

# LEAN CONSTRUCTION PHILOSOPHY AND INDIVIDUAL FREEDOM

Pim Polesie<sup>1</sup>

## ABSTRACT

Lean construction may increase efficiency, effectiveness and productivity in construction projects by minimising non-value adding activities to maximise the value added from each individual. To identify non-value adding activities, lean principles advocate increased controllability and transparency. This may limit the individuals feeling of freedom, creativity and willingness to suggest changes that lead to continuous improvement. Therefore, limiting individual freedom, “unused creativity” may increase.

The purpose of this paper is to challenge lean construction philosophy with focus on what individuals from the construction industry have identified as freedom.

The theory of lean construction principles have been identified and evaluated in a literature review. The analysis of practice is based on 20 open-ended qualitative interviews with production managers from construction-related companies with focus on their perception of freedom and motivation.

The study has led to a better understanding of practice and its relation to theoretical assumptions. It distinguishes between what is assumed and what is known.

By minimizing waste through focus on principles that do not limit what individuals’ perceive as freedom, acceptance of lean construction philosophy can be furthered at construction sites.

## KEY WORDS

Lean construction philosophy, Lean principles, People, Freedom, Culture, Waste, Change.

## INTRODUCTION

Santos and Powell (2001, p.166) state that construction “*is often perceived as being dirty, dangerous and dull*” and that the industry is in need of a move from a blame culture to a problem-solving one (Khalfan, McDermott and Swan 2007). Traditional cost-focused management can no longer provide adequate information for managers in complex construction projects (Marr and Spender 2004).

The lean construction philosophy may be a better way to manage construction projects (Ballard and Howell 1994; Ballard and Howell 1998; Salem, Solomon, Genaidy and Luegring 2005) that would improve the construction industry (Howell 1999). The idea behind lean construction philosophy is to maximize value and to reduce waste in order to ‘redefine perfection in construction’ (Ballard and Howell 1998; Salem et al. 2005). It advocates increased controllability through increased

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<sup>1</sup> Division of Construction Management, Department of Civil and Environmental Engineering, Chalmers University of Technology, SE-412 96 Gothenburg Sweden, Phone +46(0)70-989 04 47, pim@chalmers.se

standardization and reduced variability (Santos, Formoso and Tookey 2002). This approach may reduce individual's perceived freedom and thereby their creativity (Sandoff and Widell 2009). Liker (2004) argues that unused creativity may be considered as a reason for waste which may lead to lack of continuous improvements.

The delicate balance between these factors, controllability and standardization (effectiveness) on one side and perceived freedom and willingness to innovate (efficiency) on the other, should be further explored. These factors should be confronted with each other when considering lean construction in practice. Relevant questions to ask are 'do the factors balance or can they coexist' and 'at what cost are the two sides implemented'.

Removing activities that do not add value may initially lead to lower costs, better 'value for the customer' and more direct use of resources in the construction process (Ballard and Howell 1998; Howell 1999). However, if much customer value is realized as a consequence of that individuals working on the projects perceive less freedom, their motivation to continue improving by finding new kinds of waste may be reduced, they may give up and become docile (Sandoff and Widell 2009).

If motivation is decreased by relying on lean philosophy e.g. by reducing the variability of processes, the perceived level of freedom may be reduced (Green 1999; Mehri 2006). Lean construction philosophy has some solutions to these problems e.g. suggesting a decentralizing of the organization and by increasing empowerment of individuals. But, are these solutions sufficient?

The purpose of this paper is to challenge the lean construction philosophy by focusing on what production managers from four Swedish construction-related companies have defined as freedom and to question how the implementation of lean philosophy may affect their motivation and willingness to take new initiatives.

Implementation of lean construction philosophy may even be perceived as a threat. There may be a risk that the capable workers, who are flexible because of their skills, choose to leave organizations if it gets too skinny. The cost of losing well-trained workers and having to re-build functioning well functioning teams may by far exceed the savings made from reducing waste.

## **LEAN CONSTRUCTION PHILOSOPHY**

Lean construction promotes time reduction from ordering to delivery of products by decreasing activities that do not add value to the end product (Stigzelius 2006). It has been seen as an outgrowth of recent developments in manufacturing management (Green 1999; Thomas, Horman, Souza and Zavrski 2002). Others argue that the lean philosophy embodies a mindset that involves all individuals in an organisation to find removable wastes and to increase the efficiency and effectiveness of the operation (Salem et al. 2005).

Howell (1999) suggests that a lean delivery system may be applied to any kind of project in the construction industry. He states that it is especially well suited for 'complex, uncertain and quick projects'. Al-Sudairi (2007) agrees, and further argues that lean principles are effective also in simple processes. Howell suggests that lean construction may be a means to meet customer demands by using less of almost everything and thereby focusing not only on the management, but also on the 'physics'. He argues that by implementing a lean philosophy more value may be produced for the customer. Kashiwagi and Savicky (2003) maintain that the

philosophy also encourages loyalty, empowerment, consensus and a move from a cost focus that awards construction contracts to the lowest bidder. In the same line of argument Stigzelius (2006) maintains that lean philosophies are based on working smarter, not harder and to do the right things at the right time in contrast to just doing things right. On the other hand Green (1999) and Mehri (2006) argue that the a lean philosophy may increase stress and undue exploitation of the workers through decreased focus on the personal integrity. There seems to be a lack of agreement about what lean philosophy is all about. Eriksson (2009) argues that the ideas behind lean construction philosophy are not quite clear in the literature. Jørgensen and Emmitt (2008) agree with Eriksson and argue that there is a lack of common definitions in the lean construction literature.

Ballard and Howell (1998) suggest that every construction project should be viewed as a unique production system, instead of being one of many projects of the same kind. They further claim that the client's objectives can be analyzed clearly and that management of the projects then be fully decentralized to maximize throughput, awareness of the project. This will also reduce inventories (Ballard and Howell 1998). From this aspect lean construction philosophy promotes a system approach to every project, where best value should be defined from a customer perspective (Kashiwagi and Savicky 2003).

Womack and Jones (2003) and Liker (2004) argue that firms that go lean try to gain advantages of closer collaboration, in order to increase value for the customer. Somewhat in contrast to Ballard and Howell (1998), Womack and Jones (2003) suggest that reducing indirect costs by standardising processes often requires more cooperation over a longer period with a few chosen suppliers and subcontractors. They do not view every project as a unique production system. Dubois and Gadde (2000) maintain that longer periods of collaborations are of special importance in construction. They argue that about 75 % of the total cost in Swedish contracting firms may be related to purchased materials and services.

In contrast to production, construction is contract driven. Therefore improving the planning system is a key indicator of improved workflow reliability (Salem et al. 2005). Howell (1999) argues that it is by measuring the performance of the planning system that cause and effect for lean construction organizations are reflected and realized. Before finding these measurements, Howell (1999) suggests, the primary objective for any construction organization is to bring the flow of work and production under control. He maintains that this forces the organisation to change its delivery system in order to support a more reliable flow of work.

## **THE HUMAN ASPECT OF LEAN CONSTRUCTION**

People are important in lean construction philosophy (Ballard 2000). Even so, lean construction have been accused of neglecting the human and cultural aspects of the work process (Green 1999; Alves and Tsao 2007). The people involved in the organizations that adopt lean construction philosophies are expected to be more active in the process of continuous improvement. Stigzelius (2006) maintains that since this philosophy entails working smarter, not harder as well as taking care of all employees' creativity to encourage continuous improvements, the working environment will improve which reduces the absence of workers from places of work that are truly lean.

In contrast to Howell's (1999) and Stigzelius's (2006) argumentation, Green (1999), has analysed lean construction critically from a human perspective. He maintains that lean organisation exploits their employees more than other comparable organisations. He further suggests that employees, despite the higher wages, regularly complain about "*poor safety standards, stress of work, loss of individual freedom and discriminatory employment practice*" (p. 26).

Howell (1999) argues that human issues come into play especially when implementing lean philosophy, when building the systems, teams, organizations, and when formulating the contracts and communicating amongst each other and with other actors. In this reasoning human recourses are of special importance for the organisation when changing or interacting. The soft issues, like obtaining agreement on contracts and avoiding failure in communication, Howell (1999) argues, do not change what he calls 'the physics' of the system. Instead, he argues, co-workers that are not trained in lean construction thinking are at a disadvantage since they have less insight into the logic of the bigger picture in the production system.

Both Howell (1999) and Salem, Salomon et al. (2005) maintain that people can try to avoid lean construction systems due to that their perception of cause and effect becomes outdated. Salem, Salomon et al. (2005) suggest that it is the common sense of the individuals in the industry that needs to be changed in order for them to understand the advantages of lean construction. They argue that education is necessary to bridge this barrier. As an example of this difference Howell (1999, p.3) states "*Working to eliminate reworks makes perfect sense when a system perspective is adopted but stopping the line looks strange to people who are trying to optimize performance of a single activity*". It is further argued that increased transparency allows workers on site to make decisions that support the preset production system objectives. This reduce the need for management involvement (Howell 1999).

Green (1999) refers to Turnbull (1988) who argues that the workforce in the 'lean-regime' of the car manufacturer Nissan interpreted flexibility, quality and teamwork as control, exploitation and surveillance. Green (1999, p.26) continues "*it seems that there is a price to pay in terms of worker autonomy*".

## METHOD

A review of literature has been conducted in order to distinguish between what is recommended in the literature from what is experienced among production managers in the industry. This overview has given a theoretical framework for interpreting the interviews with 20 production managers (foremen, project managers, project engineers and site managers) that were conducted in 2009 in four Swedish construction related companies in the Gothenburg region.

The literature mainly describes different aspects of the lean construction philosophy. It has been identified through key articles, their list of references and also by recommendations from people in the lean construction community. Literature regarding lean production has also been reviewed to some extent.

The explorative interviews were semi-structured in accordance with Holme and Solvang (1997), Yin (1994) and Chen and Partington (2006). An open-ended approach based on principal and follow-up questions was chosen to ensure a holistic view. Each interview was conducted within a time-span of 100 to 130 minutes. The interviews were in three parts: the current situation, improvements and how freedom

affects motivation. Each parts was narrowed down to sub questions, e.g. 'please describe you work role' and 'what do you enjoy the most in your work'.

When analysing the data for this paper the respondents' perceived freedom and motivation was emphasised and contrasted with elements from the philosophy. The aim was to identify tensions between perceived freedom and motivation, as presented in the interviews, and principles of lean construction, found in the literature.

The findings were discussed in three workshops with actors from the construction industry. In the workshops standardisation was contrasted with freedom and motivation in order to identify if they were viewed as antagonists and to open up for discussion.

### **THEORY IN PRACTICE -A PRODUCTION MANAGER PERSPECTIVE**

The production managers perceived freedom as important. However only a few of the lean construction principles affected their feeling of freedom. They suggested that the industry should not be compared to car manufacturing plant since construction is concerned with one-of-a-kind projects, c p Howell and Ballard (1998). However, when standardisation was brought up in the workshops many of the participants interpreted it as a means to reduce their responsibility and to increase the controllability by giving them more time for them to solve more important tasks. It was argued that the rate of standardisation through prefabrication had increased significantly in recent years, mostly through standardisation of materials.

Good relations between the sub contractors and suppliers were perceived as important among the interviewees. Even so, collaborations that extend over several projects were rare. The focus on short-term profits was often seen as a hindrance to change and as an obstacle for finding innovative solutions and to constantly improve. Some of the interviewees suggested that it could depend on the traditional emphasis on price rather than value for the customer, this is in line with Kashiwagi and Savicky (2003).

Howell's (1999) explanation that the industry is contract driven and that certain results are expected from every singular project was maintained. It was suggested that the focus on profit and the perceived uniqueness of every construction project functions as a barrier against the development of long-term collaboration. Some of the interviewees suggested that benefits from long-term collaboration with material suppliers had been realised to some extent in their organisations. However, even in these collaborations, there was a profit-per-project reward in focus. This was identified as one of the factors that maintained the competitive blame-culture among the individuals in the industry.

To build stronger relations with other contractors and suppliers as suggested in the lean construction philosophy was often presented as a possible means to create extra time for the interviewees to focus on more significant issues. Thus it was actually perceived as a means to increase their freedom.

It was maintained that the construction industry has not yet adapted to reducing their indirect costs by standardising processes and products. This is in line with the arguments of Dainty, Ison et al. (2005).

The view presented by Koskela and Vrijhoef (2001) that the construction industry is based on centralised task management was not quite in line with the answers in the interviews. It was rather maintained that each project was run as if it were an

individual organisation. This is in line with Howell and Ballard (1998) and Styhre and Josephson (2006). The production managers maintained that they often acted as leaders with much authority with a system approach.

The interviewees were not prone against increased standardisation or the implementation of toolboxes as some advocate of the lean construction philosophy have suggested. Instead, it was argued that the tools allowing room for improvisation were important in order to resolve everyday problems that arise due to uncertainty and uniqueness of the industry.

Some of the interviewees even maintained that decreased responsibility and uncertainty through more specific work roles was sought after. They argued that it would give them freedom to solve specific tasks and to focus on the more significant issues. It was further argued that increased centralisation and standardisation could be a way to create more homogeneous practices, thereby more effective work sites in line with Santos et al. (2002).

Examples of factors that influence perceived freedom were ability to overview influence project economy, the possibility to set up effective teams, the possibility to influence the client and ability to control the schedules for the flow of work. Most of these issues are related to being able control the activities of the projects. Other aspects of the interviewee's roles such as the large amount of paperwork connected to administration or the purchasing of goods were not perceived as important. Some of the interviewees suggested that they had to maintain control over the projects. Others suggested that some of their activities took too much time from the more significant activities. They maintained that others could equally as well handle such tasks. To some extent this stands in conflict with Santos et al. (2002) who maintain that construction managers should initially change their focus from writing documents to the achievement of standardised practices.

## **DISCUSSION AND CONCLUSIONS**

The principles of lean construction have not yet been thoroughly explored in practice. Some tensions may be perceived from the response in the interviews and the reflections from the workshops. The picture of what a lean philosophy really entails has not yet been agreed on as suggested by Eriksson (2009). It was clear that the interviewees did not have enough knowledge about what lean philosophy would mean for their work-role. As suggested by Howell (1999), the implantation of this philosophy may change the construction industry for the better. On the other hand, it could be argued that if no clear definition could be presented the implementation may increase uncertainty of projects and decrease their controllability since individuals will interpret the 'undefined' philosophy as they wish. A stable foundation in the house of Toyota has to be built into the culture of the organisation before the philosophy can be implemented at a project level as argued by Liker (2004).

There is some agreement in the literature that lean construction is a 'new' way of managing construction projects but, it is suggested to be either a philosophy (Howell 1999), a mindset (Eriksson 2009) or a toolbox (Salem, Solomon, Genaidy and Minkarah 2006) or a mix between all these. This has created some confusion.

Some of the aspects of implementing lean construction have been suggested to simplify and standardise construction projects. Some of this effort may be identified as means of streamlining the work roles of production managers. Other aspects of the

philosophy are to empower the individuals and to decentralise initiatives within the organisations. This may increase tension but also make the projects more responsive to customer needs. However the interviewees did not always subscribe to these priorities.

Such contradictions may promote misunderstandings that change the work environment and prevalent attitudes within the projects. Key terms in the philosophy such as waste and value are sometimes interpreted differently in different situations. This was frequently commented in the interviews. The efficiency and effectiveness were interpreted in many different ways by the interviewees. Therefore the implementation of a toolbox as suggested by Salem et al (2006) may be misunderstood. In the same line of argument, Jørgensen and Emmitt (2008) suggest that a common definition of lean construction is actually missing.

Since the decision to implement lean construction is likely to be taken by top management as suggested by (Salem et al. 2005) and implemented in the projects by production management focus may be turned towards issues that were not intended due to miscommunication within the organisation if the fundamentals of lean philosophy have not been put in place. Especially if no clear definition of what to include in the philosophy exists (Eriksson 2009). The top management in the organisation should therefore be careful when implementing lean construction so that the efficiency and effectiveness are increased by the reduction of waste as suggested by Ballard and Howell (1998) and not by working harder as suggested by Mehri (2006). This misconception is another aspect that could easily create tension between theory and practice when implementing lean philosophy.

Kashiwagi and Savicky (2003) argue that the customers of facilities are reluctant to pay more for increased value if they do not understand how it affects them. It might therefore be of value to change the mindset of the customer and not only the mindset of the actors in the construction organisation as suggested by Salem et al. (2005). Increased customer awareness of lean construction principles may increase collaboration between customers and production managers. Thereby their empowerment and ability to influence may also be increased. These were seen as important freedom factors. However increased collaboration with the customer by production managers may take some time, which is another of their factors of freedom. This conflict may at times create tension.

The implementation of lean construction may be a way to increase controllability and transparency through increased standardisation and reduced variability of construction projects as suggested by Santos, Formoso et al. (2002). In the interviews this was perceived as a way to reduce their responsibility and to open up more time to dealing with significant tasks. It was even presented as way to increase the controllability of their projects. Increased project controllability was perceived as a freedom factor.

It could however be argued that if top management decides to implement lean construction without considering the consequences such a transformation would entail, the implementation of lean principles may even impair the existing organisation. Production managers may feel that they have not been entrusted to influence the decision even though it affects their work role. Since the ability to influence was presented as a key factor for perceived freedom, production managers may renounce their responsibility and take on a docile role as suggested by Widell

and Sandoff (2009). This is not at all as intended by lean philosophy. Loss of knowledge in project organisations is problematic since it is recognised as a mix of experiences, values, contextual information and expert insight which works as a framework for evaluating and incorporating new experiences and information (Marr and Spender 2004).

If key individuals leave the organisations it may take quite some time to create new well-functioning teams in the organisation. Therefore some risk assessment should be undertaken before changes in the organisations that affect the individual within. It is also valuable to be able to interact with all individuals within the organisation before changes are implemented in line with lean philosophy.

As described by Green (1999) the implementation of lean philosophy strategies may reduce the choices to solve problems and thus reduce uncertainties but also worker motivation and their willingness to be innovative. However, according to the interviews there is a willingness to adopt more structured work roles in accordance with the lean philosophy to find time to handle upcoming problems more directly and to be more innovative and creative. Some of the interviewees argued that also problem prevention and not only problem solution was a major part of their job but that they could not find the time.

None of the sources above mention how production managers perceive their own role. Neither do they suggest how production managers perceive their need for freedom or their need for flexibility of making individual choices. This is an important area for further research. The flexibility of construction projects may be what the customer needs and what the construction organisations should pay particular attention to. By implementing a rigid toolbox flexibility of the organisation may be lessened.

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