

IMPLEMENTING LEAN CONSTRUCTION: A PRACTICE PERSPECTIVE

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ABSTRACT

This study uses a practice perspective to examine how lean project practices are implemented in construction firms. Implementing lean construction has proved to yield significant performance benefits. Nevertheless, implementation challenges continue to intrigue practitioners and academics alike.

The study is based on a case of a construction firm, which is involved in implementing a lean project practice. Using a practice perspective allows us to capture the constitutive relationship between what actors within this firm actually do when they engage in the activities of lean construction, and the structural properties of the lean construction concept.

The findings show that the lean project practice is implemented through an enactment and learning process that over time enables the practice to be created and recreated across the internal and external project organization. Implementing this new lean project practice is an ongoing process, through which the practice is translated and transformed by the actors engaged in the activities of using and implementing it.

The paper contributes to the understanding of implementing lean construction by showing that such an implementation process will never be ‘finished’. Instead it is an ongoing learning and enactment process that involves both internal and external actors.

KEYWORDS

Lean construction, implementation, practice, enactment, learning

INTRODUCTION

The lean construction concept is considered a vital strategy to improve the performance of the construction industry (Egan 1998), and has been reported to create substantial improvements for construction firms adopting it (Ballard and Howell 2003). The question remains, however, why it has not been adopted more broadly among the firms in the sector (Mossman 2009). Since Ballard and Howell (2003) voiced a need for lean construction research that systematically examine implementation issues, several contributions have aimed at explaining the challenges of implementing lean construction and how these can be overcome. The specific characteristics of the construction sector, being complex, fragmented, and project based, are seen as key barriers to the implementation of lean construction (e.g.,

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Mossman 2009), just as they are seen as acting as barriers to any type of change in the sector (Gann and Salter 2000, Bresnen et al. 2005).

A recurring topic in the literature on implementing lean construction is the differences between construction and manufacturing industries, in which the lean concept first occurred (Koskela 1992). Some argue that these differences and the specific characteristics of construction mean that lean principles per se are not very relevant for the construction sector (Winch 2003). Others argue that despite the differences, construction is just as well suited for lean thinking as the manufacturing industries; what is needed is a shift towards looking at construction from a “theory of production” (Koskela and Ballard 2006) and a cultural change in the sector (Höök and Stehn 2008).

In this paper, we examine the implementation of lean construction from a practice perspective. Using a practice lens allows us to treat the implementation of lean construction as an enactment process, in which the lean construction concept is seen as being created through the constitutive relationship between the structural properties of the concept and what actors actually do when engaging in the activities of lean construction (see for an overview of the practice theory, Feldman and Orlikowski 2011). The practice perspective is used to analyse findings from a case of a construction firm that is engaged in implementing a lean project practice. The findings show how the lean construction concept is created and recreated through an enactment and learning process, which involves the actions and interactions of actors at various levels in both the internal and external project organization. Our study contributes to the stream of lean construction research that deals with implementation issues in general (e.g., Höök and Stehn 2008), and implementation issues from a practice perspective in particular (e.g., Green and May 2005, Sage et al. 2012). It does not consider whether lean construction should be implemented or not.

The remainder of the paper is structured as follows. The next section outlines the theoretical basis, presenting a review of current literature on implementing lean construction and change processes in project-based companies. Then we present the research design and methods, followed by the results from the case study. The last section discusses the findings in relation to the theory and suggests key managerial implications and avenues for future research.

THEORETICAL FRAMEWORK

IMPLEMENTING LEAN CONSTRUCTION

Lean construction has over the last two decades gained widespread interest from academics and practitioners within the construction sector. The interest has been spurred by the establishment of the International Group of Lean Construction and the UK Governmental report *Rethinking Construction* (Egan 1998). In this report, it is argued that construction should learn from other industries, such as manufacturing, that has successfully implemented lean principles to achieve sustained performance improvements.

The lean construction literature has focused on defining what lean thinking means in the construction setting and the benefits that can be achieved (e.g., Ballard and Howell 2003). However, the literature also includes debates of whether lean thinking

is the solution to the perceived problems of the construction sector, revealing different views on the underlying theories of the construction process (e.g., Koskela and Ballard 2006, Winch 2006). Several contributions report on successful implementation of lean construction, however, implementation problems are also highly recognized (e.g., Mossman 2009). Previous research has emphasized that lean construction must be accompanied by a conscious and consistent strategy and championed by senior level managers (Mossman 2009). Furthermore, it is found that the successful implementation of lean construction presupposes a cultural change of the construction sector (Höök and Stehn 2008), including a fundamental change in the organization of the commercial relationships in the construction supply chain (Miller et al. 2002).

Some have criticized the lean construction literature to be too prescriptive and based on a unitary perspective, thereby neglecting the social and politicised nature of the implementation process (Green and May 2005). By interviewing several stakeholders in the UK construction industry, Green and May (2005) revealed varying views on lean construction and what they argue mirrors the vagueness of definitions, contradictions and ambiguities in the literature. Based on the findings, they concluded that while this ‘interpretative flexibility’ may aid the effective diffusion of lean construction, there is also a risk that without a restructuring of the overall business context away from the short-term competitive pressures, “the likeliest outcome is that managers give lip service to the language of lean, whilst persisting with established practices and routines” (Green and May 2005, p. 510).

In a similar way, Sage et al. (2012) showed how the implementation of lean construction in practice may yield unexpected results in terms of reifying, rather than displacing, pre-existing power relations. These authors argue that using a practice lens adds to our understanding of implementation problems as it allows for exploring the ‘meso-level’ of lean strategizing, which they refer to as the hinterland between corporate strategies and intentions on the one hand and the actual practices of lean construction on site on the other. Their study of a general construction contractor’s intention of implementing a lean construction improvement strategy shows that the lean construction concept is subject to several interpretations, translations and transformation on its way to diffusion.

CHANGE AND LEARNING IN PROJECT BASED ORGANIZATIONS

The general literature on project based organizations has long focused on learning and change. For example, Brady and Davies (2004) showed how changes in the strategic direction and the building of new capabilities of a project based firm happened through the interplay between exploration at the project level and exploitation at the organizational level. Prencipe and Tell (2001) illustrated in a similar way how the learning styles of project based firms can be discerned according to whether they primarily focus on accumulation (i.e. exploration), articulation and/or codification (i.e. exploitation) of knowledge. The problems of effectuating change in these types of organizations have also long been recognized. Particularly, the tension between project and company-wide processes and how to overcome these has been at the heart of this literature (e.g., Gann and Salter 2000). Similar to the recent contributions within the lean construction literature, Bresnen et al (2005) used a practice perspective to illustrate how implementing change in construction is highly

conditioned by the embedding of the new knowledge into existing routines. In a study of change initiatives in the project management routines of four construction companies, they showed how initiatives that disrupted existing power and knowledge structures were likely to trigger great resistance in the respective organizations. They concluded that a key managerial task is to identify the gaps between new and existing practices and use a differentiated strategy depending on degree of disruption, which in turn will influence the need for bottom-up involvement (Bresnen et al. 2005).

While the literature on changes in project-based organizations has primarily focused on the internal processes of change, it is recognized that construction is embedded in an inter-organizational environment (Eccles 1981), consisting of both a temporary project network and the permanent network from which projects draw resources (Dubois and Gadde 2000). As Styhre et al. (2004 p. 958) put it: “(..) construction projects are fundamentally network-based organizations, consisting of a great variety of actors with different expertise, taking part in the construction project at different times”. Thus, changing existing project work practices will affect and be affected by these inter-organizational interfaces.

A framework for understanding the implementation of lean construction

Two key implications can be derived from the theoretical discussion above for our study of the implementation of lean construction; first, we need to consider how people involved in the use and implementation of lean construction enact the lean construction concept. The practice literature has long looked into the concepts of routines and learning to understand the diffusion of practices (Feldman and Orlikowski 2011). It is found that practices, such as routines emerge through the constitutive relationship between agency and the structural properties of the routine, and that this happens through a dynamic learning process (Feldman 2000). This means that we need to understand how the lean construction concept is created and recreated as people at various levels in the internal project based organization learn and engage in the new practice. Second, as lean construction will involve people from various companies, we also need to consider how the external project based organization engage in the translation and transformation process of the lean construction concept. These insights are used for the analysis of the case study presented in the following sections.

RESEARCH DESIGN AND METHODS

The paper presents a case study of a construction company and the introduction of a new lean construction practice across the company’s different units and multiparty construction projects. The case illustrates how the new practice developed through interplay between the Head Office’s strategic efforts and the way it was applied in projects. Some of the events occurred prior to the enquiry, allowing for retrospective reflections, while much of the development processes were possible to trace in real time. The study was therefore process-oriented that is; real-time, theory-led and contextual (Pettigrew 1997). A qualitative case study design was chosen because it allowed for in-depth investigations and rich descriptions of relational phenomena and their dynamics and complexity (Dubois and Gadde 2002).

Data collection took place over a four year period, between 2010 and 2014. It included several meetings and informal interviews and discussions, as well as archival data (company websites, business publications, minutes from meetings,

company reports, evaluation reports, etc.). 16 formal interviews took place with managers at the company's Head Office, managers in different regions and districts, as well as project managers and other project participants. Different data collection methods were used to ensure the quality of the study (Yin 1994). A semi structured interview guide was used where the focus was on the new lean construction practice, the connection between implementation processes at and across the corporate level and the local, project level and the role of the external project based organization, including relationships with sub contractors and clients. The 16 interviews were transcribed verbatim and sent back to the respondents for verification and clarification.

The analysis relied on an abductive research logic, which means that theoretical and empirical insights were intertwined and informed each other (Dubois and Gadde 2002). Memos were created that systematically ordered field notes parallel with data collection and review of the lean construction literature. We probed the data for themes that seemed important for our understanding of implementing lean construction, aided by the simultaneous literature review. The initial report became a narrative of the dominant themes expressed by the participants in the study and this, in combination with archival material, was used to determine chronological event histories in time-ordered case matrices (Miles and Huberman 1994) that formed the basis for the within-case analyses. The software NVivo was used to code and analyze the interview material. No statistical generalizations are claimed based on the study, but the discussion relies on analytical generalizations where the results are compared to previous research and theoretical perspectives of changing practices in project-based organizations.

RESULTS FROM THE CASE STUDY

THE CASE COMPANY

The construction company is a Norwegian contractor located in all the three Scandinavian countries. In 2011, it had a total turnover of 3 billion USD and 6100 employees. The company is a typical project-based organization. It is geographically dispersed, and the corporate organization is primarily seen as a support function to the district offices and respective projects, which have great autonomy. Top management emphasizes that the decentralized structure of the company and the project organization's autonomy are beneficial, and that all management systems need to be adjusted to each project.

In the beginning of the 21st century, the company started to recover from a downturn in the market and there was a shared acknowledgement in the top management team of the need for improvement. In one meeting, the discussion centred around the question why craftsmen are more often on sick leave than the administrative personnel. The answer seemed to be rooted in the workers' lack of understanding regarding their role and responsibility in the projects. This insight triggered a change initiative where the idea was to involve the workers to a greater extent in the projects, making them engaged in their own work situation and feeling more ownership. This would create a common company culture based on involvement. The following sections describe how this change initiative developed into a new project work practice based on lean principles and the implications and challenges of this change.

IMPLEMENTING A LEAN PROJECT PRACTICE

The basis for implementing the new lean project practice was a company-wide improvement process of a more general kind, which the Head Office initiated and run in 2004 and 2005. The improvement process was framed as a staircase, where there was an acknowledged need for starting in the internal organization, before advancing to external actors. The first step in the process, focusing on involving the individual worker, was seen as the basic condition for the next step, which was the creation of a shared 'we-culture' across the company. The next steps would involve the customers and finally the suppliers. The initial focus was on involving the workers to a greater extent and more systematically than earlier in the projects' decision processes. In each project, one should strive to develop a common understanding of the project goals and together decide on how to reach these goals. The basic assumption was that involvement would contribute to develop a corporate culture where each employee would be empowered and feel membership to the company as a whole.

The idea about involvement and the shared culture was more or less adopted by the company's local units. It soon occurred, however, a need for a more systematic tool that could facilitate the creation of ownership and an involvement culture. Six pilot projects were initiated that would use a formalized planning and involvement project practice, focusing in particular on start-up meetings, site meetings and evaluations at the end of the projects, in addition to creating common agreements that all parties would sign. The new practice was based on ideas from Toyota production systems and lean principles (e.g., Ballard and Howell 2003). The ideas had already been adopted by one of the district offices, where representatives had exchanged ideas with experts of lean construction in Denmark and applied lean principles in a few projects. These experiences were feed back to corporate managers. Lean construction was considered to fit well with the company-wide change initiative, as one manager explained:

Lean construction represented what we were trying to improve; it was part of an overall cultural change in the company, focusing on asking questions and knowledge sharing.

Guidelines were formulated and the practice applied in the pilot projects. The pilot projects were all supported by a facilitator from the Head Office, who represented a group of employees that had a designated role as lean construction experts. The six pilots used the practice to a varying extent, however, and with varying results. Some were very successful, others were not. The 'failures' was explained by these projects' inability of creating ownership and understanding of the new way of working, both on the management and the operational level. The projects were evaluated formally resulting in a brochure that was distributed to all districts and projects. The brochure described a systematic plan hierarchy and meeting structure, where the different workers from each speciality would meet and decide together on how to plan ahead. The last planner system and the seven conditions for lean production (Ballard and Howell 2003) were central. The parties would work on a board with post-it notes to find the best possible sequence for each task, so that the production would run without too much delay and as smooth as possible. The refined method was further applied into new learning projects across all the district offices, starting in 2008-2009.

An evaluation meeting was conducted in October 2010. The conclusion was that those projects that had worked hard and implemented the whole concept had succeeded, but there were substantial differences in degree of implementation among the projects.

BARRIERS TO CHANGE OF THE EXISTING PROJECT PRACTICES AND WAYS TO DEAL WITH THEM

A quote from one of the corporate managers illustrates what many construction firms struggle with in regard to changes:

In this company, the districts and the projects are very autonomous - which is our greatest strength and perhaps weakness...

There is a strong tradition in our case company for giving autonomy to the district offices and the projects. This tradition greatly influenced the way the lean project practice was received and used across the units. There were different opinions among our interviewees with regard to how voluntarily the implementation of the practice should be. Many argued that the local levels had to decide for themselves and use what parts of the practice that suited them the best. It was nevertheless a common belief that the top management should push more, since there were several examples of successful use of lean construction. Many worried that those not adopting it or only partially adopting it would miss great potential for project improvements. The interviewees referred to several projects where only parts of the method had been adopted and where things had gone wrong. There were examples where much time had been used on the post-it exercise, for example, but where other conditions had been neglected, resulting in much more time being used during execution than earlier. Hence, even if acknowledging the need for autonomy, several of the corporate managers were concerned that when only parts of the method was used important elements would be left out resulting in failure.

The key barriers to adopting the new practice were multifaceted. Some used the old phrase: 'We have always worked like this, so we don't see what's new'. The projects were used to decide themselves and not being told, hence there was acceptance for variance in degree of adoption. Furthermore, the new practice required changes in roles, particularly the site managers'. While some of these adapted quickly, others were more reluctant to engage in an involvement-based leadership style. As one local manager explained:

For some people it is quite an intuitive way of working, while for others it has been their greatest strength to manage in a very authoritative manner.

Several of the interviewees pointed to the risk of only focusing on the technique, meaning that the focus only becomes planning and production when there is a need for a cultural change. Related to this was a concern that the workers became very good at planning, but not in creative thinking.

Despite some resistance, the practice increasingly diffused across the company and was eventually considered to be 'the way of doing' projects in the company at large, even if not necessarily used in all projects. One corporate manager noticed:

Lean construction has diffused over time rather than being rolled out and decided. It was actually quite easy to implement – like a knife in hot butter.

To facilitate the diffusion and deal with challenges, much focus was put on communicating success stories, creating curiosity and enthusiasm about lean construction and how it might be applied. While the district offices initiated communication and meetings across the units, the corporate management team also facilitated transfer of experiences through articles in the company magazine, distributing the formal evaluations of the projects applying lean construction and the brochures describing the practice across the units, as well as initiating formal meetings and networking. In addition, the facilitators acted as important knowledge agents. No formal training programs in lean construction were held initially, however, something which was considered by some of the interviewees as a slip. An important element in the implementation process was to connect the lean project practice to other initiatives and subsequent practices. For example, the company put a lot of efforts into improving its health, security and environment systems, and the routines and procedures for this were combined with the lean construction practice.

Involving external actors in implementing lean construction

Much focus was put on the internal organization of the company, facilitating the change in project work practices and creating an internal involvement culture. However, it was also recognized that the change would affect and be affected by external actors. The evaluations from the pilot projects concluded that involvement of subcontractors was necessary, but had not been done sufficiently. While the corporate managers had seen the involvement of sub-contractors as a matter of course, the projects had not. Projects that had involved sub-contractors, experienced that some sub-contractors were open to lean construction while others were sceptic to the extended planning time. Some of the projects had also experienced that sub-contractors came to the meetings expecting to be informed and not to actively participate. Those with positive experiences, however, found that sub-contractors realized that they could save time and money as the work processes were running more smoothly. One subcontractor even offered to lower his bid for the next project given that the new lean method was applied. Even if price as a key selection criteria was still important, several of the interviewees argued that lean could eventually influence which sub-contractors to choose and how. As one manager remarked:

Long-term relationships with sub-contractors and suppliers are important if we want to succeed, we cannot just use them and throw them away afterwards. It requires a dialogue also between projects.

The experiences and the evaluations of the pilot projects showed that implementing lean construction would also be hard if the client was not included. Lean construction presupposes that the client is able to provide sufficient documentation and drawings at the right time for the work to be performed. Based on these experiences, the refined lean practice included the client in the plan hierarchy, with structural meetings in order to ensure that the drawings were completed and distributed on time. In some of the projects this worked very well, with good results, while in other projects this failed. The ability to engage the client was a key success factor for lean construction.

The interviewees argued that the company had to focus on informing existing and potential clients about lean construction and use the successful lean projects to sell the concept. Even if many clients are public actors, hindering long-term relationships, informing these about the potential benefits of lean construction was seen as a way to encourage them to use other selection criteria rather than price only. Some private clients that had successfully been involved in the lean project practice were already repeating the business with the company. The managing director concluded:

I think we've got something now that is so good that it will increase our competitiveness; clients and sub-contractors will see that to work with us is profitable.

DISCUSSION

We started this paper by arguing that a practice perspective would be useful to understand implementation of lean construction as this lens allows us to study the role of agency in the implementation process. In line with general (e.g., Bresnen et al. 2005) and lean construction (e.g., Sage et al. 2012) literature using the same approach, our case shows that implementing a company-wide lean project practice happened through a learning process in which individuals involved in using and implementing the new practice enacted it over time. This enactment, in turn, resulted in the practice being refined and adapted to the context in which it was used, a process which never really finished, but is an ongoing effort. Feldman (2000) described how routines are subjects to change, as people using them continuously learn and accumulate new experiences, leading to refinements and adaptations. Our findings show that the implementation of lean construction in the case company was based on a similar learning process as proposed in much learning literature (Prencipe and Tell 2001). First knowledge of lean construction was accumulated as the basic ideas were used in a few projects. The results were then communicated across the units and to corporate levels through visits and meetings, leading to the articulation of the concept and its basic ideas. This further formed a basis for codification of the lean practice into brochures and guidelines that were used in new projects, which again created new experiences and further refinements. Thus, as indicated above, an ongoing learning and enactment process took place, which combined the structural aspects of the lean construction concept with its actual use.

The findings illustrate the interplay between strategic efforts on the corporate level and initiatives, interpretation and actual use on the local level. This finding is in line with Brady and Davies (2004), who showed that change in strategic direction and the building of new capabilities happen through the interplay between project based exploration and top-down strategic exploitation. This was seen as a necessary way of implementing the change in our case company, where the units sustained some of their autonomy while at the same time the organization as a whole was improving. In other words, it enabled a balance between exploration and exploitation.

Thus, a key management task for construction companies is the integration of experiences from projects into the company's continuous business processes and strategies (Gann and Salter 2000). This is also considered important in the lean construction literature, where for example Mossman (2009) urged for the need for time and resources to facilitate bottom-up processes in the implementation of lean

construction. Interviewees from the case company expressed a concern that lean construction would only be seen as a technique, and not leading to the cultural change that was initially sought. In many ways, the lean project practice disrupted existing knowledge and power structures (Bresnen et al. 2005), and especially the role of site managers had to change from the traditional authoritative style to an involvement style. To facilitate the implementation of lean and the associated cultural change, the company relied on the power of experience based learning, where the workers and site managers would experience the benefits themselves. Resources and aids were provided, and the lean project practice was connected to other business processes and initiatives, such as Health, Security and Environment systems and routines.

To a large extent, our case study provides a story of the implementation of lean construction that apparently was more concurrent with the initial ideas and strategies of corporate management, than the story told in Sage et al. (2012). Even if the lean practice was subject to translation and transformation in our company as well, a more coherent practice emerged. The implementation strategy based on diffusion rather than rolling out and the combined top-down and bottom-up processes in our case company may be one explanation for this relative success.

The implementation efforts in our case company focused primarily on the internal project organization. Nevertheless, it was highly acknowledged that the change relied on clients and sub-contractors for being successful. The lean project practice required another way of working with these actors compared with the traditional arm's length relationships, which characterize construction (Dubois and Gadde 2000). In a setting where the development of trust has poor conditions and short-term gains are pursued (Bignoux, 2006), it is difficult to implement a new work practice that initially requires more time and money being spent. For some of the external actors, lean was seen as more time consuming. Furthermore, as Ness and Haugland (2005) remark, in situations with no guarantee or expectations of the future each actor in a relationship will be suspicious of the other partners' intentions. Our case company relied on the power of good examples and real experiences to pursue the external actors to engage. Indeed, sub-contractors that experienced the benefits from the new practice lowered their bids and working sub-contractors that had complied successfully with the new lean practice was considered useful. The same was true for clients as the company aimed at repeating business with those clients that had been involved in successful applications of the lean project practice.

CONCLUSION

The case study presented in this paper provides two key insights into the practice of implementing lean construction. First, it shows that lean construction is not a 'ready-to-use' concept, but emerges as individuals at various levels engage in the use and implementation process. This is in line with previous lean construction literature taking a practice approach to the understanding of implementation issues (Green and May 2005, Sage et al. 2012). Second, it illustrates the need for taking into consideration the engagement of external actors into the implementation process, since construction is per definition a network activity (Styhre et al. 2004). Managers considering changes in project practices in general and the implementation of lean construction in particular, must be aware of the barriers to changing existing practices. The study illustrates that new project practices must be aligned with

existing project practices. Implementing lean construction involves the translation and transformation of the concept based on learning-by-doing. This takes time and presupposes a back and forth feeding of experiences from the local levels and the corporate management level (Gann and Salter 2000, Brady and Davies 2004). Local level managers and practitioners need to feel ownership and are likely to commit to a change if they see their own contribution in the development process (Bresnen et al. 2005). In project based organizations where the project practice includes external actors, managers must not only consider the internal implementation challenges but also how the change relates to relationships with external actors, such as clients, sub-contractors and other suppliers. As our study indicates, implementing lean construction is likely to be enhanced by a more long-term orientation towards external actors, something which the construction industry traditionally has not been too enthusiastic about (Dubois and Gadde 2000).

Our future research could continue the case study presented in this paper and study the long-term effects of the change in the lean project practice for the construction company's relationships with external actors. This would reveal whether or not the development towards a more long-term orientation is required for the adoption of lean construction and also its contribution to increase project performance. The study could also be extended to include similar cases of change efforts in construction companies, to reveal similar or different patterns. Our study can also hopefully encourage other researchers within the lean construction research community to continue pursuing various perspectives in their studies, including the practice perspective. This will contribute to enhance our understanding of the practice of lean construction and to develop a robust theoretical basis for the concept of lean.

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