford initiated lean principles, Toyota's Toyota Production System (TPS) became a milestone post-World War II, focusing on workflow rather than individual machines (Soliman, 2015). Lean's broader pillars include contributions from individuals like Eli Whitney (Woodbury, 1960), Frederick W. Taylor (1983), Frank and Lillian Gilbreth, and Henry Ford (Crowther & Ford, 1922). The concept evolved in Japan, with Taiichi Ohno and Shigeo Shingo refining the Toyota Way, incorporating Just-in-Time, Jidoka, and Kaizen principles (Liker& Meier, 2006). The history of lean manufacturing reflects a dynamic evolution, adapting to changing times and industry needs (Hounshell, 1984). This study provides insights into this evolution, emphasizing the integration of people into efficient processes (Shingo & Dillon, 1985), making it a comprehensive exploration of lean management's historical development.

Lean Management

Lean management lacks a universally accepted definition, but Tóth (2007) describes it as minimizing non-value-adding operations for customers and using only necessary resources. Womack (1996) formulated five lean principles: 1) Determining the value by identifying customer-centric activities; 2) Value stream identification to reveal and eliminate waste; 3) Ensuring an uninterrupted flow of value; 4) Establishing pull systems driven by customer demand; 5) Pursuing perfection through continuous improvement (Womack, 1996). Lean manufacturing, rooted in continuous waste reduction, emphasizes small, incremental improvements, following the Japanese principle of kaizen (Wilson, 2016).
Waste, as per Taiichi Ohno, includes overproduction, excess labor, unnecessary transportation and motion, over-processing, inventory, waiting time, defects, and unused spaces (Wilson, 2016). Lean manufacturing focuses on waste elimination to enhance efficiency and productivity (Wilson, 2016). Continuous improvement in lean is a cyclical process deeply ingrained in organizational culture, aiming for better results (Hoffmann, 2020).
Lean manufacturing differentiates from productivity increases at the expense of employees' quality of life, emphasizing a good working environment and avoiding non-perceived values by consumers

(Hoffmann, 2020). The seven wastes of lean include transportation, inventory, motion, waiting, overproduction, over-processing, and defects (Karaivanov, 2019). These wastes are identified and targeted for elimination in pursuit of lean efficiency and customer value.

Applying Lean Management to construction field

Construction productivity heavily relies on the efficiency of service logistics processes. Similar to production service processes, a comprehensive analysis and correlation study are essential for enhancing the productivity of construction logistics processes. Logistics, as interpreted by Prezenszki & Szegedi (2003), involves planning, organizing, managing, and controlling materials, products, and related information within and between systems. This definition can be applied to construction logistics, where the type and location of construction activities significantly influence the associated logistics activities. The adoption of lean tools in construction projects is increasing, driven by the realization of potential benefits, such as reduced project completion time, engineering hours, integrated design and supply chain management, improved constructability, environmental sustainability, flexibility, process control, and enhanced project quality (Abdelhamid et al., 2008).Lean construction combines practical developments, operational research, design and construction practices, and adapts lean manufacturing principles to the construction process. It encompasses continuous improvement in all aspects of the built and natural environment, including design, construction, activation, maintenance, salvage, and recycling (Abdelhamid et al., 2008) Lauri Koskela's challenge in 1992 questioned the inefficiency of the time-cost-quality trade-off paradigm in construction management. Lean construction emerged as a paradigm-breaking approach, emphasizing the need for active management of variability throughout the project life cycle (Ballard and Howell, 2003). The traditional models and tools of construction management, such as work breakdown structure, critical path method, and value management, have often fallen short of delivering projects at the expected quality within the given time and budget (Abdelhamid, 2004). Lean construction, inspired by lean production, aims to bring continuous improvements by eliminating various types of waste.

The implementation of lean construction principles involves identifying client values, streamlining value flows through efficient processes, eliminating waste, achieving a continuous workflow, using pull planning and scheduling, continuously improving processes, and implementing takt planning. However, implementing lean construction in the construction industry faces challenges due to the uncontrolled environment, variability, and the absence of a one-size-fits-all method.

In conclusion, lean construction offers a transformative approach to project management in the construction industry, emphasizing client value, waste elimination, continuous improvement, and efficient workflow coordination through tools like the Last Planner system. While challenges exist in adapting lean principles to the construction environment, the potential benefits in terms of project efficiency, cost savings, and client satisfaction make it a compelling paradigm for the industry.

Visual Management in Lean Construction: Enhancing Transparency and Efficiency

In the realm of construction, Visual Management, as a prominent component of Lean philosophy, serves as an effective tool for project management and process optimization. The primary objective of Visual Management is to improve information flow and transparency on construction sites, enabling swift decision-making and more efficient communication among project teams. Research studies, such as those by Howell and Ballard (1994), suggest that visual tools like wall charts, Kanban boards, or daily updated status boards can aid project teams in optimizing planning and execution processes.

One notable example of the success of Visual Management is its application within the Last Planner system, which underscores the importance of effective communication and transparency throughout the planning and execution processes. The Last Planner system employs visual tools, including weekly work plan graphics, facilitating teams in tracking and understanding discrepancies between planned and executed tasks (Ballard & Howell, 2003). Furthermore, when applied in Lean Construction, Visual Management contributes to the rapid identification and resolution of issues, thereby enhancing the overall efficiency and quality of the entire project.

The “Big room concept”

Visual Management, integral to Lean Construction, plays a pivotal role in fostering transparency and efficiency throughout construction projects. One widely acknowledged application of Visual Management is within the Last Planner system, which utilizes visual tools to bridge communication

gaps and streamline planning processes (Ballard & Howell, 2003). As research suggests, these tools, such as wall charts and Kanban boards, contribute to aligning planned and executed tasks, enhancing overall project performance.

In conjunction with Visual Management, the Big Room concept has emerged as a transformative approach to collaborative project delivery. Rooted in Lean principles, the Big Room involves bringing key stakeholders, including owners, architects, contractors, and suppliers, together in a physical or virtual space to facilitate real-time collaboration (Kagioglou et al., 2020). In the construction industry, there is a growing recognition of the need for methodologies such as the Big Room concept to address the increasing complexity and size of projects. These methodologies enable project participants to collaborate more effectively by providing a shared work environment, facilitating better information flow, reducing communication barriers, and fostering integrated teamwork. As projects become larger and more intricate, these approaches help maximize efficiency and success in the construction process. This collaborative environment aligns with the principles of transparency and continuous improvement inherent in Lean Construction.

The Big Room concept significantly advances Visual Management by providing a shared space for stakeholders to collectively engage in planning, problem-solving, and decision-making. It enables the visualization of project progress, challenges, and goals, fostering a deeper understanding among team members. The international success of the Big Room concept lies in its ability to break down silos, promote cross-functional collaboration, and enhance communication efficiency (Howard & Bjornsson, 2017).

Research indicates that the implementation of the Big Room concept contributes to improved project outcomes, including reduced lead times, enhanced quality, and increased stakeholder satisfaction (Petrakopoulou et al., 2019). By utilizing visual tools within the Big Room context, teams can elevate their ability to monitor and respond to project dynamics in real-time.

However, it is essential to acknowledge that while the Big Room concept and Visual Management tools offer substantial benefits, challenges exist. These may include the need for a cultural shift within organizations, overcoming resistance to change, and effectively managing the logistics of a shared physical or virtual space (Ballard & Howell, 2003). Nevertheless, the potential gains in collaboration, efficiency, and project success make the adoption of the Big Room concept and Visual Management tools a compelling proposition for the Lean Construction community.

CASE STUDY

This chapter provides an in-depth exploration through a real case study, offering valuable insights into the practical applicability and effectiveness of Lean Construction within the context of a specific construction project. The study was conducted at Hungary's largest high-rise general contractor, where I participated in the realization of an assembly plant building covering an area of approximately 100,000 square meters. I personally gathered the data, participating in every phase of the project, engaging in weekly meetings with the project team, and personally assessing progress and the effectiveness of introducing visualization.The case study revolves around a construction project that fully integrated Lean principles and their associated Visual Management tools. The project not only reflects the successful adaptation of Lean theories but also underscores the efficiency of the Big Room concept, where key stakeholders collaborated in a shared space.

The presented case study is based on a construction project that embraced Lean Construction principles and the related Visual Management tools comprehensively. The study not only highlights the successful incorporation of Lean theories but also emphasizes the efficacy of the Big Room concept, where major stakeholders collaborated in a unified workspace.

Introducing the Big Room concept in construction projects sparks intriguing inquiries into its potential impact, efficacy, and broader implications. One area ripe for exploration is whether the adoption of the Big Room fosters enhanced collaboration among diverse stakeholders, leading to more streamlined decision-making and problem-solving processes. Furthermore, researchers may delve into the hypothesis that the physical proximity of team members within the Big Room positively influences communication and knowledge sharing.

During the initial phase, meticulous attention was paid to outlining the organizational structure of the Big Room, delineating the roles and responsibilities of each participant. The aesthetically designed space was instrumental in fostering an environment conducive to open communication and innovative thinking. Breaking down organizational barriers and operating within a shared space undeniably contributed to overall higher project efficiency. (Figure 1 illustrates a depiction of the Big Room concept, tailored to the specific project.)

The case study provides insights into the pivotal role of Visual Management tools in daily workflows. Kanban boards, process diagrams, and other visual aids enabled teams to monitor task progress in real-time, identify potential bottlenecks, and promptly address changing circumstances. Furthermore, the case study underscores the positive outcomes stemming from the integration of Lean principles and the Big Room concept across the construction project's entire lifecycle. Specifically, this integration led to marked enhancements in project efficiency, collaboration, and problem-solving. By fostering a culture of continuous improvement and collective responsibility, Lean methodologies streamlined workflows, minimized wastage, and bolstered communication among project stakeholders.

The impact of these integrations was assessed through a range of key performance indicators (KPIs), including but not limited to reductions in project duration, heightened productivity, improved quality, and enhanced stakeholder satisfaction. Notably, implementing Lean practices such as the Last Planner System and pull planning resulted in a noticeable decrease in project timeline. Additionally, adopting standardized processes and eliminating non-value-added activities contributed to an overall increase in productivity rates.

Emphasizing quality at every project stage and employing Lean tools like quality circles and error-proofing techniques led to a reduction in defects and rework. Moreover, there was a discernible improvement in stakeholder satisfaction. Surveys and feedback mechanisms were employed to gauge stakeholder satisfaction levels throughout the project, revealing a positive correlation between the implementation of Lean principles and stakeholder satisfaction metrics.

In summary, the integration of Lean principles and the Big Room concept yielded tangible benefits across various facets of the construction project, ultimately contributing to its successful execution and delivery.

Figure 2 illustrates the involvement of Trade partners, which is a crucial aspect to ensure that the essence of the methodology encompasses the participation of all relevant project team members throughout the entire process, enabling the methodology to fully realize its potential.

Research inquiries for a researcher might center on understanding the specific mechanisms by which the Big Room concept enhances project efficiency. For instance, one could investigate how the co-location of key participants influences project planning and execution within the Big Room environment. Another aspect worth exploring could be the role of Visual Management tools in facilitating communication and transparency.

The challenges associated with implementing the Big Room concept could be related to communication, conflict, collaboration, technological challenges, and participation and commitment issues. Communication difficulties arise from the challenge of maintaining effective communication among larger teams and participants with differing interests. Managing diverse opinions, priorities, and work styles may require significant effort.

Furthermore, conflicts and collaboration challenges stem from divergent interests and goals among different stakeholders, often leading to conflicts and challenging collaboration dynamics within the Big Room.

Since the Big Room concept may necessitate various technological solutions, such as virtual communication tools and project management software, introducing and effectively utilizing these tools may pose challenges for project participants from a technological standpoint.

Lastly, concerning participation and commitment issues, active engagement in the complex project structure and sustaining commitment from all participants can be challenging, particularly in long-term projects.

This could involve examining the organizational and cultural shifts required for a successful transition to the Big Room approach, as well as strategies for addressing resistance to change.

In summary, investigating the introduction of the Big Room concept involves developing hypotheses around collaboration, communication, and project efficiency. Research questions focus on elucidating the specific mechanisms, challenges, and adaptability of this collaborative workspace in construction projects.

CONCLUSIONS

Lean principles, including concepts such as Visual Management and the Big Room, play a pivotal role in the construction industry, serving multiple overarching objectives. Firstly, these principles are geared towards streamlining processes and eliminating inefficiencies, thereby optimizing resource utilization and improving overall project efficiency. By fostering a culture of continuous improvement, Lean principles contribute to minimizing delays, reducing costs, and enhancing project outcomes.

Visual Management, a cornerstone of Lean philosophy, is instrumental in improving

communication and transparency within construction projects. Through the strategic deployment of visual tools and displays, teams can readily assess project status, identify bottlenecks, and facilitate real-time decision-making. Visual Management fosters a shared understanding among project stakeholders, fostering collaboration and alignment towards common objectives.

The Big Room concept aligns closely with Lean principles by offering a physical space conducive to collaboration and integration among diverse project participants. Its primary objective is to dismantle silos, encourage cross-functional communication, and facilitate collective problem-solving. The Big Room serves as a central hub where stakeholders come together, nurturing a sense of shared responsibility and a collaborative mindset. This approach resonates with Lean principles by underscoring the importance of teamwork, transparency, and swift information exchange.

Moving forward, future goals include further refining Lean principles, Visual Management techniques, and the implementation of the Big Room concept to address emerging challenges in the construction industry. This may involve leveraging advanced technologies for enhanced data visualization and decision support, fostering greater inclusivity and diversity within project teams, and exploring innovative approaches to sustainability and resilience in construction practices.

In summary, Lean principles, Visual Management, and the Big Room concept collectively aim to revolutionize traditional construction practices by instilling efficiency, transparency, and collaborative dynamics. These strategies contribute to fostering a more agile, adaptable, and responsive construction environment, ultimately leading to enhanced project outcomes.

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LIST OF FIGURES

Figure no. 1
A Case Study on the Implementation of the Big Room Concept in Construction Project
Source: Author own research

Figure no. 2
Involving trade partners in the system's utilization.
Source: Author own research