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Developing the True North route map as a navigational compass in a construction project management organisation

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Abstract

Question: How can a construction management (CM) / project management (PM) organisation, as client's representatives, apply Lean Construction principles and practices?

Purpose: To propose a holistic and long term Lean implementation strategy for the case of a CM/PM organisation in Germany that is acting as client's representative.

Research Method: The Reading Model was used as a tool to benchmark against other organisations.

Findings: It is highlighted that the implementation of Lean Construction often requires both a change in organisational culture and structure. It is also stressed that the application of Lean Construction requires a rigorous analysis of the organisation's capability in relation to becoming Leaner.

Limitations: This research is performed for one stakeholder in the South-West of Germany. Hence the proposed True North route map needs to be tested in other organisations and in different countries. In addition, the impacts of this route map can't be measured yet, as the company is in early stages of application.

Implications: The True North route map guides a CM/PM company in becoming Lean and further can help them to constantly improve their Leanness. Further it describes how Lean Construction can be implemented holistically in a project environment.

Value for practitioners: The paper introduces a different perspective on Lean Construction, namely viewing its development from the point of view of the project manager who is acting on the client's side. Hence a more holistic view for

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implementation is derived and demonstrated by application to a real case in Germany.

Keywords: Benchmarking, Construction Management, Germany, Project Management, True North

Paper type: Full Paper

Introduction

The trend in the construction industry sees Lean Construction as a growing approach with many advantages for the built environment (Demir et al., 2012). This new project delivery system is best suited for complex, uncertain, and short program projects, but it is also applicable to all types of construction projects (Howell and Ballard, 1997a, Howell, 1999). However, there is a higher focus on applying Lean by companies who are acting at the operative level (such as designers and contractors) rather than by organisations who are acting at the strategic level as the client's representative. Therefore a new current good practice guide needs to be developed, which encompasses a more holistic implementation of Lean Construction in CM/PM. We use the term "current good practice" in preference to the alternative of "best practice" as "best practice" is a term which is not compatible with the True North approach. The True North philosophy is that best practice can never be identified and achieved; once the best practice has been identified it becomes outdated and results in the current good practice.

This work shows parts of a wider research project which has been undertaken at the Built Environment and Sustainable Technologies [BEST] - Research Institute for a PM company (in the US context often stated as CM company), subsequently referred to as Company X, from the South-West of Germany. Company X is acting as the client's representative and, hence, is focused on establishing the strategic framework for managing the construction project and taking a holistic view over the whole project lifecycle. Further, the company selects the companies for the different phases at the operative level, though it is not managing the execution of the different phases. Company X wants to develop a new strategy to gain more competitive advantage, to get more customer satisfaction and to increase effectiveness and efficiency in its projects. Furthermore, increasing customer expectations have resulted in an expectation of higher service (for lower gains) and consequently more stress for the employees of the company. Following the trend in the German construction industry is to implement the Lean approach; and given that previous research indicates the approach results in greater productivity, enhanced stakeholder satisfaction and higher quality (Salem et. al, 2005), Company X decided to apply Lean Construction principles and practices in their projects.

This paper aims to propose a possible way for the case of Company X to apply Lean Construction principles and practices. Further the paper moves beyond the specific case to companies that directly serve clients as CM/PM services. This is aligned with a long term Lean implementation strategy, which will be further referred as "True North". To achieve this aim the paper outlines a True North route map which can act as a navigational compass to guide Company X in particular and maybe other CM/PM organisations in general wishing to undertake Lean. The next section provides the conceptual framework for the paper by outlining the salient concepts, namely: the link between current good practice and Lean, the role of benchmarking and the True North concept.



Conceptual Framework

Current good practice and Lean Construction

To take advantage of the benefits which are provided by Lean Construction, a number of case studies, reported in the literature, have identified current good practice tools and approaches to implement Lean Construction and generate a Lean philosophy in project environments (Ballard and Howell, 1998; Alarcon and Seguel, 2002; Arbulu and Zabelle, 2006; Roelandt, 2008). The implementation of Lean needs the support of top management in financial terms as well as with human resources. Even so, success is not guaranteed (Almeida and Salazar, 2011). Therefore Womack and Jones (2003) state that those new to Lean should firstly focus on activities which are perceived as important for success and which are highly visible. This focus will motivate people in the new way of working, resulting in higher engagement within the process amongst and organisations' staff (Coffey, 2000). Adoption of this approach has been viewed as an effective way of implementing Lean Construction in prior study (Roelandt, 2008).

However, the implementation of Lean Construction can also depend on the characteristics of the company (Neto, 2002). This relates the whole issue of introducing Lean Construction to the activities of business management, especially formulating and carrying out a business strategy (ibid.). As a result Neto and Alves (2007) argue that the focus, in the short term, with Lean tools and practices on highly visible and important tasks might not be the right approach. Rather, the focus should be in the long term and founded on a more solid basis (ibid.), with the change process going beyond consideration of purely the economic aspects of becoming Lean (Alarcon and Seguel, 2002). Hence, the implementation of Lean Construction requires a company to become a learning organisation in order to sustain competitive advantage (Henrich et al., 2006). In this context a learning organisation is one "which facilitates the learning of all its members and continuously transforms itself in order to meet its strategic goals" (Pedler et al., 1989, p.92). An example of a learning organisation is Toyota, who apply the theory to practice through their "True North" approach, which is briefly outlined in the next section

The "True North" approach

True North is a concept evolved from Toyota. Therefore the True North is a fixed, unchanging absolute reference point which helps to navigate to the ideal way of how things should be (Smalley, 2011). Rother (2010) argues that the application of a continuous improvement philosophy within the implementation of Lean might be not enough to guarantee success, because an additional overall direction is required i.e. applying Lean thinking to construction needs a long-term vision (Mossman, 2009). Long-term vision will help a company to navigate through different actions to finally achieve the aim (Rother, 2010). Over the past 50 years, with its "True North" focus, Toyota has achieved a lead position in eliminating waste, creating value and improving its own products and processes continuously (ibid). The goal is zero defects, 100% value with the lowest costs and continuous flow production. The True North works as a navigational compass proving a guide to take an organisation from the current condition to where they want to be (ibid.). The assumption is that every process step on the path to the True North will create a benefit for the organisation (Johnson, 2007), as the reference point True North is fixed and

the organisation is heading towards to it. One way in which an organisation can develop an appropriate path to become Leaner in their approach is through benchmarking activities and the next section sets out the salient benchmarking concepts that inform the development of the True North route map.

Benchmarking

Benchmarking one's processes and performance against other companies is a way to pull innovations through an organisation (Alves et al., 2009). Leading construction organisations have traditionally used benchmarking to constantly improve their performance (Pickrell et al., 1997). Ramirez et al. (2004) provide a succinct definition of benchmarking, describing it as "*an important continuous improvement tool that enables companies to enhance their performance by identifying, adapting, and implementing best practices identified in a participating group of companies*". There are other definitions of benchmarking, though they are similar in content to that of Ramirez et al.; and from this one can concur with the conclusion of Pickrell et al. (1997, p.8) that benchmarking involves: study of key internal processes, comparison with others and continuous improvement.

Benchmarking is a tool for business strategy development (McCabe, 2001), where the aim is to change the business process for the better (Pickrell et al., 1997). This change relates to culture, process, improvement of performance and productivity (Alracon et al., 1998). Hence Benchmarking is a tool which aims to facilitate innovation and/or "breakthrough". Innovation in this sense means *Kaizen* (continuous improvement) and breakthrough is *Kaikaku* (radical innovation) (Alves et al., 2009). The continuous improvement and radical innovation perspectives create a relationship between Lean and benchmarking, in which benchmarking can be used as tool for Lean Construction (Ramirez et al., 2004; Serpell and Alarcon, 1996) and/or to guide its implementation (Marosszeczy and Karim, 1997). However, another perspective is that organisations might avoid innovation as it is perceived as risk (Henrich et al., 2006). Therefore the change process of innovation or breakthrough should engage with and be more reflective of existing management practices. Furthermore benchmarking should be used as a tool for identifying the current good practice but not as a driver for innovation (ibid.).

Benchmarking is not a straight forward task for construction (Mohamed, 1996) and there are barriers and limits, as set out by Lantelme and Formoso (1999, p. 2): "construction is a project oriented industry - the product is usually unique in terms of design and site conditions and a temporary organisation needs to be created for each project; construction projects tend to be relatively complex - there is a wide variety of materials and components involved, many different agents take part in the process, and the final product has a large number of performance attributes". Therefore different types and methods of benchmarking are required for implementation. Mohamed (1997) determined three different types for construction: *internal* benchmarking, *project* benchmarking and *external* benchmarking. Internal Benchmarking compares internal business operations between organisations to continuously improve them. Project benchmarking compares organisation's projects to create a database to guide the management of future projects. External benchmarking aims to adapt current good practices from other industries into one's own industry. However, Mohamed's external

benchmarking perspective does not fully encapsulate all of the different ways this type of benchmarking is undertaken. Therefore external benchmarking needs further sub-categorisation. This can be done through the proposed types of McCabe (2001), which are *competitive* and *functional or generic*. Competitive benchmarking compares any business which is a direct competitor. This method causes difficulties in gathering data as direct competitors might be not interested in sharing their knowledge. Functional or generic benchmarking aligns with Mohammed's definition of external benchmarking. Hence, the different types of Benchmarking can be illustrated through Figure 1.

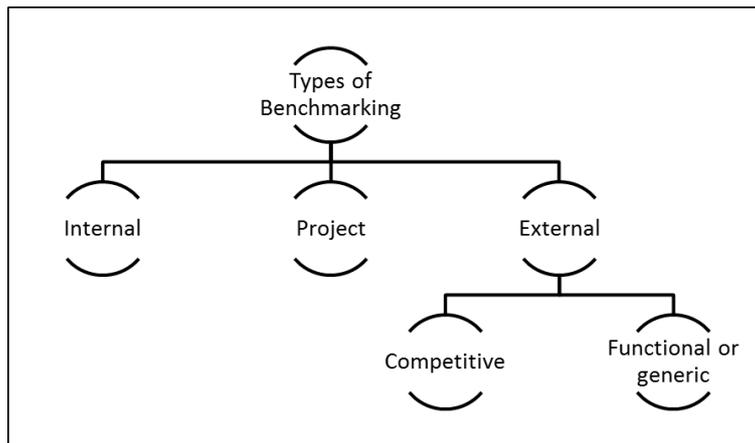


Figure 1: Different types of Benchmarking (adapted from Mohamed, 1997 and McCabe, 2001)

To become widely used in the construction sector a tool or method needs to be simple and flexible (Garnett and Pickrell, 2000). The current benchmarking tools and methods which are widely used in other industries besides construction do not meet this need, as they are too detailed and/or inflexible (Pickrell et al., 1997). The Reading Model for Benchmarking has been specifically developed for the construction sector to address this issue (Pickrell et al., 1997) and its appropriateness to construction has been further validated by Garnett and Pickrell (2000). It consists of the following steps: (1) recognising that you need to change, (2) deciding what to benchmark, (3) deciding who to benchmark against, (4) defining what data to collect, (5) collecting the data and analysing it and (6) putting the results into practice. The next section details how the development of the True North route map was undertaken for Company X by following these steps.

Developing the True North route map

The next section documents the case of Company X, which uses the Reading Model, with its six steps, to explore how Lean principles and practices can be applied for their projects and as a navigational compass.

Step 1: recognising the need to change

There is a current boom in the German construction industry which has had an impact on Company X through their capacity to undertake work being fully utilised. However, the boom in the industry has also created higher customer expectations. This in turn caused more stress for the employees of Company X, because the current margins on

projects do not allow for additional human resources being employed. Hence the customers want more services for less money and Company X tries to manage this with the same number of staff. Another reason for the high stress levels within Company X is related to the internal processes and management systems not being particularly well defined. Additionally, past experience shows that a boom in the industry is followed by a downturn. Given the anticipation of a potential future downturn the willingness to build up human resource capacity within the company is low. Therefore the rationale for change and for benchmarking sits in the context of the company aiming to achieve competitive advantage with its existing resource base. Hence increasing the customer satisfaction and improving the effectiveness and efficiency of the internal processes is required.

Step 2: deciding what to benchmark

Given that previous research indicates that the Lean approach results in greater productivity, enhanced stakeholder satisfaction and higher quality (Salem et. al, 2005), which are outcomes that Company X wanted to achieve to gain competitive advantage, the implementation of Lean Construction principles and techniques to their projects was a logical step to take. One way to apply Lean is through following Toyota's definition of zero defects, 100% value added with lowest cost and continuous flow. However, in the case of Company X, which is acting as the client's representative, the relationship of Company X is close to the customer but is more distant from operational processes. This issue questions the adaptation of implementation strategies such as those for Contractors. In addition there is an absence of extant literature for implementing Lean Construction in CM/PM organisations, acting as client's representative. Therefore Company X decided to modify Toyota's way of thinking by taking the True North concept as the underpinning structure and developing it further into their own way of applying Lean principles. Hence Company X wanted to benchmark against what Lean organisations look like and hence establish how they could become a Lean organisation. This goal aligns well with the concept of the "True North" approach, with X's long-term vision being to make it the best Lean Construction PM company in Germany. All the defined objectives are part of the True North Path to achieve this vision.

Step 3: deciding who to benchmark against

This step was complicated by the fact that Lean Construction has not been implemented by PM companies which are acting on behalf of the client in the same region of Germany as Company X. This meant that competitive benchmarking was not possible. Hence it was decided to apply functional and generic benchmarking. Five Lean organisations [LOs] were selected, based in the same geographical region as Company X. It was stressed to potential companies that by not being direct competitors a competitive environment was avoided and a Win-Win Situation could be created. This Win-Win situation included sharing the benchmarking results with the parties involved in this research.

Five companies agreed to participate in the benchmarking process.

- LO-A, LO-D and LO-E are Lean consultants, which are using Lean methods within their company, but are more focusing on training their clients in Lean methods. Two of the Lean consultants are out of the automotive industry and one is an equipment producer for the construction and automotive sector. What those



three Lean consultants have in common is that, after the successful internal implementation of Lean, the companies decided to create a subsidiary company, which is consulting and supporting other organisations with this new paradigm. Hence, especially this group of LOs shows that the implementation of Lean can pay back better as expected

- LO-B is a company specialising in the production of paper machines. The company is the leading builder of paper machines in Europe. They act in the field of plant construction, where the focus is more on the machines and the building around is seen merely as a shell. Therefore the emphasis in their projects is more on functionality than on aesthetics. One major aspect of achieving success for LO-B is related to the fact that the company is working with Lean principles and techniques during the design and execution of the machines.
- LO-C is one of the leading contractors in Europe. Their market leadership position has been achieved primarily through the acquisition of a number of local companies. Over the past decade LO-C has undergone major transformational change in the way it works. They established continuous improvement departments within the company, which have the aim to support the Lean journey. Since doing this, they have achieved enormous improvement within their projects.

Both LO-B and LO-C were actively practicing Lean methods in their products or projects.

Step 4: deciding what data to collect

In order to decide which data to collect, a deep understanding in the implementation of Lean Construction was required. To facilitate this, we decided to firstly use a qualitative technique, because it “[...] *provides information on different management dimensions to help identify current good practices and explain observed performance differences*” (Ramirez et al., 2004). As a result semi structured interviews were utilized, which have the capacity to provide insights into how research participants view the world (Bryman, 2008). Standardised interview guidelines were prepared which were sent in advance to the research participants so that they had enough time to prepare themselves. Potentially the questions asked could deviate from the scheduled interview guide depending on how the interview progresses. This flexibility is a clear advantage of semi structured interviewing, which allows the research to explore why things happen in the way they do (Moore, 2000). Each interview lasted in average one hour each. They were tape recorded, transcribed and then analysed.

The interpretation of the analysed interviews resulted in four broad criteria, namely: philosophy, advantages, weaknesses and techniques. These 4 criteria were subsequently subcategorised into 35 characteristics. The characteristics have been derived through considering the various perspectives of the different interviewees. Further details about the criteria and their sub characteristics are provided in the next section. Each criterion with its sub-characteristics will be referred to subsequently as the “benchmarking matrix/matrices”.

Step 5: collecting the data and analysing it

For this step we decided to supplement the qualitative data collected through the interviews with quantitative data. A number of benchmarking matrices relating to the criteria identified in the previous step were sent to the same five involved companies. This data provides two different types of information. On the one hand, it shows what an organisation which is using or selling Lean looks like; on the other it gives insights into how an organisation could put the results into practice. Further the benchmarking matrices provide high transparency about the current good practices of the involved LOs. When analysing the data the aim was not to copy the current good practice but rather to identify interdisciplinary inspirations in developing the Lean Construction strategy of Company X. This is explored in more depth in the sixth and final step. The analysis of the data is presented in relation to each of the 4 broad criteria identified in step 4, namely: philosophy, advantages, weaknesses and techniques.

Philosophy

The results in relation to the first benchmarking matrix, which focused on aspects relating to philosophy, are given in Table 1.

Table 1: Benchmarking Lean philosophy

Lean Philosophy	LO				
	A	B	C	D	E
How important	High	High	Very high	Very high	Very high
Implementation by training courses/workshops/games/simulations	X	X	X	X	X
Mentor of the philosophy		X	X	X	X
Acceptance of Lean	Good	Good	Average	Good	Good
In-house training	X	X	X	X	X
External training			X	X	

Table 1 illustrates that all LOs attach high importance to having a Lean philosophy within a Lean organisation. A mentor for the philosophy is used by three LOs. The mentor is the contact person for all questions within a department or an organisation about all Lean issues. Furthermore this mentor is responsible to remind people that they do not fall back in to their old none-Lean behaviours. All the LOs used in-house training, which reflects that this can be recognised as a long-term approach. However, the use of "external training" in this context can be seen as an injection of new innovation and therefore as the use of radical innovation.

From the interviews it was evident that all of the LOs believed that a deep understanding of the Lean philosophy is a significant enabler for implementing Lean. For instance LO-D described how *"the philosophy is so essential that it is a basic prerequisite*

for success”. The LOs used different models to convey the Lean philosophy in their organisations. LO-D stated: “we use workshops and they should be conducted with adequate business games/simulations to bring a wow-factor to the participants”. LO-D argued further that the creation of a small number of highly visible success factors in a specific area serve as a kind of a lighthouse for the people and motivates them to internalise the philosophy.

All LOs used workshops as an instrument to facilitate a good understanding of the Lean philosophy. This is crucial to overcome natural resistance and scepticism amongst staff. For example, LO-D and LO-C explained that approximately 10% of employees are generally against the Lean philosophy at the beginning. Another 10% are convinced about its merits and want to adopt it. However, the majority (80%) have a neutral attitude and need good and continual training to be convinced.

Advantages and weaknesses

Table 2 summarizes the perceived advantages and weaknesses of using Lean. The identified advantages and weaknesses reflect those reported in the literature (e.g. Burgos and Costa (2012) or Skinnarland (2012)). The table demonstrates in absolute measures the view that real time savings, cost reduction and quality improvement is delivered from using Lean.

Table 2: Benchmarking Lean - advantages and weaknesses

Lean Advantages	LO				
	A	B	C	D	E
Time savings	10-20%	>30%	10-50%	>40%	10-30%
Cost reduction	10-20%	5-10%	10-50%	>15%	10-30%
Quality improvement	Yes	Yes	Yes	Yes	Yes
Lean Weaknesses					
Sustainability of the employees	X	X	X		X
Understanding of lean thinking	X		X		X
On-going commitment of the management			X		X
Willingness to change		X	X	X	X
Increase of the planning effort				X	
New partners = no continuity	X				X

LO-B stated: “in terms of time savings we could identify in the whole process an improvement with up to 30% within the last 15 years”. This was confirmed by most of the LOs. In terms of cost savings, LO-E said: “we identified cost savings in our projects from 10% to 30%, depending on the process quality”. The LOs also realised that the quality of

their products and processes rises up when they implement the Lean philosophy and use then the Lean methods.

Table 2 further shows that in terms of weaknesses sustainability of the employees, which was perceived as low due to high employee fluctuation was the most common issue that needed to be addressed. Also high on the agenda was the level of understanding of Lean amongst employees. Most construction projects require different partners, for instance architects, structural engineers, main and sub-contractors and project managers (on the client side). New partners can bring an inconsistency and this was also identified by the LOs as a weakness. Another widely recognised weakness was the willingness to change, which was coupled with the threat of staff falling back to the old daily routine way of working, which does not include any Lean approaches.

Planning was another issue and was articulated in the interviews by LO-D who stated that *“the planning effort is higher for a construction project but therefore there is a less control effort needed”*. LO-C argued that Lean Construction does not easily fit to every corporate culture. A lack of on-going commitment from management, which is evident through short-term thinking, was another identified weakness.

Indeed all of the interviewed LOs stated that there is a requirement to set-up a different form of project organisation before one can start to become Lean. As explained by LO-B: *“you have to implement a professional project organisation before you start to go Lean”*. Further, most of the LOs believed that the willingness to change, a good communication maturity, the existence of a process vision, and the commitment of the top management is needed in an organisation to establish a basic framework for Lean to be effective. LO-E explained further: *“all project participants have to be pre-qualified to find out whether they fit into a Lean project or not”*. However, barriers for use of the Lean methods have been recognised by LOs, like for instance internal boundaries in the organisation and hierarchy levels; a lack of holistic thinking; and scepticism to abandon old habits.

Techniques

Table 3 below illustrates the high variety of the Lean techniques used by the LOs. We classified the techniques into two broad categories, namely: diagnostic and operative. The diagnostic tools are those which are required to do the work preparation, to diagnose threats, opportunities and/or improvements. Under the umbrella of diagnostic are tools like the Five S's, Five Why's, Spaghetti chart and Error-proofing. Tools for the operative level are characterised by having a direct impact in the production process i.e. *Kanban*, PDCA, Setup reduction, Just-in-time, One piece flow and Pull system. Not all techniques can be easily classed into one of these two groups as there are some which act on both levels, such as the Last Planner® System or the Lean Project Delivery System. However, the categorisation of the techniques in this way is a useful delineation which shows the broad focus for the majority.

All LOs had customised the techniques before they used them and they all try to measure the implementation. However, they considered Lean maturity to be difficult to measure, resulting in the fact that the LOs often struggled with their measurement approaches.

Table 3: Benchmarking Lean techniques

Lean techniques - Diagnostic	LO					Lean techniques - operative	LO				
	A	B	C	D	E		A	B	C	D	E
Five Ss	X	X	X	X	X	Just in time	X	X	X	X	X
Five Whys	X	X	X	X	X	One piece flow	X	X	X	X	X
Visual management	X	X	X	X	X	Pull system	X	X	X	X	X
Continuous improvement	X	X	X	X	X	Error-proofing		X	X	X	X
Spaghetti chart	X	X		X	X	Kanban		X	X		
PDCA	X	X		X	X	Total productive maintenance	X	X	X	X	X
Production analysis board	X			X	X	Heijunka		X	X	X	X
Setup reduction	X			X		Last Planner® System					X
Value-Stream Mapping	X			X	X	Lean project delivery system					X

Step 6: putting the results into practice

To put the results into practice we used the data presented above within a workshop with the Chief Executive Officer's and two leading project managers of the case, to develop a route map for Company X, with several identified steps to move towards their True North. In this workshop we, as researchers, had the role of a facilitator to ensure that the developed steps are aligned and derived from the findings of the benchmarking and from the requirements and ideas of Company X. The route map can therefore be seen as a navigating compass showing X how it can achieve its vision of being the best Lean Construction PM company it could possibly be. It might be not necessary or practicable to implement each step on this way. But as long as each step taken is on the path towards the True North the organisation will continuously improve their Leanness. The True North route map is shown in Figure 2.

The crucial enabler of moving towards the True North is to embed a deep understanding of the Lean philosophy amongst all participants. The organisation and its staff needs to be fully trained in Lean thinking, principles and techniques, with the aim being to create a paradigm shift from a "traditional" culture to a Lean culture. The Lean culture has to become second nature for the whole organisation, covering an emphasis on process thinking, the view that projects are temporary production systems, the rigorous pursuit of the elimination of waste and the striving for perfection when undertaking work.

The first steps are training and workshops that should be done internally to create continuous improvement and repeated externally to create radical innovation. External consultants should be taken on board to support this. Once the organisation is aware of Lean thinking and its techniques, then a strategic business unit (SBU) can be created by the organisation. The remit of the SBU is to develop the company's own way of being Lean. This development has to cover presentations, a set of tools and the dissemination of

knowledge through a series of workshops. Furthermore strategies for the acquisition of projects and a contract with the client that fit the new Lean approach to CM/PM ought to be established.

Step 8 is necessary as the Interviews showed that not all designers and contractors are able and willing to contribute to a Lean Construction project. To be able to pre-qualify designers and contractors, audits can be established. These audits can also serve a second value, the collection of data of those designers and contractors which support the Lean journey of Company X. Over time a pool of appropriate designers and contractors will be built up, from which the most suitable designer/contractor for each new project can be selected. The selected designers/contractors will become partners by receiving support and training for their own establishment of Lean thinking in their organisation, which will be aligned to the aims and commitment of the Company X. The following steps are cyclic in their nature:

- Getting closer to the True North definition of a mature Lean organisation which delivers projects in one reliable end-to-end process, with 100% value for the customer.
- New partners will join the pool and others will leave; not proving able to further share the same commitments and goals as Company X
- The Lean philosophy and techniques will be further developed and applied within the organisation

It ought to be emphasised that the True North route map presented in this paper is a starting point and it will be constantly improved. This improvement can be undertaken using Plan, Do, Check, Act (PDCA) cycles (Imai, 1986) between each step illustrated in Figure 2. Toyota's definition of zero defects, 100% value added with lowest cost and continuous flow is comparable with the definition of the True North in the CM/PM context of this case; and, although difficult to attain, it acts as a target driving the ethos of continuous improvement.

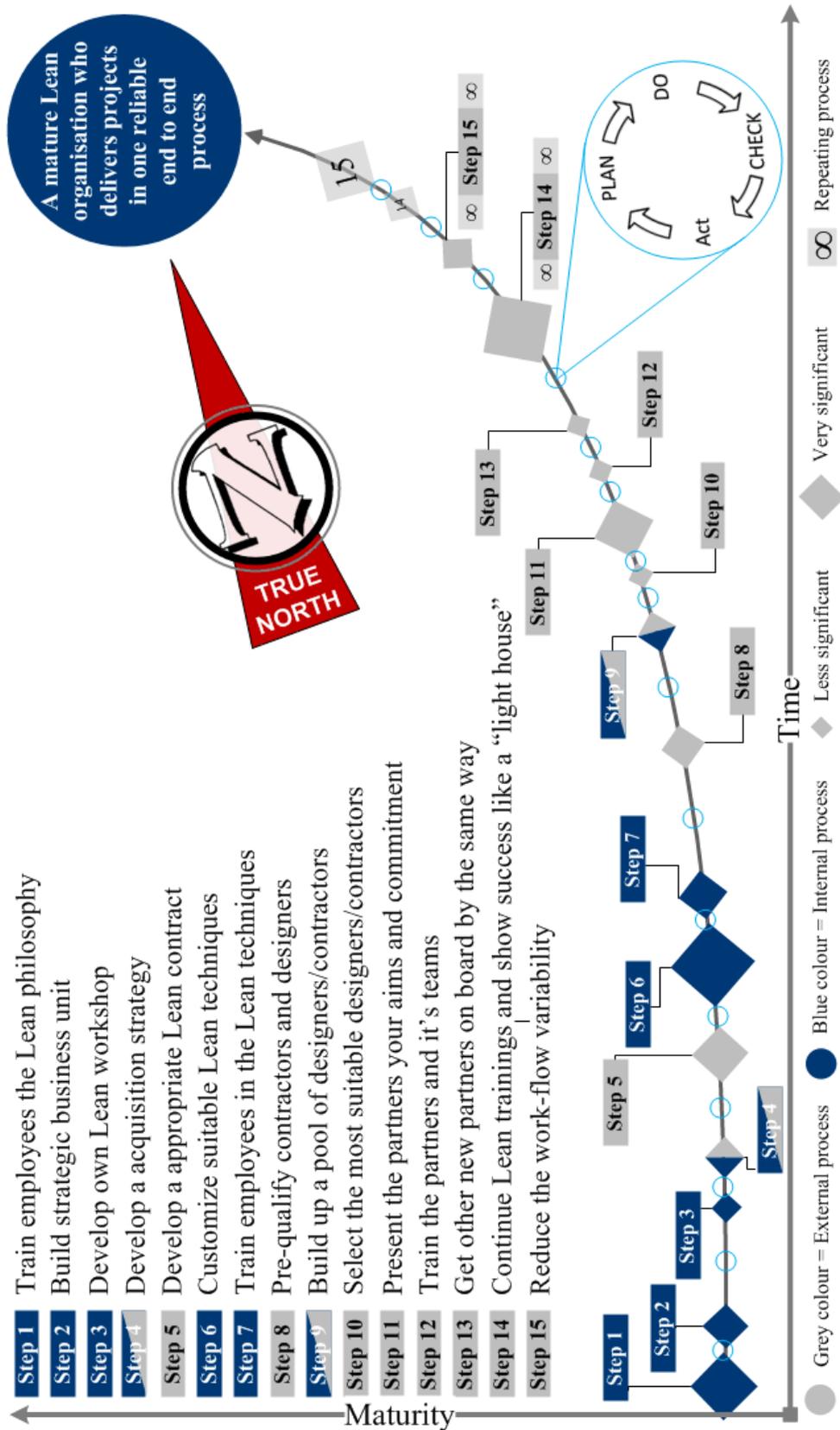


Figure 2: True North route map

Conclusion

A validated Benchmarking process for construction, called the Reading Model, is used to analyse how Lean Construction principles and practices can be applied into a CM/PM organisation from the South-West of Germany, within five Lean organisations from a number of business sectors. A route map is proposed which acts as a compass to guide the case organisation which wants to become Lean. This has been labelled as “The True North route map”. The findings of this research show that a Lean organisation develops a philosophy which makes Lean second nature. Furthermore projects are seen as temporary production systems. A Lean organisation is aware of process thinking, the need to eliminate waste and uses customised Lean techniques which are adapted to suit the organisational requirements. Finally they foster long-term and deep-rooted cultural change within their organisation. This is facilitated through the commitment of the top management, internal and external training initiatives and a long-term vision which provides a clear focus and direction of where they want to go in terms of becoming Leaner in their PM approach.

The impacts of this route map can't be measured yet, as the company is still in early stages of application. Nevertheless the development and achieved current good practices resulted in an intermediate knowledge and awareness of Lean within the organisation. The researchers have recommended to Company X that all endeavours for further steps shall be documented to follow this case in its started Lean journey. In general is the developed way of applying Lean Construction principles and practices to be seen as a whole and the steps should not be seen isolated. This study is undertaken for a particular stakeholder from the South-West of Germany. Hence, the proposed True North route map needs to be further validated and tested in other organisations and in different countries. Future research would be a comparison of the evolved True North metrics with other metrics used within practice and academia. In addition it needs to focus on measuring the nature of Lean behaviours amongst organisations within the built environment. Specifically in terms of how to measure the gap between where a construction project organisation is currently at and where they want to be in terms of their Lean Construction maturity.

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