

# **PATH DEPENDENCY TO PATH CREATION: ENABLING STRATEGIC LEAN IMPLEMENTATION**

**Nicola Morrey<sup>1</sup>, Christine Pasquire<sup>2</sup>, Andrew Dainty<sup>3</sup> and Derek Thomson<sup>4</sup>**

## **ABSTRACT**

The ability to change is a necessary capability for a business, irrespective of whether those changes are driven by external forces such as market conditions or client demands, or are instigated by the business itself. However, path dependencies exist within businesses that entrench ways of working which can influence their ability to respond to change.

Path dependency refers to the idea that events and decisions that have taken place in the past continue to influence current decisions and ways of working. This paper proposes that path dependencies inhibit lean change and that only when they are identified and understood can they be overcome, enabling new paths to be created and organisational lean strategies to be implemented effectively in practice.

Building on Morrey et al (2010), the paper describes action research carried out in a case study company which evidences that path dependencies have inhibited the implementation of their lean strategy. These path dependencies are identified therefore as either enablers or barriers to lean change.

It therefore follows that lean strategies cannot be implemented effectively unless these path dependencies are understood and accounted for, and that taking account of path dependencies needs to be foregrounded in the lean debate. Had these path dependencies been understood at the time of the implementing the lean strategies, rather than retrospectively in order to understand why they had not played out in practice as planned, the lean strategies could have accounted for these entrenched ways of working and been more effective.

Further to this, the paper suggests that it is only when path dependencies are understood that path dependencies can be overcome/capitalised upon, or new paths can be created. Proposals to overcome and capitalise upon the path dependencies uncovered in the case study company are discussed, with acknowledgement that these new paths could become the path dependencies of the future!

## **KEYWORDS**

Standardisation, process improvement, path dependency, change management, lean, strategy, implementation barriers, root cause analysis

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<sup>1</sup> Research Engineer, School of Civil and Building Engineering, Loughborough University, Loughborough, Leicestershire, LE11 3TU, N.Morrey@lboro.ac.uk

<sup>2</sup> Professor, Centre for Lean Projects, School of Architecture, Design and the Built Environment, Nottingham Trent University, Christine.Pasquire@ntu.ac.uk

<sup>3</sup> Professor, School of Civil and Building Engineering, Loughborough University, Loughborough, Leicestershire, LE11 3TU, Phone 01509 228742 [A.R.J.Dainty@lboro.ac.uk](mailto:A.R.J.Dainty@lboro.ac.uk)

<sup>4</sup> Doctor, School of Civil and Building Engineering, Loughborough University, Loughborough, Leicestershire, LE11 3TU, Phone 01509 222895 D.S.Thomson@lboro.ac.uk

## **INTRODUCTION**

The majority of lean construction literature focuses on project based production performance improvement, using lean tools and techniques adapted to suit the needs and circumstances of the organisations where they are being implemented (e.g., Court et al. 2008, Carneiro et al. 2009.) In many cases these works recognise some of the barriers to lean construction, such as management commitment, people capability, commercial engagement, cultural issues etc. and often propose actions for further improvement and areas of research (e.g., Alarcon and Diethelm 2001, Johansen et al. 2004.) There is less work however in understanding the root causes of these barriers to change at an organisational level, such that lean philosophy can be embedded strategically in all aspects of the company culture and business strategy.

So how can lean be done better from a strategic point of view? Stage 3 leanness (Kinnie, 1996), where lean focus is on the attributes required by the organisation to respond to change, suggests that management responses are path dependent and adapted to suit the organisational circumstances (Kinnie et al. 1996, Green and May 2005.) The adaptation model of lean diffusion also states that local factors and path dependencies play a part in how lean is played out in practice (Scarborough and Terry, 1998, Green and May 2005.) Further Green et al. (2008 p.76) also state that “the issue of path dependency is not especially prominent within the construction specific literature and arguably deserves much stronger emphasis.”

Path dependence refers to processes that are “unable to shake free from their history” (David 2001 p.19.) In other words, people become locked into ways of working that prevent them from being able to change. This paper proposes that path dependencies inhibit lean change and that only when they are identified and understood can they be overcome, enabling new paths to be created and organisational lean strategies to be implemented effectively in practice.

Following an overview of path dependency, this paper describes the research methodology employed to uncover the path dependencies within a case study company. The path dependencies found are then discussed in terms of their impact on lean strategies implemented to date, and proposals for how the business can capitalise on and overcome these path dependencies are then discussed and conclusions drawn.

## **PATH DEPENDENCY**

There are three broad categories of work in the lean construction literature, namely strategic, operational and tactical (Garnett et al. 1998) following on from Koskela’s (1992) new construction philosophy that identified three distinct levels; tools and technologies, manufacturing methods and general management philosophy. There is a wealth of literature concerning project based production performance improvement, applying the lean philosophy and Transformation Value Flow (TVF) theory (e.g., Howell and Ballard 1998, Koskela, 2000) and using lean tools, such as Last Planner (e.g., Johansen and Porter 2003) and 5S (e.g., Carneiro et al. 2009.) The implementation of these tools and techniques has, in many cases, followed the adaptation model of lean diffusion; rather than assuming that these tools are universally applicable and can be copied and implemented in the same way in every instance, the adaptation theory takes into account local factors and path dependencies, which play a role in how lean is played out in practice (Scarborough and Terry 1998, Green and May 2005.) Feedback on how these cases of lean implementation have

played out in practice touch on the barriers to implementing lean, outline organisational elements that are critical for lean implementation, and propose areas for future action and research (e.g., Johansen et al. 2004.) However, the root causes of these barriers to lean implementation are rarely investigated, either at project level or specifically at organisational level. Path dependency analysis, as a technique, can therefore provide insights into initial conditions, and can be considered to be root cause analysis of barriers to change.

At stage 3 leanness it is stated that management responses will be highly path dependent and lean production philosophy and techniques will be adapted to suit the individual circumstances of the organisation at that point in time (Kinnie et al. 1996, Green and May 2005.) This paper therefore proposes that path dependencies inhibit lean change and that identifying an organisation's path dependencies is key to enabling effective, strategic lean change. It is suggested that only when the path dependencies, i.e. barriers/enablers to change, are known can they be overcome such that new paths can be created and lean strategies be realised in practice as planned.

Path dependency refers to the idea that events and decisions that have taken place in the past continue to influence current decisions and ways of working such that people become locked in paths that they cannot break free of (David 2001.) Examples such as the prevalence of the Qwerty keyboard (David 1985) and the VHS video recorder (Liebowitz and Margolis 1995) are used to evidence that a single decision/event can lead to the lock in of a product, even if that product years later becomes the less efficient or economical choice. Causes of path dependency include the durability of capital equipment and technical interrelatedness of technology (David 1985, Liebowitz and Margolis 1995); having made a capital investment, other technologies must align with this investment, and economies of scale need to be achieved to make the investment pay off. Whilst this makes economic sense it can lead to lock in to a solution that over time prohibits change. Following from the economics literature, path dependency is then considered in the context of dynamic capabilities, in other words the ability of a business to respond to internally or externally driven change. The competitive advantage of a firm is seen as being a combination of its managerial and organisational processes (routines), its asset position (its technology, customer base, relationships, etc) and the paths that are available to it, which in turn are dependent on the paths already taken (Teece, et al. 1997.) If a firm's routines are its history, to understand them fully, it follows that you need to understand the history, the path dependencies, too (e.g., Teece et al. 1997.) A link is also made between a firm's routines and learning (e.g., Garvin 1988.) Therefore, with respect to lean transformations, where new ways of working need to be developed, embedded and learned, it follows that path dependencies can influence the ability of a business to make such changes. In other words, past decisions can lock the organisation into pathways that constrain future choices and ability to respond to change.

Path dependencies undoubtedly exist within organisations, as evidenced through the literature review. Their impact on implementation of lean strategies has not been assessed however, despite adaptation models of lean diffusion and stage 3 leanness acknowledging that path dependencies influence how people respond. This paper therefore provides empirical evidence that path dependencies inhibit lean change, and

proposes that lean strategies must be cognisant of the future path dependencies they might create.

## **RESEARCH METHODOLOGY**

The research has been carried out within a single case study company that has been implementing change based on lean principles since 2006. 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 employs approximately 400 people and has an annual turnover of ~£250m which is generated by three operating divisions run from offices in the South, West and East of England. In addition the business also has a number of support functions - estimating, human resources, health and safety, marketing, supply chain management, information communication technology (ICT) and business improvement, which provide expertise and support to each of the individual project teams. The company engages sub-contractors, chosen as part of the supply chain, to deliver projects such as schools, student accommodation, hospitals and laboratories which are won through competitive tendering and framework agreements.

The research methodology follows an action research framework. This methodology suits the case study company since the researcher is responsible for process improvement activities, and is therefore a part of the changes being implemented, and action research designs also involve the people who are affected by the research that is taking place.

The research design uses the feedback from two cases of lean improvement, that have been implemented within the business over a period of two years, to identify the historical events that have proven to be path dependent and to show how they have influenced the lean strategy. The lean strategy employed was that of developing and implementing standardised ways of working across the business in the areas of work winning and project delivery. The completed processes and tools can be considered to be a version of standardised work, one of the core lean tools. Standardised work documents the current, best practice for carrying out a particular activity/process. The result is that activities can be carried out consistently, and without variation (waste), ensuring that the desired results of quality, cost, delivery and health and safety will be achieved every time (Liker and Meier 2006.) A full description of this strategy and how it was developed and enacted in practice is discussed in Morrey et al. 2011. This strategy did not play out exactly as expected however, therefore post implementation, ten semi-structured interviews were undertaken within a two month period with participants to gain their feedback and understand the path dependencies, i.e. the barriers, to change. Interview questions included whether they thought there was a need for change, whether they thought the strategy employed was correct, what they thought about how the processes had been implemented and what barriers to change exist in the organisation.

A history of the company was obtained from historical documents and semi-structured interviews and presented as a series of timelines in order that feedback from the cases of organisational change could be referenced back to past events/decisions, thereby identifying the path dependencies. Seven historical timelines were created under the following categories; general company history,

industry, Company performance, process and learning, ICT, organisational structure and people, innovation, marketing and communication.

### **THE PATH DEPENDENCIES IDENTIFIED AND THEIR IMPACT ON ABILITY TO CHANGE**

Based on the feedback from the cases of organisational change and the company history the following section discusses the path dependencies identified, and how these historical events/decisions continue to show themselves today through the feedback on the cases of the lean strategies implemented.

**Family Business Since 1890** - Starting out as a family business has set the business on its original path, and 112 years on it is still a factor in how people see the business and approach their work. Throughout the years, family members have been directly involved in running various companies within the Group, ensuring the business remained on this path. This initial beginning has therefore created a path dependency that is evidenced today in feedback that refers to “family values” and being “insular” and “parochial”. The family origin should in some senses be a strength to capitalise upon. Some people noted that employees feel like a part of the family, but that with new people coming into the business it was beginning to feel less like that. However, the downsides of the family heritage would appear to be a lack of challenge, reluctance to engage with parties external to the organisation and lack of accountability.

**“Builder” Culture Prevails** - The family business heritage is closely linked to the second path dependency identified, that of the case study company still considering itself to be a “builder” rather than a main contractor. Nearly all of the interviewees, when asked what the business does, included the word “builder” in their response, despite the company having no direct labour and engaging a supply chain to carry out its works. This path dependency of being a builder, whilst having positive connotations with respect to reliability and quality, can be considered to be restrictive with respect to the strategic intent to become a “solutions provider.”

**Lack of Standardised Processes due to Loss of Functional Heads** – The “builder” path dependency has undoubtedly been reinforced by a disconnect between what people actually do and the Company’s strategic intent; with no standard ways of working, aligned to strategy, people had developed their own methods. In the late 1980s, functional heads, who were middle management, defined ways of working that were implemented across the business; interviewees recall being given a manual which clearly defined their role and the management reporting they needed to adhere to. The loss of these functional leads in 1988 meant Company standards were no longer documented and implemented across the business, and that operating divisions began to define their own ways of working. It is the removal of these functional heads, the process owners and experts, that has led the business to become accustomed to lack of standardisation, and people becoming unaccustomed to being involved in defining processes for their functional area. This lack of process has impacted the level to which strategy has been enacted in practice. This is evidenced by the short-lived nature of Company initiatives which only endured for short periods of time.

The recent lean strategies were designed to create the new standard approach, and feedback shows that people are beginning to see the benefits of standardisation, with

someone commenting that the “tools provide a platform for implementation of Company procedures that prior to the development of the tools was outdated and inadequate.” The comment that “people used to work in isolation and in the way they have always have done it” was in the context of acknowledging the benefits of the improved ways of working, as well as accepting that previously there was a lack of definition. Despite the perceived benefits however, it was also recognised that “people will embrace good tools and ignore bad tools” and “everyone has taken on board the tools which aid their particular job.” This evidences that partial compliance still exists and that the path dependency has not been fully overcome as people find ways to get around changes they don’t buy into.

**Divisional and Departmental Silos** - Regional businesses were first created in the 1970s when various businesses were acquired. These acquisitions have created a path dependency as these divisional businesses have become silos that other parts of the business feel excluded from/in competition with. The creation of the divisions need not have led to the dependencies that are starting to be overcome today, however the organisational structure and approach to processes that went alongside the creation of the divisions meant that variation became prevalent and each part of the business created their own ways of working. One way or another, all of the work winning case study interviewees mentioned the operating divisions in the sense of them having divided the Company. This discord between departments has made implementation of change more difficult. An example of this is the work winning process, where estimators are reluctant to stop doing activities that are now allocated to work winning managers since they feel it diminishes their role and importance within the business.

**In-house Developed System** - The final path dependency identified concerns the Company’s ICT systems, specifically the creation of the in-house developed database system launched in 2003. All of the people giving feedback referred to the way the developed processes and tools are accessed through the system, with comments ranging from referring to lack of user friendliness, to people simply asking for “paper!” copies of the documents. Although the ICT team, in their feedback, feel that the business has begun to “pull” on their services, and people are arguably becoming more ICT aware through use of personal mobile phones and laptops, the current system does pose a barrier to the way recent changes have been received. Whilst in some respects an in-house developed system gives the business flexibility, and means it is not reliant on external third parties providing bespoke products, there is undoubtedly evidence, in the form of the feedback, that the decision to develop its own in house system has locked the business into a path that it now needs to review.

**Summary** - Feedback from the recent change strategies has helped to identify the path dependencies that exist within the case study company. Therefore, it follows that all of these path dependencies have had an impact on how the recent change strategies have been received by the business. The family builder heritage is apparent in the way people view the business and retain a level of insularity and lack of challenge, meaning introducing change strategies and different ways of working create fear in the sense that it moves people out of their comfort zones. Creation of operating divisions, coupled with the loss of functional heads who took ownership for processes, helped lead to silo mentality and variations in ways of working across the divisions being accepted; only since the benefits of the recent process improvements

have been seen in practice is the downside of the variation being appreciated. Finally, ICT has proven a barrier to new ways of working being accepted, regardless of whether this is a true barrier, due to the limitations of the systems, or an easy excuse for people to resist change. The previous narrative also outlined how each of these path dependencies are interlinked, and how later events have served to reinforce earlier decisions and ways of working. For example, had functional heads not been removed, the impact of having operating divisions might not have been so divisive.

The path dependencies uncovered here fit with the work of Mahoney (2000) and Ebbinghaus (2005) who discuss path dependency in the context of sequences and of events. Events that take place in the early stages of a historical sequence, in this example the setting up of a family building business, are the contingent occurrences that can't be explained based on any prior events and are decisively important to the final outcome. After these "contingent historical events take place, path dependent sequences are marked by relatively causal patterns or what can be thought of as "inertia." (Mahoney 2000 p.511.) In other words, once processes are set in motion, they tend to stay in motion, with the inertia created ensuring these processes and patterns are repeated over time, or meaning that subsequent decisions lead on from each other as an apparently naturally occurring sequence of events.

## **PATHS TO THE FUTURE**

The path dependencies uncovered and discussed in the previous section show how events and decisions from the past are continuing to influence and present themselves in the present and indeed pose barriers to change. However, despite these path dependencies, there is still evidence of change occurring within the business. Feedback from the interviews evidenced people are beginning to see the value of consistency and standardisation and its impact on performance; "alignment of the processes across the business was necessary" and I "believe they are a very important part of our business *now*", evidencing that they weren't before but that opinion has been changed. Similarly, the support for involving people in change, e.g., it was "right to draw on the skill base across the business" and comments that asked for further people involvement, such as "I believe the people who have produced the tools would have welcomed rolling out their tools," show that path dependencies are being overcome and that this opportunity should be capitalised upon further. New people to the business would also seem to be creating new paths through their openness in involving external organisations in bringing their ideas into the business.

Ebbinghaus (2005) discusses three possible scenarios for institutional transformation. Path stabilisation involves the "marginal adaptation to changing environmental conditions" (Ebbinghaus 2005 p.17) and is most likely when an institution is strongly entrenched in its ways of working, is remaining true to its core principles and is locked into its original paths. Path departure is likely when there are more significant changes in the environment and when earlier decisions have not narrowed the future path such that they determine fully the next step. Path departure could be achieved through "gradual adaptation through partial renewal of institutional arrangements and limited redirection of core principles." (Ebbinghaus 2005 p.17.) Path departure could therefore be achieved through long term gradual changes that over time add up to a larger re-orientation (Pierson, 2000b), a situation where the business changes the purpose from which it was initially intended (Thelen 2003), or

the addition of a new orientation to the business that requires its own separate arrangements and ways of working (Thelen 2003.) Finally, path cessation or switching is a radical transformation that ceases the self-reinforcing ways of the business and gives way to a new institution in its place.

The case study company could therefore be considered to be undergoing path stabilisation; it remains entrenched in its core principles of being a family owned building business, and the lean strategies to date have served to adapt its ways of working. This change could be continued, and the path dependencies in existence marginally overcome through the following recommendations.

It is recommended that the business develop strategic relationships with third parties, for example universities, clients and consultants who are able to access industry best practices, latest research and provide bespoke services that are outside of the immediate skill sets within the business. Doing this would help tackle the parochial and internally focussed behaviours that evidence the family building business path dependency. This approach is already being taken in some areas of the business, for example in work winning where external parties have been engaged to provide expertise in the areas of publishing and document presentation. Strategic relationships, rather than one off interactions, would allow consideration of future strategic targets, not only in terms of work winning, but also with respect to technical advances, industry developments and management/social sciences.

Continuing to engage people in developing and improving their processes, and driving the implementation of lean principles in this way, would continue to overcome the loss of functional heads, would help break down divisional silos (as working parties should be made up of people from across the business) and should also help develop capabilities in the areas of process improvement. Developing process improvement skills could also enable people to break free from the “builder” mentality and begin to challenge what they do and how they do it. Best practice sessions could also reap similar benefits if they were facilitated to encourage people to problem solve and think in a different way. A series of best practice sharing sessions would also give people a means of sharing ideas and promote a more outwardly looking approach, helping to overcome the divisional path dependency. Management’s role in driving and supporting these efforts is critical, and it is recommended that the manager role needs to be redefined and communicated so that managers realise the role they should play in learning, problem solving and coaching.

The business also needs to find a way in which to involve people in future ICT strategies and technology choices. Employee engagement in the process improvement activities to date has been shown to give increased buy in and credibility to the change. This needs to be achieved with ICT improvements, so that ICT solutions facilitate, rather than become a barrier, to change.

The above proposals would continue the change that has been started by the lean strategy employed to date within the business and would focus effort specifically on overcoming and breaking the self-reinforcing cycles in evidence due to the path dependencies. However, to meet the business’s future strategic aspirations to become a “solutions provider”, it would seem that path departure, rather than the marginal adaptation of stabilisation, is required. To this end, the business would need to create a clear vision and set of principles that could be cascaded and implemented through renewal of processes, systems and capabilities that would be aligned with that

strategy. There is perhaps also the potential to create a new layer (Thelen 2003) to the business that could focus on new work streams and therefore have its own ways of working and separate set of core principles and values, with new people and/or people with the capability to relinquish the old principles and history.

## **CONCLUSIONS**

The research carried out and reported in this paper provides evidence that path dependencies inhibit the implementation of lean strategies and as such, lean implementation strategies need to understand and account for these path dependencies if they are to be fully realised and effective in practice. It therefore follows that the issue of path dependency needs to be foregrounded in lean debates if the topic of strategic lean implementation is to be advanced.

It is suggested that without an understanding of the path dependencies and the company's unique path through history, participants in change programmes will find ways around change and revert to continuing as they always have done. Only an acknowledgement and understanding of the barriers to change will allow them to be consciously overcome. In other words, understanding the path dependencies will allow lean strategies to be targeted to overcome the reinforcing mechanisms and inertia created by the path dependencies, enabling new paths to be created. Path dependency analysis is therefore a tool for understanding the root causes of barriers to organisational change, which in turn will allow appropriate change mechanisms to be determined.

Alternatively, there is the option of ceasing existing paths, or enabling path departure, by making more significant changes to organisational principles and processes. For example, in this case it is unlikely that the business can fully escape being locked in by its family heritage, however new strategic routes to market could be created on new paths, following new processes with different types of people, rather than attempting to adapt existing aspects of the organisation.

Finally, the creation of path dependencies, especially those due to contingent events, is by nature unavoidable; the case study company did not set out to create those that exist, and decisions made now have the potential to become the path dependencies of the future. Therefore, since future interventions have the potential to create new path dependencies, it is important to ensure that those you create (intentionally or not) are compatible with the intended strategy. In other words, if lean philosophy is core to the business strategy, then all aspects of people, process, culture and ICT need to attend to that strategy, otherwise new paths created will lock the organization into ways of working that are at odds with the strategy and prevent it from being enacted in practice.

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