

Developing A Strategy to Enact Lean

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Abstract: This paper explains the strategy employed by a case study company to implement lean across the business, and to reflect on the success of this approach so other companies may consider this learning and how it might be useful to them. The strategy to enact lean in the case study company was based on creating a number of standard tools/ways of working. These tools can be considered to be standardised work for key aspects of the construction process that the company undertakes. The aim of the tools was to ensure that critical tasks would be carried out to the correct standard (quality, time, cost, health and safety) every time, across the business. Achievement of this is expected to lead to improved performance and elimination of variation (waste). To implement this strategy of using standardised work to eliminate variation and lead to improved performance, a step-by-step process was developed to create the tools/standardised work. The paper describes the process that was undertaken and how it aimed to not only produce a number of tools/standardised work, but also to involve people and managers from across the business such that lean philosophy and thinking might also begin to become embedded. The paper will firstly explain, with reference to the relevant literature, how and why the strategy to implement standardised work was chosen, the process that was defined to develop the standardised work, and what happened when that process was put into practice. The findings of the paper show that whilst the completed tools delivered business benefits, the development of the tools did not follow the planned process. The paper discusses how people within the business responded to this strategy and how the process had to be continuously adapted to cope with the current business environment and path dependencies, further evidencing that lean implementations need to be tailored to suit the needs of the individual firm, rather than there being a one size fits all solution. Further, the conclusions will be set in the context of what lean has become to mean to the case study organisation, and how this sits in the wider debate of whether lean is an all encompassing philosophy or a set of prescriptive tools and techniques.

Keywords: Lean, standardised work, waste, strategy, change, process.

1. Introduction

The case study company is a main contractor whose scope of works encompasses the design management, construction and refurbishment of buildings across the UK. The business was founded in 1890 and became renowned as a family building business in the North East of England. Through a number of acquisitions in the 1970s the business developed regional presence across the UK, and by the 1990s was delivering major construction projects. Today, the business employs approximately 400 people and has an annual turnover of ~£250m which is split across three operating divisions that are run from regional offices in the South, West and East of England. In addition to the three operating divisions, the business also has a number of support functions, for example estimating, human resources, health and safety, marketing, supply chain management, ICT and business improvement, that provide

expertise and support to each of the individual project teams. The Company delivers projects that include schools and colleges, student accommodation, hospitals and laboratories. These projects are won through competitive tendering and framework agreements. The average project value is £21m, with over 85% of the cost of each project being outsourced to sub-contractors who are chosen and vetted as part of the Company's supply chain.

The Company is currently implementing a change programme based on embedding lean principles such that it can continually improve and meet business targets. This change programme is central to the Company's strategy.

A recent stage of this change programme was to develop and implement a number of tools/ways of working that could be standardised across the business to ensure

that critical tasks are carried out consistently to the correct standard, thereby ensuring risks are mitigated and projects are delivered as planned, achieving the planned profit target.

Recent work within the lean community has described how lean tools and techniques have been adapted to suit a particular company (Court, et al., 2008; Carneiro, et al., 2009). Rather than describing the completed production system however, this paper explains the rationale and detailed step by step approach behind how a set of tools, adapted from the concept of standardised work, were developed in a bid to engage people from across the business in the improvement process. Whilst the outcome of the strategy, i.e. the completed standardised work, is important, it is the process by which it was achieved that is described and analysed in this paper. Management support, time given to improvement activities, employee engagement and motivation, and identifying and communicating the need for improvement, set in the context of organisational performance, all identified by Mitropoulos and Howell (2011) in their model of performance improvement process, are discussed in terms of what the case study company actually did in order to try to ensure all these aspects were embedded into their improvement process.

Having described the process developed by the business to create its standardised work, the paper then goes on to explain what happened when the process was put into practice; it explains how people in the business responded, what aspects of the process were adhered to, and how the process had to be continually adapted throughout in order to achieve the end goal of the completed tools. What actually happened is discussed in the context of what this means for the business in terms of being able to make future changes, and also in terms of other recent lean construction literature. For example, the ability of people to engage with improvement strategies is highlighted in terms of knowledge and capabilities, and the influence of the company culture on ability to change and learn is identified (Hirota and Formoso, 2001; Morrey, et al., 2010).

Finally, the conclusions of the paper are set in the context of defining lean. The experience of the case study company is used to suggest that lean cannot be defined in isolation of context, and is therefore neither a set of prescriptive tools and techniques on one hand or an ambiguous “complex cocktail of ideas” on the other (Green, 2000, p.2.) but something that needs to be adapted to suit the needs of the business and its culture and objectives.

2. The Company Business Case

At any one time, the case study company will have approximately 20 ongoing projects being delivered by project teams across its three operating divisions. Whilst some projects were able to deliver results in terms of on time delivery, cost and quality, other projects failed to do this and were considered to be “bad jobs,” i.e. completed late and made a loss. This level of inconsistency in delivery of projects on time, within budget and to the required quality has lead not only to individual project losses, but sometimes to an overall business loss. In this sense, the business had established a sense of urgency to change, the first of the eight stages in Kotter’s process for creating major change (Kotter, 1996).

During this time the business was delivering an in-house developed and delivered project management training programme to its senior managers (project leaders, contracts managers) and front line managers (deputy build managers, gang supervisors). The development of the training material for these courses highlighted a lack of documented, defined ways of working; ways of working had to be hastily written in order for the training course material to be completed, rather than the training course material being based around existing company standards and processes. In addition, delivery of the training courses highlighted the fact that different divisions of the business, and even different project teams within divisions, were developing their own ways of working, in some cases creating new processes and templates at the start of each project.

In response to the inconsistent performance and the learning from the training programmes, the business carried out an analysis of post project review findings. Rather than poor project performance being found to be due to complex situations, it was a lack of application of the basics of project management that were found to be the causes, for example:

- Poor handover of information from the tender team to project team.
- Inadequate design management.

Variation in ways of working was clearly leading to inconsistency in project performance, with different project teams defining and re-defining how they worked; a business waste in itself. These findings prompted two main requirements; the need to reinforce these basics across the business, and the need to clearly define a benchmark of what “good” looked like so it could then be communicated and embedded across the business.

The business therefore decided to develop a number of “tools” that would become the standard way project teams would carry out certain critical project management tasks.

Developing these standard, internal working practices would provide a consistent framework for project teams, despite any project specificities. The prime objective was to ensure that these critical tasks could be carried out to the same standard, every time, by every team, mitigating the risk of finishing late and over budget.

This objective became one of the strategic functional imperatives outlined in the Company strategy document, and as such could be considered to have buy in at Board level.

Table 1 shows the tools that the business decided should be developed and standardised. This list of tools was determined following an analysis of post project reviews and based on the areas highlighted as being inconsistent during the delivery of the learning programmes. As an aside, post project reviews are reviews held at the end of projects to understand what went well and what did not go well.

Table 1. List of tools developed and description of purpose

Tool name	Description of purpose
Tender launch meeting agenda & checklist	Ensure all the tender team review all the project information and agree the tender strategy
Final price meeting agenda	Ensure all tender information is presented appropriately for approval before submittal to client
Sub-contractor appraisals	Method for assessing and communicating sub-contractor performance
Forward load for sub-contractors	Method for giving sub-contractor companies a forward view of workload
Tender handover agenda and checklist	Ensure all information and assumptions made by the tender team is communicated to the project delivery team
Project launch meeting agenda	Agenda to ensure the project team review all project information, agree objectives and team set up at the start of the project
Construction director mid month review	Check list for construction directors which details all the activities and tools they should be checking their project teams are carrying out
Project team checklist	Checklist for the project manager which details the critical tasks and tools he should be checking his team is implementing and maintaining
Package management	Set of 7 tools which allows creation and purchase of a sub-contractor package such that it meets the clients requirements
Quality essentials plan	Means to identify key quality control risks and actions to mitigate them
Handover sheet	Sheet to be signed off by preceding trade on site signifying the next trade can commence work
Stop day check sheet	Checklist of items to be checked and signed off before the next stage of works can commence.
QA checklist	List of quality control instructions, relating to a particular type of work e.g. bricklaying, to adhered to
BREEAM issues summary sheet	Sheet listed all actions required to achieve the BREEAM rating
Project commercial review and KPIs	Checklist for commercial managers to use to assess whether the project team are undertaking the required commercial tasks
Verification of client funding check	Checks to be made by finance team to ensure that the client has the funding for the project
Risk health check	Executive Board checks to ensure that the project team are properly resourced and managing risk appropriately
Countdown to completion	Set of 6 tools that ensure account is taken of all the items required to complete the project and handover the relevant information to the client team

3. A Strategy to Enact Lean – Develop Standardised Work

The decision to develop a set of tools, and the way these tools were developed, became the strategy by which the business could enact lean principles in practice. The business called this stage of the lean implementation plan the “stabilisation” stage in recognition of that fact that “it is only when the process is stable that you can begin the creative progression of continuous improvement” (Liker and Meier, 2006, p.111).

Both the tools themselves, and the process by which the tools were developed, were to become vehicles for embedding lean principles and techniques, i.e. strategies to enact lean in practice.

The completed tools can be considered to be a version of standardised work, one of the core lean tools. The important thing to note however is that this is a version of standardised work which has been developed to suit the needs of this business. Adapting existing methods to suit the individual business’ need has similarities to another case in the lean construction literature. A Brazilian construction company developed their own production model, called the PS-37, based on Goldratt’s Theory of Constraints (Goldratt, 1990) and 5S, the five senses of organisation (Carneiro et al., 2009). The PS-37 case study paper (Carneiro et al., 2009) describes the steps of the production process that was developed by adapting existing lean methods; this paper in contrast does not explain what the completed tools are, but describes how the tools/standardised work were developed, how the approach taken differed in reality from the planned approach, and what this means for the business as it continues to try and implement change based on lean principles.

Standardised work documents the current, best practice for carrying out a particular activity/process. The result is that activities can be carried out consistently, ensuring that the desired results of quality, cost, delivery and health and safety will be achieved every time (Liker, 2004; Liker and Meier, 2006).

From a Company perspective, this elimination of variation in project performance is a reduction in waste. In addition, creating the standardised work in itself forces wastes in the work methods to be identified and eliminated by those who are carrying out the work.

Once defined, the standardised work, which represents current best practice, would then become the Company’s Management System, and therefore be the baseline for training and continuous improvement. In addition, the content of the Company Management System is that which is audited as part of the Company’s accreditation to the ISO9001 quality management system standard, which is based on the Plan Do Check Act approach. (Deming, 1986; British Standards Institution, 2008).

4. The Process to Develop the Standardised Work

Previous research has identified that little attention has been paid to the ways companies develop their production models/processes; “very little attention has been given to the methods top competitors use to make content decisions that originate their production systems” (Carneiro et al. 2009, p.384). The next section of this paper therefore explains in detail the process that the case study company

undertook to develop the standardised work, which would become the content of their Company Management System, i.e. their production system.

The process developed to produce the standardised work had two main objectives:

- Produce the right tools.
- Engender employee involvement and empowerment.

Concerning the first objective, the “right” tool was defined as:

- A way of working that would enable the correct output(s) to be achieved each time. This would be specific to each individual tool.
- One that was lean, i.e. allowed the task to be carried out efficiently (process waste eliminated).

Aside from the objectives stated above, the business did not explicitly set measurable targets that were to be achieved as a result of implementing the completed tools, for example, x% projects complete on time, or y% reduction in defects. The fundamental principle that consistent, current best methods would lead to improvements in quality, cost and delivery was accepted as a given, and as such that focus for the development of the tools was concentrated on involving people with the right experience to identify what currently worked well and develop it into a standard format/tool. The process to develop the tools was therefore much more process focused than results focused (Mitropoulos and Howell, 2011), emphasising the need to get the process and method right in order to reap the required results.

Regarding the objectives of the strategy, there was a conscious effort not just to follow the mentality of trying to implement a particular lean tool, i.e. standardised work, but to set that in the context of the wider aim of becoming a lean organisation where people were involved in the improvement process and had an understanding of what lean was and what it was trying to achieve in wider terms.

The senior management team had identified the areas for improvement and the 18 tools that should be developed based on the findings from the analysis of post project reviews (see Table 1 previously). Rather than the process improvement team develop these tools by themselves, the Process Improvement Manager (the researcher) set about developing a process by which people from across the business would be involved in the improvement process. Table 2 shows the 12 working groups of people who were convened, each lead by a Process Improvement Facilitator, to develop the tools.

Since a number of people would be involved in developing the tools, the Process Improvement Manager felt it was important to have a defined, documented process for developing the tools in order to make sure that the correct tools would be developed and that managers could review and check the work being produced. A set process would also allow the Process Improvement team to facilitate the groups of people in the same way, to the same standard.

Table 2. Working group members and the tools they developed

	Team 1	Team 2	Team 3	Team 4	Team 5	Team 6	Team 7	Team 8	Team 9
Sponsoring director	Peter Bates	Richard Alport	Peter Millett	Phil Greer	Phil Greer	Peter Bates	Sean Smylie	Peter Bates	Phil Greer
Process improvement facilitator	Craig Fletcher	Mark Wheatley	Mark Wheatley	Nicola Morrey	Craig Fletcher	Martin Elms	Mark Wheatley	Nicola Morrey	Craig Fletcher
Process leader	Colin Sargeant (construction director)	Neil Clarke (construction manager)	David Crampton (construction director)	Chris Smith (construction director)	Paul Waller (construction manager)	Mike Armstrong (construction manager)	Stephen Price (commercial director)	Steve Crampton (commercial director)	Mike Trigg (construction director)
Working group members	Andy Haylock (estimator)	Antony Gaukroger (supply chain)	Neil Darnton (estimator)	Paul Steele (project manager)	Trevor Lawrance (subcontract buyer)	Phil Curran (design director)	Gary Walton (commercial manager)	Paul Marsland (commercial manager)	Paul Surtees (planner)
	Shaun Baker (estimator)	David Perrin (subcontract buyer)	David Murray (training manager)	Mick Bodecott (project manager)	Paul Flynn (QS)	Stuart Jessop (quality manager)	Simon Woolcock (commercial director)	John Dixon (business development)	Graham Hope (project manager)
	Guy Tristram (site manager)	Tim Goddard (commercial manager)	Jon Howland (estimator)	Neil Matthias (site manager)	Selina Manton (subcontract buyer)	Mark Owen (H&S manager)	Paul Marsland (commercial manager)	Marcus Kidd (finance manager)	John Lavin (project manager)
	Gary Walton (commercial manager)	Paul Eastwood (supply chain)	Andrew Constantine (commercial manager)		Rob Rushworth (planner)	Mark Richardson (site manager)	Farooq Lakada (finance manager)	Nick Summerfield (construction manager)	East managing QS
	Andy Beale (planner)	Mark Kenyon (QS)	Nigel Moore (project manager)		Danny Baker (estimator)			Derek Urquhart (construction manager)	

Tools to be developed by the team	Tender launch meeting agenda and checklist	Sub-contractor appraisals	Project launch checklist and agenda	Construction director mid month review	Package management	Quality essentials plan	Commercial manager measures	Risk health check	Countdown to completion
	Final price meeting agenda	Forward load for sub-contractors	Handover agenda & checklist	Project team checklist		Stop day checks	Verification of client funding		
						QA checklists			
						Handover sheets			
						BREEAM issues summary sheet			

Each group, guided by the Process Improvement Facilitator, would undertake the process defined by the Process Improvement Manager, with the end outcome being the completed tools that could then be implemented by all project teams across the business.

The Process Improvement Manager started by defining the top-level improvement process, which is shown in Fig. 1 below.

The first step of the process is concerned with understanding current conditions. This meant that in the first instance each group was to understand what currently happened in this area of project management, whether any existing forms or templates were already in use, and whether these achieved the desired results.

Having understood what was currently happening, each group then had to determine what should happen in the future. The group has to develop the tool, whether it was an agenda, a checklist, a form to be filled out that would enable that critical aspect of project delivery to be carried out to the required standard every time. The team had to develop the content of the tool and its format, i.e. would it be in Word, Excel, landscape, portrait, etc.

Once the group had completed their tools they had to be reviewed and signed off by senior management. Following sign off, the approved tools would then be implemented across the business. Implementation would include ensuring the tools would be embedded into the

Company Management System, and that training would be identified and delivered to ensure that all the people who needed to know how to use the tool would be able to do so to the correct standard. In addition to training, performance standards (job profiles) would also be updated to reflect the changes required of the roles that had to use the tools. Similarly, any changes to the Company ICT system that would need to be made to accommodate changes to process would also be identified and implemented.

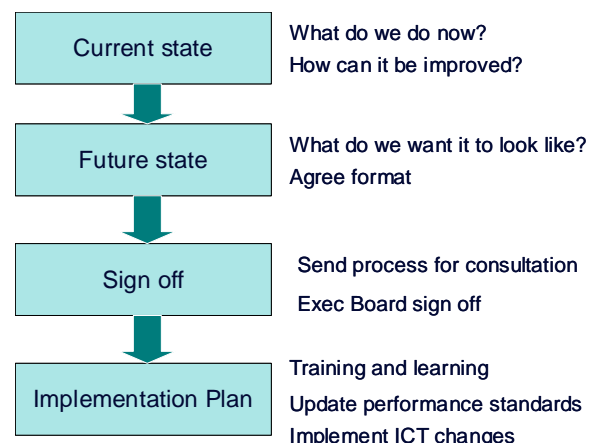


Fig. 1. Process improvement process

This top level improvement process is something the Process Improvement Manager had been taught as part of being trained by SMMT (Society of Motor Manufacturers and Traders) Industry Forum engineers, who had been trained by the Japanese engineers at Nissan and Toyota.

Having set the top-level process, based in principle on having groups of people develop the tools, a detailed process was drawn up for each of the groups to follow. The overall process for developing the tools consisted of 23 steps. The process was drawn up into a process map using Visio process mapping software. In addition to the process, some of the process steps had defined tools that the Process Improvement Facilitators should use to help them carry out that step of the process. These tools included standard presentations and meeting agendas. Figure 2 shows part of the detailed process map for developing the tools.

The square boxes define each step of the process, while the document boxes refer to the tools that the Process Improvement team used for carrying out that step of the process.

The following sections discuss the key elements of this 23-step process and why the Process Improvement Manager developed the process in this way and how this

process was designed to embed a culture of lean thinking and give the people involved experience in process improvement and problem solving.

4.1. Employee Involvement and Empowerment

A common discussion surrounding standardised work is that of whether standardisation actually disengages people and makes their working lives too rigid, stifling creativity. Toyota’s view of standardised work is that “rather than reinforcing rigid standards that can make jobs routine and degrading, standardised work is the basis for empowering workers and innovation in the workplace.” (Liker, 2004, p.142). Adler (1999) talked about democratic Taylorism in the sense that Toyota was encouraging workers to become the problem solvers and develop their own standardised work, rather than having it imposed on them by someone else. Toyota believes that the key to achieving balance between rigid procedures and freedom to innovate “lies in the way people write standards as well as who contributes to them.” (Liker, 2004, p.147). Further to this, the way processes are developed, tested, evaluated and documented and communicated appear to be important factors in being able to effectively transfer knowledge and allow new processes to be learned so that a business can overcome dependencies and change (Teece, et al., 1997; Zollo and Winter, 2002).

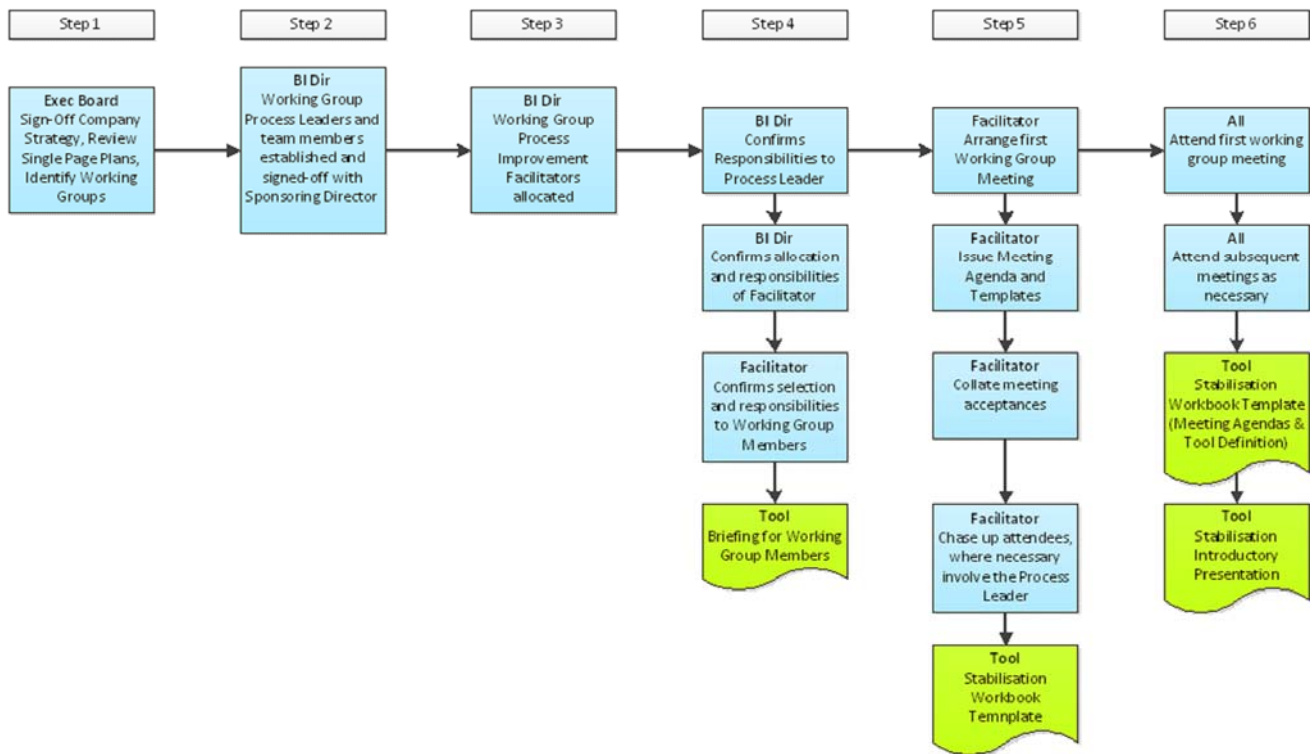


Fig. 2. Extract of the strategy for developing the stabilisation tools

To this end, the 12 working groups were set up to develop the tools. These groups consisted of people from a range of relevant disciplines and from across each area of the business. The groups were lead through the process of developing the tools by the Process Improvement team facilitators. Involving the process experts from across the business would ensure that current, best working practices would be revealed, debated and agreed in the final form of the tool. A second aim was that taking people through a structured process and involving them in the development of the tools would introduce them to a problem solving/improvement mindset that they would be able to take back with them into their day job, hopefully more empowered to effect change. In other words, begin to teach and coach people the improvement process, referred to as the improvement kata and coaching kata. (Rother, 2010; Liker and Rother, 2011).

4.2. Communication of Purpose

The process included ensuring that the working group members understood the reasons the business was developing the tools and what the next steps would be. The first working group session was focused on explaining the approach to developing the tools and why they were needed in the context of the wider business. The aim of this was to try to engender in people the need for change, and to ensure people would be working for the benefit of the whole organisation, and not just focusing on their immediate project or area of work.

For example, step 5 of the process was “Attend first working group meeting.” This meeting had an agenda that the process improvement facilitators were to use, and a presentation whose content included explaining the purpose of the tools and why they were needed by the business.

4.3. Defined Roles and Responsibilities

The roles and responsibilities of the working group members, process leaders and sponsoring directors were

defined, documented and communicated to the individuals as part of the process. The aim was to ensure people were clear of what was expected of them.

Table 3 below outlines the roles and responsibilities written for working group members. Similar roles and responsibilities were defined for process leaders and sponsoring directors.

4.4. Senior Manager Involvement

Senior managers at all levels of the business were involved in the process of developing the tools. Executive Board directors were allocated as “sponsoring directors” for particular working groups. The aim was to ensure that the groups had a figurehead for their work, and to ensure that the directors themselves would engage with the improvement process. Middle managers, such as construction directors, were assigned as “process leaders” of the working groups. It was felt essential to involve these managers, as they would ultimately have to ensure their teams’ compliance in using the completed tools.

Additionally, the support and understanding of management was also required so that they could support the people from their teams who had been chosen to take part in the working groups; ensuring people would be released and encouraged by their managers to participate would be important. Management support is recognised in Mitropoulos and Howell’s (2011) model of performance improvement process as being a contributory factor to making operational improvement.

A steering group was also set up to oversee the progress of the development of the tools, ensure that the agreed process was being adhered to, and to provide leadership and support through emphasising the importance of the work at every opportunity. The steering group was supposed to be the guiding coalition (Kotter, 1996) who could oversee progress and make decisions and provide leadership for the benefit of the whole business, not just viewing things from a single perspective.

Table 3. Working group roles and responsibilities

Roles and responsibilities of working group members:

- Challenge current processes, tools and checks through attendance at the improvement workshops facilitated by the business improvement champion
- Propose improvements to the process, tools and checks
- Share ideas and feedback to colleagues during the improvement process; feed comments back into the working group
- Be involved in developing the implementation plan for introducing the new proposals
- Own and complete actions on the implementation plan
- Be a champion of the new processes and tools on your projects/in your departments and with your peer group

4.5. Check Points

Regular checkpoints were built into the process to ensure the working groups were progressing as planned, and that the tools being developed would be fit for purpose. Check points included reviews of progress with the sponsoring director, progress reviews with the steering group and formal sign off of the tools by the Executive Board before they were released as the standard to the whole Company.

4.6. IT Support

In order to allow the working groups to share information and work on the same documents a new IT filing structure was set up that would allow the groups access to each others work, retain version control and eliminate the need for e-mailing documents to each other. The aim was to use IT as a mechanism for improved collaboration and sharing, creating a different environment and way of working that would in itself reduce duplication and waste, but also promote a team ethos and sense of shared purpose.

5. What Happened in Practice?

Much effort was put into developing a strategy that would not only produce the right set of tools, but also perhaps more importantly begin to educate and engage people from across the business in the improvement process and lean philosophy. However, implementing the process in practice and attaining the intended outcomes proved to be much more difficult in practice than on paper.

In the main, the Process Improvement team were able to follow the top-level strategy of working with the groups to understand the current tools in use within the business and develop the future state tools with the teams. However, scheduling the sessions with working group members was a constant challenge due to lack of availability, with most sessions taking place without the full group in attendance. This meant that the Process Improvement team had to do follow-ups with individuals to ensure they were kept appraised and involved, rather than the team being able to work collaboratively.

The strategy employed to develop the tools was aimed at engaging and involving employees, and clear roles and responsibilities for those involved were set out. Individuals within the working groups did engage with the strategy at the facilitated working group sessions and became enthused with developing the tools they had been assigned to work on. Some groups felt particularly empowered by the strategy, and felt barriers between company departments and teams were being broken down as they gained a shared understanding of each other's roles. However, outside of these sessions, individuals seemed to go back to their day jobs, which did not include spreading the message of what they had learned. In the main, the majority of the individuals did not carry out their working group roles as defined, in many instances leaving the Process Improvement facilitators to carry out most of the actions. Arguably one result of this was that the intended ownership of the tools was taken away, with the only resulting gain being completion of the tools within the required timescale.

In particular the checkpoints that were to be undertaken by the Executive Board directors and steering group were not adhered to. Due to a lack of availability, which could ultimately be said to be a lack of priority, progress reviews with Board directors were rarely undertaken. In order to

maintain progress, these checks were effectively abandoned, with the result being that the tools required more re-working when they were finally reviewed at the end of their development. In addition, the whole Board did not sign off all the tools; the strategy was again amended and final sign off fell to one Board director. This was despite the strategy of developing the tools being part of the Company business plan, bringing into question how that plan had been developed and the level of top management buy in. It is possible that senior managers were being asked to engage in a strategy that they felt threatened by due to it being new and outside of their experience and knowledge. Whilst needing skills to cope with and lead change is not limited to change based on lean principles, this highlights the need to consider the difference between management and leadership, and the skills needed for both, in a lean organisation (Bodek, 2008).

Outside of those in the working groups, a commonly held view was that standard tools would turn people into robots, with little scope for creativity or innovation. This is a view that is evidenced in a case study of a Japanese automotive transplant to the UK where reality was reported to be reduced worker autonomy rather than empowerment (Garrahan and Stewart, 1992). These concerns are counter to the intended strategy that was aimed at involving people in developing their ways of working, providing a mechanism for continuous improvement, but fundamentally to create tools that would allow the creativity to be in the way they used the tools, rather than the tool itself.

6. What Did We Learn?

The previous section discussed what actually happened when the strategy developed was put into practice. These experiences are now discussed in the context of the challenges to the business in terms of future process improvement activities, and how these experiences relate to existing lean construction literature.

The lack of engagement in the strategy by some individuals has lead the researcher to consider whether individuals had the capabilities to engage fully with the strategy and carry out the working group roles as defined. Whilst project teams overcome problems on a daily basis, getting to the root cause of problems and preventing their reoccurrence is not a common way of thinking, i.e. the process improvement process was unfamiliar. Previous work has pointed to construction managers being influenced by their tacit knowledge, and that this knowledge is in turn influenced by organisational culture and beliefs (Hirota and Formoso, 2001; Carneiro et al., 2009). Using the Myers-Briggs Type Indicator (Briggs Myers et al., 2003), which uses a forced answer questionnaire to identify an individual's preferences, analysis shows that approximately 70% of senior construction managers in the case study company base their learning around what they think they already know, indicating that asking them to do something different is asking them to go against their tacit knowledge.

Other research being carried out within the case study Company proposed that path dependencies existing within the business were influencing the way it, and its people respond, to change (Morrey et al., 2010). Path dependency refers to the idea that events from the past continue to influence current decisions and ways of working. Historically within the case study company ways of

working were prescribed by functional heads, and individuals were not involved in the development of their tools/processes. This path dependency has meant the majority of people in the business have not had to develop process improvement skills as a natural part of their day-to-day life. It is suggested that within Toyota the problem solving cycle has become tacit as a result of an organisational learning process, and that it is this, rather than the cultural factors that makes the difference to how they operate (Spear and Bowen, 1999; Hirota and Formoso, 2001). The strategy of engaging individuals in developing their own processes, by setting up the working groups, was aimed at overcoming this path dependency by introducing people to the problem solving/improvement process. However it is evident that it will take more than one exposure to the improvement cycle to overcome the path dependencies and embed the improvement and coaching katas such that they become custom and practice, and ultimately tacit knowledge that everyone in the business possesses.

Overall, it could be said that individuals at all levels did not engage as envisaged with the strategy. Although this was identified and highlighted at the time, the designated leadership did not intervene in the intended ways, leaving the Process Improvement team to drive the strategy without the back up of the guiding coalition or Executive Board. When the working groups and roles were set up, the vision was that all parties would be engaged and enthused by the lean agenda, however this assumed that those individuals wanted to be involved and also that they shared the same goals for the organisation. The developer of the strategy, who had learned from lean texts such as the Toyota Way (Liker, 2006), Lean Thinking (Womack and Jones, 2003) had assumed a unitary perspective of the organisation (Fox, 1974; Burrell and Morgan, 1979) i.e. that all parties would want to strive for the common goal and that the strategy was in everyone's interests. In reality, all those asked to engage with the strategy had their own interests, and without clear leadership from senior management as to the importance of this strategy, their day jobs took precedence. The pluralist perspective of the organisation, where individuals and groups have their own interests with only fleeting interest in the goals of the organisation (Morgan, 1997) is one that was evidenced here, and which Green and May argue has been largely ignored in the lean construction debate (Green and May, 2005).

Another point of contention was sign offs and checkpoints that had been built into the strategy to ensure progress was being made but also to ensure the tools being developed were fit for purpose. Some individuals complained that in the end their opinions would not matter as management would eventually over-rule what they wanted. Arguably the planned strategy developed by the case study company was controlling the level of empowerment and participation. Stuart Green (1999, 2000) suggests that this reinforces the hard human resource management approach that is typical of construction and allows managers to use lean rhetoric as a disguise for further command and control. However, in a pluralist organisation, where individuals only have a passing interest in the goals of the whole organisation, at some point there needs to be some decision making by management. In a pluralist organisation conflict is an accepted characteristic of the organisation and interest groups play for power, with the task of management being

to "shape the debate and convince competing parties to follow their chosen course of action." (Green and May, 2005, p.501). So rather than the unitary approach of managers being able to implement lean irrespective of the actions of others, the pluralist approach sees management as being responsible for shaping the debate and convincing competing interest groups. Certainly in this case it fell to the Process Improvement team to carry out the convincing in order to ensure the strategy, in its continually adapting form, was completed. The challenge seems to be finding the balance between employee empowerment and involvement and a need to take decisions to steer the business in the right direction.

7. Conclusions

In direct response to the business need to eliminate variation in performance the case study company decided to develop a set of tools that can be considered to be a form of standardised work, which is a lean improvement technique. But more than just picking a lean technique from the toolbox and applying it in isolation to achieve a specific business result, the organisation was aiming to enact lean at a philosophical level also, encouraging a change in mindset through the way it went about developing the standardised work. In other words, the strategy to develop the tools was aimed at developing improvement skills and encouraging employee involvement and empowerment. So to what extent can the strategy of developing a set of tools to enable the enactment of lean be considered to have been successful?

A set of tools was produced and a full implementation plan to embed them across the business was completed. There is tangible evidence of improved project performance and a level of consistency and control of projects has been attained. An Executive Board member has given feedback that the improvement in projects completing on time can be attributed to this aspect of the lean strategy. In this sense, the result of the strategy, i.e. implementing the lean technique of standardised work, has proved successful.

While there is the tangible output of the completed tools and their impact, to what extent has this strategy been successful in engendering a lean thinking mindset? Some of those individuals involved feel this strategy has given them the first opportunity to take ownership of their ways of working, and they continue to propose further improvements. However in general, people have returned to their day jobs. Until the improvement process becomes a recognised part of everyone's role, and they are given the skills and coaching to do it, only pockets of a change in mindset will exist.

Perhaps most interesting though is how enactment of the strategy played out in practice compared with what was planned. As discussed in the previous section, precise adherence to the process to develop the tools was not achieved. At all stages throughout the development of the tools the process was amended and re-developed to make it achievable in practice. So what does this tell us about lean and how its enactment needs to be approached?

Firstly, the day-to-day needs, politics, and pressures of the business mean practice does not conform to theory, and therefore any strategy to enact lean needs to continually respond and evolve to overcome barriers. It is not a case of setting out on a clear path and sticking to it rigidly, but

rather accepting that what will happen in practice will be different, with the challenge being to keep reinventing the approach until it works within that organisation. Not only do the current internal and external environments impact on the strategy, but path dependencies also play a part. Whilst the approach of developing standardised work always remained, the way the business went about developing it evolved from the planned process as events unfolded, and people in the business reacted in certain ways. The end goal was achieved, albeit not exactly as planned.

Secondly, the business did not attempt to become lean by implementing a set of prescriptive tools and techniques. Instead the business took the theory of standardised work and developed a version of it to suit its purpose. This is similar to other cases described in the literature; the PS-37 case study (Carneiro et al., 2009) describes how Goldratt's theory of constraints were developed to suit the internal and external circumstances of the business, recognising that there is no one right way to make decisions but that myriad factors will play a part. Similarly, Ko et al. (2011) apply the 4Ps of the Toyota Way (Liker, 2004) to develop an improvement strategy for formwork engineering. The experience of this Company reinforces that there is not a one size fits all solution to lean implementation. Contrast this case study company's approach with that of another which designed a lean and agile construction system for a large mechanical and electrical project (Court, et al., 2008). In this case one of the objectives of the system was to meet a company objective of being incident and injury free. This determined the way that system was developed and communicated across the project team. In all of these examples, the companies can be said to have implemented lean, and yet the company business cases, approaches and practices by which that had happened are different.

So what does concluding, "one size does not fit all," mean for those trying to define lean and how it can be implemented? The experiences here support the adaptation theory of the diffusion of lean where local factors and path dependencies play a part in how lean is played out in practice, rather than a diffusion model which suggests elements of lean are universally applicable and can be copied from one place to another regardless of context. (Scarborough and Terry, 1998; Green and May, 2005). This also highlights the need to discuss lean diffusion in context; doing so in abstraction of context becomes meaningless since context defines everything in terms of what lean becomes.

In this case, the business has not tried to implement a set of lean tools and techniques, and nor has it tried to directly emulate the approach of another. The case study company has made lean fit for its own purpose, responding to its own needs, capabilities and external environment. It has taken a "lean as a philosophy" approach and developed its own strategy for implementation, which it has learned it must continuously adapt in order to meet the ever-changing context in which it is being enacted.

So is lean without definition? On the one hand it is seen as an ambiguous "complex cocktail of ideas including continuous improvement, flattened organisation structures, teamwork, the elimination of waste, efficient use of resources and co-operative supply chain" (Green, 2000, p.2.), and on the other a prescriptive set of universally applicable tools and techniques. Can each company define what lean is, in which case it becomes "good

management?" Or is there a set of fundamental guiding principles that can be appropriated and re-shaped in a contingent way? If, as evidenced here, lean implementation needs to be based on adaptation theory, founded on a set a fundamental principles, then lean can only begin to be defined within an organisational context, meaning local factors and path dependencies need to firstly be defined. Lean cannot be defined in abstraction of these conditions.

References

- Adler, P. S. (1999). "Building Better Bureaucracies." *Academy of Management Executive*, 13(4), 36-49.
- Bodek, N. (2008)-last update, Leadership Is Critical To Lean [Homepage of Manufacturing Engineering], [Online]. Retrieved from http://findarticles.com/p/articles/mi_qa3618/is_200803/ai_n25418552/ on March 21, 2011.
- Briggs Myers, I., McCauley, M. H., Quenk, N. L., and Hammer, A. L. (2003). *A Guide to the Development and Use of the Myers-Briggs Type Indicator*, 3 edn. Mountain View, California: CPP.
- British Standards Institution (BSI), (2008). *BS EN ISO 9001 - 2008 - Quality Management Systems - requirements* (incorporating corrigendum July 2009). UK: British Standards Institution.
- Burrell, G. and Morgan, G. (1979). *Sociological Paradigms and Operational Analysis*. 1st edn. UK: Ashgate.
- Carneiro, A. Q., Filho, A. N. M., Alves, T. C. L., Nascimento, K., Carneiro, R. Q., and Barros Neto, J. P. (2009). Development and Evolution of Project Production Systems: The PS-37 Case, *IGLC 17*, 2009, IGLC, 383-392.
- Court, P., Pasquire, C., and Gibb, A. (2008). Modular Assembly in Healthcare Construction - A Mechanical and Electrical Case Study, *IGLC 16*, 2008, IGLC, 521-532.
- Deming, W. E. (1986). *Out of the Crisis*, 1st edn. MIT Press.
- Fox, A. (1974). *Beyond Contract: Work, Power and Trust relations (Society Today & Tomorrow)*. 1st ed. UK: Faber and Faber.
- Garrahan, P. and Stewart, P. (1992). *The Nissan Enigma: Flexibility at Work in a Local Economy*. New edition ed. Thomson Learning.
- Goldratt, E. M. (1990). What is this thing called theory of constraints and how should it be implemented? *Great Barrington*, MA, North River Press.
- Green, S. D. (1999). The Dark Side of Lean Construction: Exploitation and Ideology. *Proceedings IGLC-7*, 21-32.
- Green, S. D. (2000). The Future of Lean Construction: A Brave New World, *IGLC 8 Brighton*, IGLC, 1-11.
- Green, S. D. and May, S. (2005). Lean construction: arenas of enactment, models of diffusion and the meaning of 'leanness'. *Building Research & Information*, 33(6), 498-511.
- Hirota, E. H. and Formoso, C. T. (2001). Barriers to Management Innovations: Communicating Meanings, *IGLC 9*, 2001, IGLC.
- Kotter, J. P. (1996). *Leading Change*, 1 edn. USA: Harvard Business School Press.
- Ko, C., Wang, W. and Kuo, J. (2011). Improving formwork engineering using the Toyota Way. *Journal of Engineering, Project and Production Management*, 1(1), 13-27.

- Liker, J. K. (2004). *The Toyota Way, 1 edn.* New York: McGraw Hill.
- Liker, J. K. and Meier, D. (2006). *The Toyota Way Fieldbook, 1 edn.* USA: McGraw Hill.
- Liker, J. and Rother, M. Why Lean Programs Fail | Lean Enterprise Institute. Retrieved from <http://www.lean.org/common/display/?o=1738> on March 16, 2011.
- Mitropoulos, P. and Howell, G. (2011). Performance Improvement Programs and Lean Construction, *IGLC 19, 2011, IGLC.*
- Morgan, G. (1997). *Images of Organization.* 2nd edn. USA: Sage Publications.
- Morrey, N., Pasquire, C., and Dainty, A. The Impact of Path Dependencies on Lean Implementation Within a Construction Company. Retrieved from http://www.leanconstruction.org/lcj/paper_2010_issue.htm on March 16, 2011.
- Rother, M. (2010). *Toyota Kata - Managing People for Improvement, Adaptiveness and Superior Results, 1 edn.* USA: McGraw Hill.
- Scarborough, H. and Terry, M. (1998). Forget Japan: the very British response to lean production. *Employee Relations*, 20(3), 224-236.
- Spear, S. and Bowen, H. K. (1999). Decoding the DNA of the Toyota Production System. *Harvard Business Review*, September-October, 97-106.
- Teece, D. J., Pisano, G., and Shuen, A. (1997). Dynamic Capabilities and Strategic Management. *Strategic Management Journal*, 18(7), 509-533.
- Zollo, M. and Winter, S. G. (2002). Deliberate Learning and the Evolution of Dynamic Capabilities. *Organization Science*, 13(3), 339-351.
- Womack, J. and Jones, D. (2003). *Lean Thinking, 1 edn.* New York: Free Press.

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