LEAN AND SMEs

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INTRODUCTION

This report provides a literature review aimed at supporting the Highways Agency (HA) with Lean Implementation in the Small and Medium sized Enterprises (SMEs) within their supply chain. In doing so the report considers good practice in lean implementation; the particular characteristics of construction SMEs; and case studies and tools that are currently used in the construction industry. The report is intended to inform further primary research in the form of interviews and surveys in order to provide recommendations to the HA for successful implementation of lean within their supply chain SMEs

LEAN IMPLEMENTATION

LEARNING FROM TOYOTA

Lean principles are founded on the practices of Toyota. Therefore, before considering lean implementation in the context of the construction industry it is worthwhile looking at the principles that have guided their implementation within Toyota itself. (Liker, 2004) emphasizes the reliance on every worker's active involvement in continuous improvement that is at the heart of lean practice within Toyota:

> **"THE MORE I HAVE STUDIED TPS AND THE TOYOTA WAY, THE MORE I UNDERSTAND THAT IT IS A SYSTEM DESIGNED TO PROVIDE THE TOOLS FOR PEOPLE TO CONTINUALLY IMPROVE THEIR WORK. THE TOYOTA WAY MEANS MORE DEPENDENCE ON PEOPLE, NOT LESS. IT IS A CULTURE, EVEN MORE** than **A SET OF EFFICIENCY AND IMPROVEMENTS TECHNIQUES. YOU DEPEND UPON THE WORKERS TO REDUCE INVENTORY, IDENTIFY HIDDEN PROBLEMS, AND FIX THEM. THE WORKERS HAVE A SENSE OF URGENCY, PURPOSE, AND TEAMWORK BECAUSE IF THEY DON'T FIX IT THERE WILL BE AN INVENTORY OUTAGE. ON A DAILY BASIS, ENGINEERS, SKILLED WORKERS, QUALITY SPECIALISTS, VENDORS, TEAM LEADERS, AND — MOST IMPORTANTLY — OPERATORS ARE INVOLVED IN CONTINUOUS PROBLEM SOLVING AND IMPROVEMENT, WHICH OVER TIME TRAINS EVERYONE TO BECOME BETTER PROBLEM SOLVERS."**

The above quote emphasizes the wholesale change in culture and practice that is necessary before an organization can be thought of as lean. Any organization that practices lean will have undergone a considerable period of change in order to embed that culture in its everyday practices. Therefore, it is essential to think deeply over not only which lean tools are to be adopted by an organization, but also what are the most appropriate steps to take in order to make the transformation successful? Given that the roots of lean thinking are embedded in Toyota it is worthwhile considering which lessons can be learned from Toyota in terms of lean implementation.

LEAN THINKING

Within 'Lean Thinking', Womack and Jones (1986) make specific recommendations for the application of lean principles within an organization:

1. Find a change agent
2. Get the knowledge
3. Find a lever by seizing a crisis or creating one
4. Forget grand strategy for the moment
5. Map your value stream
6. Demand immediate results
7. As soon as you have momentum expand your scope.

The importance of a change agent to drive action is emphasized*. "Action is a must because it develops a new mind, and gives people confidence that changes can be made. Above all the change agent must have the courage to* ***cause principle driven action****, and to stand against attempts to dilute lean."*
Although the emphasis is on action this must be supported by knowledge. *"Obtain enough knowledge to begin implementing lean and then continue to gain knowledge through implementation. Do not ignore the need to understand basic production management principles."*

The idea of a crisis is used as a means of ensuring that everyone understands the importance and the need to change. The key point here is that people must be convinced of the need to change.

Mapping the value stream is important in its own right, *"The advantage is that it reveals gaps in performance and practice, and may deliver almost immediate improvement",* but also because it creates an increases in the visibility of waste, "*Demonstrating an organization's waste in a process provides an irrefutable business case for the need to be lean; making visible the scale, quantity and location of waste and the potential for specific efficiency gains provides a powerful argument."*
Although lean implementation should lead to tangible results these may not solely be financial. *"Reduced costs within an activity are the wrong results to ask for, just as more rapid completion of tasks. Better to ask for immediate results in planning performance and for demonstration of how such improvements translate into reduced backlogs between activities."*

It is important to expand the application of lean principles, however, the emphasis is on improving project planning first and then expanding rather than the development of a new supporting system around inadequate projects. *"…. it is believed that designing a supporting system to mesh with an inadequate project planning system is starting at the wrong end."* If the preceding steps are in place the scope of lean implementation can be expanded.

THE TOYOTA WAY

In the 'Toyota Way' Liker (2004) presented 13 "tips" to facilitate Lean implementation. These tips are listed below.

1. *Start with action on the technical system, follow quickly with cultural change*
2. *Learn by doing first and training second.*
3. *Start with value stream pilots to demonstrate Lean as a system and provide a "go see" model.*
4. *Use value stream mapping to develop future state vision and help "learn to see".*
5. *Use kaizen workshops to teach and make rapid change.*
6. *Organize around value streams.*
7. *Make it mandatory.*
8. *A crisis may prompt a Lean movement, but may not be necessary to turn a company around.*
9. *Be opportunistic in identifying opportunities for big financial impacts*
10. *Realign metrics with a value stream perspective.*
11. *Build on your company's roots to develop your own way.*
12. *Hire or develop Lean leaders and develop a succession system.*
13. *Use experts for teaching and getting quick results*

These principles are grouped by Liker (2004) according to four broader dimensions: a) Long term philosophy; b) Process improvement; c) People and partners development; and d) Continuous improvement. Liker (2004) also emphasize the importance of keeping the company's identity during the implementation of Lean. Liker argues that every company is unique and should search for the most appropriate set of tools according to the company's context.

There is much agreement between Liker and Womack & Jones. Both emphasise learning by doing as the starting point. Both set out steps that need to be delicately brought together with care and attention and require a targeted approach. Liker identifies that changing the culture and mind-set of all employees is crucial to successfully implementing Lean. To do this the organisation must find someone who will champion Lean ideas; this person has been called the 'Change Agent'. This person must have leadership qualities (as opposed to managerial qualities discussed by Lucy et.al. (2005)), with the courage to stand up against any attempts to dilute Lean.

Lean requires decentralised decision making, which will be fiercely resisted by those who equate it to a loss in their power. And those that are at this time are disengaged employees, they will need to be re-engaged if lean is to work. For success to occur the change agent will need people at all levels of the organisation to be exemplifiers of lean principles and action, so that eventually all employees will be empowered with the principles of Lean.

IMPLEMENTING LEAN IN CONSTRUCTION

The previous section considered generic principles for lean implementation based on the practices within Toyota. This section of the report looks at lean implementation in the specific context of the construction industry. It cannot be over emphasised (Lawson & Price, 2003) that the origin of Lean and therefore much of the literature and theoretical scholarship is directed to manufacturing type processes undertaking the same or similar types of tasks. Many companies and public institutions thought that Lean practices could easily be transposed to all types of organisations. However there has been limited success implementing Lean in the British National Health Service (NHS) (Radnor & Osborne, 2013) and also in its take up in the construction industry. Koskela (2013; 2000) points out three peculiarities of construction; each project is one-of-a-kind, the production takes place on-site and it is through a temporary organisational structure. This has led to a discussion as the how adoptable Lean can be when applied outside the manufacturing environment and much good work has been carried out by the International Group for Lean Construction (ICLC, 2014) over the last decade to develop a set of Lean principles and tools focused specifically for the project based construction industry.

There are not many papers that deal with the specific of lean implementation in construction organisations. Arbulu and Zabelle, (2006) consider that:

> "the main challenges organizations are facing when trying to transform themselves into a lean organization is a combination of two aspects: (1) lack of understanding that lean project delivery implies a different way of doing business in construction, and (2) how this transformation is currently approached."

This again indicates that companies need an understanding not only of lean principles but also steps towards implementation

"Organizations can be understood as a combination of different elements such as values, culture, processes, structure, people and skills, and systems. The implementation of lean in construction is really a 'transformation' process from a current state (the way the organization operates now) to a future state where the characteristics of these elements are redefined to enable lean project delivery and increased competitive advantage in the market." (Arbulu and Zabelle, 2006, p.555)

However, Arbulu and Zabelle introduce a note of caution about pushes to adopt lean construction, "This [specific demands from the market] is pushing organizations to adopt a 'shallow and wide' implementation approach typically conceived and mandated by leadership, and then communicated from the 'top down' without proper stakeholder engagement."

This is counter to the Toyota approach as described by Womack and Jones, and Liker. Both of their books described an action first approach followed by a more widespread

uptake. Here there is a particular advantage for construction *"The construction industry has a key advantage compared with other industries regarding how to approach a sustainable lean transformation. This advantage is 'projects'……. Taking projects as the basis for transformation enables a narrow-and-deep implementation approach."* (Arbulu and Zabelle, 2006, p.557)

As per the previous section these critical changes then represent *"the start of a continuous process where old systems are disconnected, incentives are changed, processes are streamlined, and vision is reinforced through heavy-weight project leadership."* (Arbulu and Zabelle, 2006, p.557)

According to Arbulu and Zabelle the main benefits of adopting this 'narrow and deep' approach include:

1. Maintain current operations while transformation occurs. The objective is a smooth transformation.
2. Better control of when the break point occurs. The break point is defined as the moment where at least 50% of projects are being delivered through the new business model.
3. Better control of capability development. The adoption of the new business model imposes many technical challenges for leaders and project team members.
4. Better decision making regarding which project is next in the transformation process. For example, companies may want to gain competitive advantage faster by selecting projects from key clients or industry sectors based on their contribution to the organization's revenue.
5. The impact of top-down leadership support is higher thanks to working in a more controlled environment (e.g., one project instead of ten). A lean transformation initiative requires significant time dedicated to lead teams through change.

BARRIERS TO LEAN

The preceding has set out a series of actions necessary for a company to successfully implement lean. The range of these actions illustrates the complexity of these processes. For lean implementation to fully succeed it will require all of the steps illustrated to be successful. It is therefore worthwhile considering the barriers that inhibit the take up of lean.

RESISTANCE TO CHANGE

When a company implements Lean it will go through two processes, 'change' and 'transformation'. Bridges (2002) explains that 'changes' are situational; a new site, a new boss, a new role within a team, a new policy. This is the starting point of lean implementation, the starting point of 'action'. Whereas 'transformation' is the psychological process people go through in order to come to terms with the new situation. Lucy et al (2005) succinctly summarizes Kotter as follows; *Kotter (1996) states that major transformations have helped organisations such as GE, Allied Signal*

and Motorola adapt significantly to shifting conditions but, in too many situations, the improvements have been disappointing and the carnage has been appalling, with wasted resources and burned out, scared or frustrated employees. Kotter goes on to stress that the downside of change is inevitable. Whenever a business is forced to adjust to shifting conditions, pain is ever present and a significant amount of waste and anguish is unavoidable. The key issue is ***knowing how to enact change*** *and, of course, it is important to* ***have a clear vision*** *and to get* ***everyone in the organisation supporting it****.* These three statements in bold, may look obvious, but these are the most important hurdles to overcome for a successful implementation of a Lean strategy. Lean must be seen as a long term goal that should grow within the company over time.

The person or team that will implement a Lean strategy can be either be 'Managers' or 'Leaders'. Kotter (1999) explains that "*Management is not leadership; it is more about controlling and problem solving and producing the short term results expected by the various stakeholders. Leadership is about establishing direction, developing a vision of the future and setting strategies for making the changes needed to achieve that vision*." Leadership is what is needed for a company to succeed generally and especially when implementing Lean, (see Liker's 9th principle). The employees that are the ones who will be implementing a Lean strategy must be fully engaged in the process right from the beginning. Understanding how to motivate, encourage, and support employees is paramount for the success of any company especially one that wants to implant a Lean strategy. Lean by its very nature implies reducing waste and redundancy in the workplace. Employees may feel that they are being asked to change their working habits and environment for the sole advantage of the company. For Lean to be successful the leadership must understand the psyche of the employees and show them what the advantage will be to them as individuals if they adapt Lean.

Gallup makes surveys of employees to identify if they are 'engaged' or 'actively disengaged'. Kotter (1993) states that "*there is clear evidence that engaged staff produce better results and are less likely to resist change, and companies who do measure and actively manage employee engagement have seen stunning results*" The employee's that actively oppose change, especially Lean change, may be actively disengaged. Therefore success will depend on the active engagement of <u>all</u> employees right from the beginning of any process to implement Lean. Robinson et al (2004) published the results of a major study into employment engagement, which supports the view that engaged employees consistently produce better results and they identify the strongest driver as a sense of feeling of being valued and involved.

RESISTANCE TO LEAN

The preceding outlines generic reasons why it is difficult to create positive change within organisations. Many of these factors are echoed in Lucy (2005) who lists the top 10 reasons for the failure of major Lean transitions as follows:

1. Lack of a clear executive vision and leadership

2. Lack of an effective communication strategy
3. Failure to create and communicate a sense of urgency
4. Poor consultations with stakeholders
5. Lack of a structured methodology and project management
6. Failure to monitor and evaluate the outcome
7. Failure to fully mobilise 'change champions'
8. Failure to engage employees
9. Absence of a dedicated and fully resourced implementation team
10. Lack of sympathetic and supportive HR policies

Some of these failings are obviously direct failures of implementing Lean strategies, while others are more generalised including the foresight, capabilities and strategies of the team who may be acting more like managers than like leaders.

OVERCOMING BARRIERS

By considering the means with which we can overcome barriers we can begin to find ways to successful implementation. An important first step is therefore to persuade the employees to think differently about their whole jobs. This will not only include changes to their mind-sets, but also to their working practices. Lawson and Price (2003) identify four conditions for changing mind-sets. Each of which is realized independently; together they add up to changing the behaviour of employees by changing attitudes about what can and what should be done.

Employees will only alter their mind-sets if they see the point of the change and agree with it. They must understand the role of their actions in the unfolding dramas of the company's fortunes, that their contribution makes sense to them as individuals, and therefore believe that it is worthwhile for them to play their part.

The surrounding structure (rewards and recognition systems) must be in tune with the new behaviour. This means that when setting new targets, when measuring performance, or giving out financial and nonfinancial awards these must be updated to include all the new activities that may be required to implement a Lean culture. This is important as until now these were not part of the organisations' rewards and recognition systems. I.e. if people in the organisation are asked to go that much further to help implement a Lean culture, if they do not see their new behaviours being reinforced through the company's reward systems, the changes are more likely to peter out.

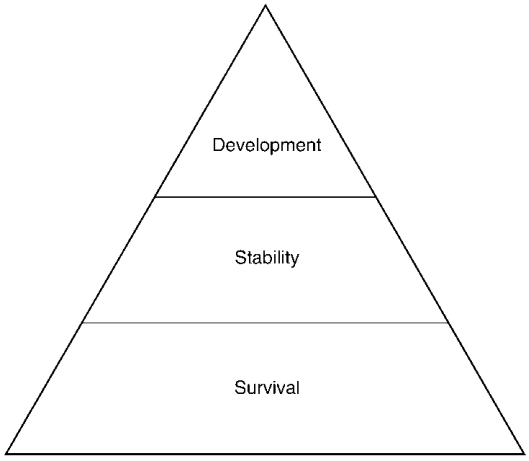
Employees must have the skills to do what is required. The concepts of Lean give generalised methodologies for a whole organisation. Employees may be confused as to how to adopt the generalised instructions to their individual workplace activity. Therefore they must be trained or taught how to implement the methodologies to their

work. The best way to do this is to break down the formal teaching into chunks and give the employee time to reflect, experiment and apply these new principles.

Employees must see the people that they respect modelling it actively. People in organisations model themselves on 'significant others' who they see in positions of influence. Within a single organisation people in different functions or levels choose different role models to emulate; a founding partner, a trade union representative or perhaps the highest-earning sales representative. So to change behaviours consistently throughout the organisation, it is not enough to ensure people at the top are in line with the new ways of thinking/working; role models at every level must "walk the talk". If some employees, especially long standing ones, voice scepticism, this can undermine enthusiasm for change.

CONSTRUCTION SMES

Contractors are in business to make a profit. They therefore need to be persuaded that by implementing Lean practices it will help their business regardless of their affiliation to the HA. If the SME implements Lean just so that it will win a contract with the HA, to gain preferred contractor status, or is enforced through contractual agreement, it will be doing it for the wrong reasons and it is very likely to be unsuccessful in its transition to lean practices. There are therefore a number of things that the HA will need to do to successfully add a non-lean SME to its Lean supply chain.



In their work on innovation in construction SMEs (2003) Barrett and Sexton classified the motivation of SMEs to innovate as follows
(1) *Survival*: small construction firms, owing to the type of markets they operate in and their lack of organizational resources and slack, concentrate foremost on project-based innovation focusing on survival.
(2) *Stability*: it is only once survival has been confidently achieved that firms are sufficiently motivated to look towards consolidating and stabilizing their market and/or resource position to ensure steady-state conditions over the medium term
(3) *Development*: this stability provides the necessary motivation to exploit the prevailing stability and to develop and/or grow.
This again points to the narrow and deep process outlined in the previous section as being the initial way in to implementing lean with the Highways Agency's SMEs.
In addition to this, and in order to enable the SMEs to move from change towards transformation or upwards to the Stability and Development modes the HA should consider actions that support the business environment for these organisations. It may

be that as part of the HA's supply chain they already have the conditions for stability but additional mechanisms that bring the supply chain together to share ideas and innovations and drive continuous improvement. This may also assist the companies to move to the Development mode. This may also help to overcome the hurdle that in many cases the SME contractors will be one stage removed from the HA. This could provide confusion to the contractor as to who the client is with regard to focusing of a lean value chain for their part of the project. Is it the HA or the project management team? For the whole supply chain to be successful in Lean, it has to be clear that the value has to be to the goal of the whole project. It is highly likely that what may be value for one section of the whole value chain may not be what is ultimately best for the HA.

One key factor that will be essential to create and also gauge the success of lean implementation will be openness. Within SMEs, and in a narrow and deep approach, those employees at the 'workface' are the ones best placed to identify waste and redundancy, and are usually able to use their ingenuity to find better working practices. These workers are often not the type of people to give advice to management, especially if they are pointing out longstanding wasteful practices. Therefore a sign that Lean is working is when these types of employees are providing feedback. Koskela et al. (2013) identify a list of wastes from Macomber & Howell (2004) associated with the communication of ideas from the workers to the decision makers. These include; failure to use people's talents, skills and capabilities; information waste; behavioural waste; and wasting good ideas. Macomber & Howell (2004) also argue that **failure to speak** and **failure to listen** are 'the two great wastes of construction', this is in contrast with the view of Koskela et al (2013) above. To overcome these wastes the Lean culture must provide the forum and abilities for those at the 'workface' to communicate their ideas, worries and grievances within the process of implementing Lean. This will not only be true within the organization but equally applicable between organisations. A structure or forum that eliminates waste through lack of communication has much potential to signal the strategic importance of lean and also to embed the principle of the sharing of learning.

CONCLUSION

The implementation of lean in any organization is a long, ongoing and complex process. The processes involved can be thought of as change and transformation. The benefits of change need to be clearly demonstrated early on in the process and then steps taken to build on this taken to ensure that the associated transformation in thinking and doing is also taking place. The project based nature of the construction industry is often seen as a reason for the conservative nature of the industry and its lack of innovation. However, with regard to the adoption of lean in the construction industry and construction SMEs in particular this project based emphasis can be used to good advantage. A 'narrow and deep' implementation strategy should be used to focus initial efforts on improvements in a project context. This is in line with Toyota's strategy of

learning by doing and also aligned with SMEs needs for tangible benefits. The benefits of this approach include the ability to maintain current operations while transformation occurs, better control of the implementation speed, better control of capability development, better decision making regarding which project is next in the transformation process, and greater impact of top-down leadership support thanks to working in a more controlled environment

The demand from the HA for their supply chain to implement lean can act as the 'crisis' that makes clear the need for lean adoption. However this initial implementation is only a starting point and strong efforts will need to be made to embed the project based lessons throughout the organization. His will require leadership and the active engagement of all employees. There is a strong recognition of the need for a change agent to drive this change through. In the longer term though a change in thinking is required throughout the workforce. Here, in addition to the lessons from Toyota, Lawson and Price have some important general advice. The reasons for the change must be clear and rewards and recognition realigned appropriately. This applies at the individual and firm level. This implies that in addition to the project focus an activity that brings firms together will have benefit. Skills training will be required at different levels of the organization to ensure that individuals have what they need to implement new techniques and procedures and so that role models are provided to demonstrate the benefits of change in practice.

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