

IS LEAN CONSTRUCTION ANOTHER FADING MANAGEMENT CONCEPT?

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ABSTRACT

Management concepts tend to fade away within a relatively short period of time. After a few years the news value declines, the “gurus” disappear, difficulties in realizing the expected gains are recognized, and new management concepts take over.

This paper brings attention to the simple question: How is it possible to sustain interest in Lean Construction? Drawing on literature describing the typical life-cycle of management concepts, the journey of Lean Construction and Lean Construction Institute (LCI) in Danish construction is used as a case.

LCI Denmark (LCI-DK) was established in 2002 as the first chapter outside of the USA and may therefore be ahead in regards of concept life-cycle to other LCI chapters around the world. It is argued that a revitalization is needed in Denmark if Lean Construction is to overcome the typical life-cycle of other previous management concepts.

This leads to a discussion of implementation barriers and challenges to keeping Lean Construction alive, and how to overcome them. The aim is to spur a discussion that may benefit all who are struggling with implementation barriers or find themselves in a post-interest era.

KEYWORDS

Management concepts, Implementation, Barriers

INTRODUCTION

Lean Construction was introduced as a new concept in Danish construction around 2000 and in 2002 the first LCI outside of USA was established. The interest in Lean Construction methods grew for some years but then diminished. This paper sets out to analyse Lean Construction (LC) as a management concept and the journey of LC in the Danish construction sector.

The paper is structured in five main chapters: First theories of management concepts are introduced followed by a brief chapter on research method. The third chapter introduces the empirical data regarding the journey of LC in the Danish construction sector, which is followed by the analysis chapter and key learnings are summarized in the concluding chapter.

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MANAGEMENT CONCEPTS

A management concept can be defined as a 'theory' about a company's success. The success often has its outset in an economic discourse and/or the ability to provide companies with a competitive advantage (Hagedorn 2003). Ideas draw on different discourses on their way to becoming management concepts, for example, technical rational models, humanistic understandings and symbolic metaphors. At the same time the promoters of the concept has to demonstrate the practical use through various means and tools (Kamp et al., 2005). Often concepts are based on practical experiences that are articulated through almost ritual stories – i.e. about the small business that became big (Hagedorn 2003).

Management concepts include a 'theory' or philosophy which often is a concrete experience made abstract and general. A management concept will typically contain a diagnosis of problems and suggests solutions to these via methods and tools to transform current processes – change management (Hagedorn 2003). The concept thus contains a more or less constructed problem area and associated solutions. In addition, management concepts are built on a diagnosis of current society, an organizational understanding and a view on human behaviour and relationships (Kamp et al., 2005) (Morgan 1986).

Management concepts can be seen as representations of knowledge that can help to develop organizations. They can create continuity and change practice, but also transform through practice. The structures are produced and reproduced by a number of established networks. On the one hand these networks include a number of players, but such an 'inclusion' will also be an exclusion of others (Hagedorn 2003).

The value and the attractive appeal of management concepts lie in its ability to inspire and persuade leaders to address possible organizational changes. Thus, a new and modern packaging of old ideas may also catch leaders' attention. The concept's interpretive flexibility makes it possible for managers to shape it, which can help to inspire and thus initiate organizational change projects. Managers use management concepts and new managerial tools and ideas to give the impression of efficient and modern management (Precept 2003).

CATEGORIZATIONS OF CONCEPTS

There have been several attempts to categorize management concepts in different groups. Davenport & Prusak (2003) makes a breakdown in which they say that management concepts are aimed at: Efficiency, Effectiveness and/or Innovation. A management concept may well try to fulfill several of these goals. Barley and Kunda (1992) argues that if you analyze across management concepts from a particular period, you will find broad common trends - for example, whether they are focused on soft values, culture and communication or production-wise and mechanistic thinking.

THE LIFECYCLE OF MANAGEMENT CONCEPTS

Management concepts go through what can be termed a lifecycle; from early 'discovery' to a point where they disappear or are embedded in daily practice. Each management concept has its own life cycle, but there are many common features.

This section will look more closely at a general lifecycle in a sector or industry and what is important for a concept to either stick or become just a 'fad'.

Studies show that the cycle of a management concept can be illustrated as shown in figure 1.

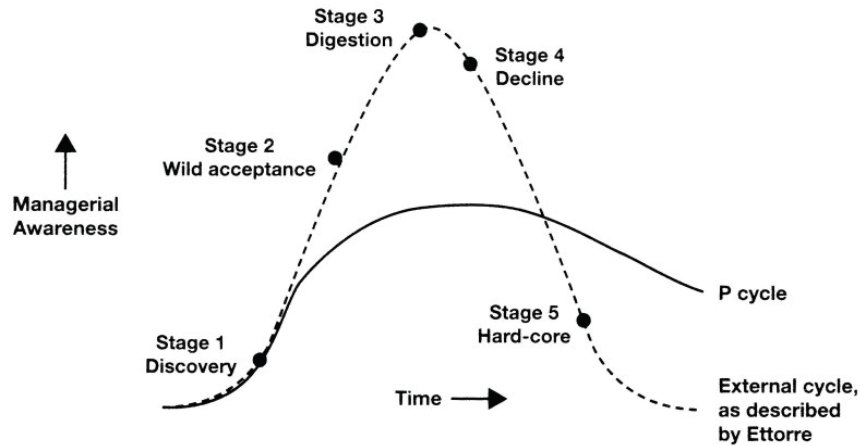


Figure 1: The lifecycle of a management concept (Davenport & Prusak 2003)

The lifecycle illustrates the development of the management concepts in an industry/sector. The illustration is based on the work of Ettore (1997) who points out five stages in the external life cycle of a management concept; The first phase of the lifecycle is the discovery of the management concept – maybe from an article published in an academic journal or through a management book/bestseller. In the second phase the popularity of the concept increases tremendously in the media and among enterprises. In peak of the curve (third phase) the concept is further examined and criticized. The awareness and number of followers/users begin to fall, and attention declines dramatically until only a small group of hard-core supporters are left (Ettore 1997).

The lifecycle can vary from a few months to several years or centuries for different concepts. It depends on the ‘range’ of the concept and the readiness for change in a sector or company. Furthermore, the concepts seldom act alone - neither within companies nor in a sector or industry. Concepts must compete against other concepts and ideas need a certain fit with existing management principles.

Over time concepts are normalized and integrated into daily practice and consultants' repertoire of techniques and technologies that are extended to new managerial areas. The normalization means that the concept disappears in public forums. Often concepts subsist in other techniques and in new concepts under a new label (Precept 2003).

CONCEPTS AS FADS

Management concepts can have a shorter or longer lifecycle whether the concept is fast gaining popularity, tested and rejected or the concept have a long 'incubation period' when incorporated into a company or sector (Koch & Simonsen 2002).

As these cycles become shorter the management concepts can be considered as fashion phenomena – fads. These fads do not necessarily follow aforementioned

cycles but are typically short-lived popular ideas which rarely produce lasting effects. Many companies are being blinded by these ideas and focus on the ideas in a short period without obtaining an actual implementation before the next new and clever idea pops up (Davenport & Prusak 2003). These management fashion phenomena can be directly harmful to organizations if adopted without careful consideration of relevance to the company's core business (Abrahamson 1991).

Accordingly, it is rarely the concept or idea that is to blame. Often concepts end up being fads because they are treated superficially and because they are inconsistent with existing organization and management principles.

VARIANTS AND FAMILIARITY

Although it is tempting to try to define a management concept, such as LC, Partnering or Value Management, a concept is typically continually evolving. This means that it is not possible to make a precise definition that will last. This may lead to a discussion whether a management concept has a substantial core, for example an ideology and tools (Hagedorn 2003), or whether there exists only variants of the concept.

When aiming to determine a core of a management concept, the question is, on what level the core must be defined. There may be terms, philosophies and hypotheses that can be identified as central. At the same time there will be a number of tools and methods that are essential ingredients when transforming theory into practice and finally the actual practice could be described. Accordingly, Spear & Bowen sought to determine 'The DNA of the Toyota Production System' (Spear & Bowen 1999) and focused on established practices at Toyota, whereas Womack & Jones (1996) described TPS through the 5 principles of Lean Production, which is a more general and abstract conceptualization. Academics will typically articulate concepts at a higher level of abstraction while the companies will focus on tools and practices.

Nyström (2003 and 2005) analyses the construction-related management concept of partnering and concludes that there are a number of different 'definitions' of this concept. He refers to the German philosopher Wittgenstein, who argues that complex concepts cannot be defined by presenting the conditions of the concept. It is not certain that there is a plurality of elements (or just one) that is common to all variants of a term, and therefore it cannot be defined in the traditional sense. Instead he argues that concepts are complex networks of overlapping similarities.

This way of understanding a concept is called familiarity (family-resemblance) as similar properties can be found in families. The notion of familiarity provides an opportunity to create a framework for a management concept that otherwise might seem vague and difficult to define. Familiarity embraces different variants of a management concept and puts them in relation to each other - even without the necessarily one shared point.

THE MARKET ARENA FOR MANAGEMENT CONCEPTS

When considering the life-cycle of management concepts, it is also important to consider concepts as sellable products (Kamp et al 2005). Abrahamson (1996) describes a market arena (figure 2) in which actors interact with the development of a management concept. This market arena is stretched by the networks and

relationships between the actors. The market consists of companies who demand and test management concepts as well as a group of concept providers and developers: Gurus, media, business schools and consultants.

The transformation from service providers to enterprises is through innovation brokers and consultants and the company's 'Idea Practitioners' as gatekeeper for the company. Evaluations, criticism and analysis of companies' use of concepts (e.g. conducted by universities) provide feedback to providers that develop the existing concept or develop/promote a new concept in response to demand.

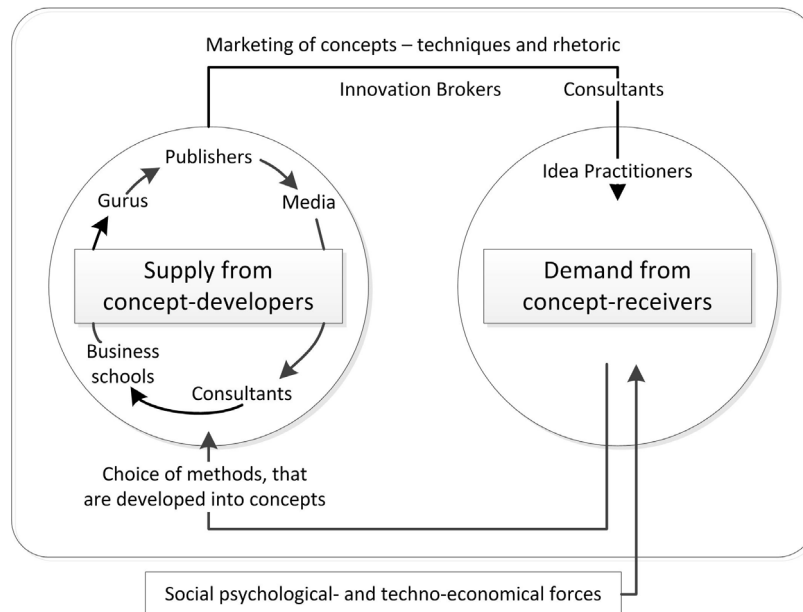


Figure 2. Market arenas for management concepts (Simonsen (2007) developed from Abrahamson (1996))

METHOD

The research presented in this paper can be situated within a social constructivist perspective, where *“method connects theoretical frameworks with the production and productive use of empirical material”* (Alvesson & Deetz; 2000:5). Accordingly, the aim is not to provide evidence, but use theory as a source of inspiration to interpret and develop practice. Part of the paper is based on work carried out in a Ph.D. thesis in 2002-2006 (Simonsen 2007), that has been updated with the authors united knowledge and experience being close to the development of LC in Denmark (as practitioners and researchers). In addition, the latest quantitative data on memberships of LCI-DK are used. Theory of management concepts is used as a primary 'lens' to perform the analysis. Also, the researchers draw on previous research regarding LC and barriers to implementation to support the interpretations and recommendations. A brief introduction to the Danish experience is presented below followed by the analysis and conclusions.

THE DANISH EXPERIENCE

In Denmark LC was introduced in the late 90's and was urged on by government initiatives aiming to stimulate productivity in the Danish construction industry. Led by a relatively small group of pioneers representing large contractors and engineering companies, as well as employers- and employees organizations, the LCI-DK was established in 2002-2004 as the first chapter outside of the USA. The increasing interest was further accelerated with the IGLC 2004 held in Elsinore, Denmark, and the adoption of LC in landmark construction projects (e.g. The Danish Broadcasting Services new headquarter). As an indicator of the life-cycle of LC in Denmark, the number of company members (excluding student members and universities) in LCI-DK is shown in figure 3. Accordingly, it seems that interest peaked in 2007 and was followed by a long decline until 2012.

In the following, it is argued that the development can be analyzed via theory of management concepts, which is used to suggest 5 reasons to the decline in interest and possible ways to overcome them.

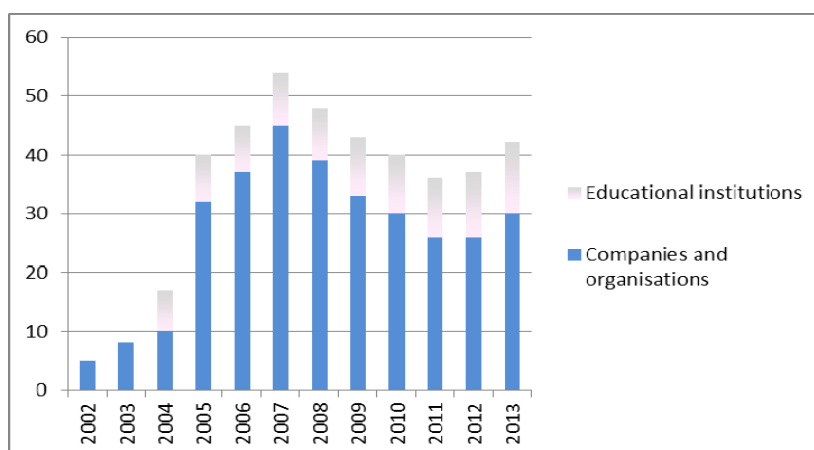


Figure 3: Number of companies and educational institution members of LCI-DK

ANALYSIS

LEAN CONSTRUCTION AS A MANAGEMENT CONCEPT

LC fits the description of a management concept. With reference to Davenport & Prusak (2003) LC is aimed at all three goals: Efficiency, Effectiveness and Innovation. It may be perceived as a variant of Lean that has been adapted to make a change in an industry that has been (and still is) heavily criticized for its low level of achievement (Joergensen, 2006, Sarhan & Fox, 2013). It is based on its own problem diagnosis that is concerned with the practice of designing and constructing in project-based organizations under almost chaotic conditions (Bertelsen & Koskela, 2003, 2005). The Theory of the concept is heavily influenced by the TFV model proposed by Koskela (2000) and the most widely used methods and tools are associated with the Last Planner™ System of Production Control (Ballard, 2000).

It is promoted in the market arena by consultants and innovation brokers, telling stories of revolutionary results, and is constantly developed by practitioners and academics. Accordingly, the familiarity metaphor is particularly relevant, when

considering LC as a management concept. Continuous development is a key principle that makes it a moving target. Thus, new extensions are still being added e.g. changing the focus from site-production and coordination between builders to design management and integration with BIM. Accordingly, Joergensen (2006) found it difficult to find a shared definition, and instead suggested some common elements.

The ongoing attention worldwide has shown that it is more than just a 'fad'. However, the question is, whether LC will follow the life-cycle proposed by Davenport & Prusak (2003) and if so, has it already reached its peak? There are indications to consider in the Danish experience.

DANISH ARENA FOR LEAN CONSTRUCTION

The Danish market arena for LC aligns well with the model in figure 2. All the key actors can/could be found in the history of LC; The consultants, the brokers (LCI-DK and others), the researchers, the idea practitioners in the companies, medias and Sven Bertelsen as the (local) guru. Also the mechanisms of the interplay between companies, consultants, researchers, brokers and media are reproduced in practice.

LC was also shaped in a Danish variant building on the development of the Danish construction sector (Simonsen & Koch 2004). The main focus was on contractor collaboration and the concept was partly introduced as bottom-up partnering relating LC to another known construction management concept of the late 1990ies.

FIVE CHALLENGES

Barriers to successful implementation of LC have recently been researched in a UK context by Sarhan & Fox (2013). Their study confirms that after the first discovery and wild acceptance stages, the success of the management concept has been somewhat limited. Similar to McGraw Hill Construction (2013), Sarhan & Fox (2013) found that lack of awareness is a major barrier. However, this does not explain why Danish companies that initially were members of LCI seemingly lose interest. Some of the explanations may be found in the following analysis, where 5 challenges are suggested.

News-value and entrepreneurial spirit is difficult to sustain

The market arena understanding of management concepts entail that the 'product' needs to be attractive in comparison to competing concepts and ideas. However, within recent years, sustainability and new possibilities in ICT have attracted much attention as part of a global development. Due to the financial crisis and prior failures in large public investment projects, focus on risk management has also been spurred by economists and accountancy firms. In addition, some companies have introduced 'commissioning' as a concept of its own, due to increased complexity in installations, building management systems and technology.

Additionally, some of the early pioneers and lean gurus, who were positioned at chief executive level in their respective companies, have found new interests or retired. The second generation innovation brokers (e.g. in the LCI-DK executive committee) are mainly positioned at a middle-management level, which limit their influence and ability to 'sell' the idea. Also, the second generation may lack the

entrepreneurial spirit that comes with ‘discovery’ – they need to find a new way to revitalize the concept and make it their own.

A proposition is, to see other concepts as complementary, not as competitors, and create relation between concepts (e.g. the use of ICT, which has already been done extensively). Nonetheless, lean is still an old label and therefore its branding value is limited.

Front-end loading is difficult to sell

Front-end loading is part of the lean toolbox and covers early involvement of contractors and vendors in the design process, set-based concurrent engineering, the Target Value Design (TVD) process, and various other methods that aim to ensure that the design fits customer needs, is cost-optimized and buildable. However, this necessitates adding more resources up front in order to reap the benefits in the end. If some of the actors participating in the process are unfamiliar with the method, even more resources need to be invested and the risk of failure is increased.

All parties need to make a commitment for Lean to work properly, however resistance is often experienced from one or more parties, when trying to implement lean (McGraw Hill Construction, 2013). However, in the authors’ experience, especially the architects are difficult to reach. In Denmark only two architectural firms are members of the LCI. This may partly be because the Danish variant of Lean has been labelled as a way to cost-optimize production processes, and partly because early involvement may be seen as an attack on the architects’ authority in the early stages of construction projects. The lean methods that accentuate customer value as a guiding star has to some extent been misaligned with the way architects tend to work (Thyssen, 2011).

The success of a management concept is depending on whether it is consistent with existing organization and management principles. However, the idea of front-end loading is difficult to sell in one-off construction projects – especially when the market conditions are tough and focus is on lowest bid (not the highest quality). Even turn-key contractors, who are dedicated to the lean concept, may find it difficult to compete against companies who are dumping their bids in order to win the contract and make their earnings on claims-management.

Objective evidence is difficult to establish

There have been attempts to provide evidence e.g. McGraw Hill Construction (2013) and the tracking of costs as part of the TVD process shows promising results (e.g. Denerolle, 2011). However, the data is mainly reported by the lean practitioners themselves and/or the results are difficult to compare across projects and countries, due to regional differences. An unpublished attempt to compare benchmarks for hospital projects in Denmark and LC hospital projects in California, USA, showed (at first glance) significant differences that were in favor of the Danish (non-lean) projects. However, part of the explanation is probably the seismic requirements for buildings in California and the burdensome permitting process conducted by the state office responsible for healthcare construction.

The different levels of lean-implementation on each project also make it difficult to establish proof. In the Danish construction industry LPS is the most commonly used Lean method. However, it is sometimes a superficial variant of LPS that is adopted by some of the trades in site-production. The effect of this can only be

reported through subjective statements from the parties involved. Furthermore, the results may well be overshadowed by some special project conditions and/or failures.

Instead of a vain search for rigorous measurement of lean effects, perhaps it will be more fruitful to collect the most convincing and recent ‘stories’, and promote these in professional networks and media.

Low-hanging fruits have become everyday practice

Another challenge is the mechanism of ‘normalization’ described by Precept (2003). On the annual LCI meeting in Denmark 2013 a consultant was invited to present the many good process initiatives that had been implemented in a large Danish construction project. Although the techniques and methods used were obviously taken from the lean back-catalogue, the consultant was unaware of this. This can be seen as the ultimate success of the concept. However, if lean is applied unconsciously, there is a risk that important lessons are lost and development will stagnate, because structured and informed reflection perishes. Also, the more difficult aspects of LC that potentially can create significant results are likely to be abandoned, because they are difficult to implement and therefore need a very conscious implementation.

A way to deal with this challenge is to acknowledge efforts that seem lean, no matter if they are adopted consciously or not, but at the same time help practitioners to see the best fruits and realize what the LC community can offer.

Skewed balance between market actors

With reference to Abrahamson (1996) there needs to be a balance between the actors in the market arena.

In Denmark the development has mainly been led by contractors and engineering companies, whereas theory development has mostly been produced by a handful of academics / PhDs. There is not much prestige in construction management research and research is often published in academic circles that are somewhat distant to practitioners. In addition, there are not many lean consultants who focus on the construction industry.

On the other hand, there has been a significant increase in student memberships of LCI-DK. However, these are often scholars who have not yet obtained their diploma, and therefore their contribution is somewhat limited. Hopefully they will listen and learn and bring this into their daily practice once they get jobs in construction companies.

Globally LC is characterized by good correlation between theory and practice, but local innovation brokers and academics are needed to respond to local demand. A solution may be for the LCI-DK to fill out the missing link and focus more on translating and disseminating the findings obtained in other countries.

WHAT CAN BE DONE?

To keep the concept lifecycle of LC (in Denmark) going there is a need for renewal to keep the concept new and interesting for companies to engage in working with LC and be part of a continuous development of the concept.

There is still room for additions of new tools and methods to the Danish variant of LC. Inspiration can be imported from other countries where the LC variant most likely is shaped differently.

The life of LC as a management concept is mirrored in the activity of the ‘market arena’ (as described by Abrahamson (1996)). A ‘healthy and living’ concept is reflected in the ongoing interplay between actors in the market – companies, brokers, consultants, research, media etc. It may be possible to stimulate this activity by pushing stories to media, arrange meetings and conferences, fund LC research etc. There may only be few key-players that need to be activated in order to maintain momentum in the market arena.

The role of academics and consultants

Globally the LC community has enjoyed a continuous increase in members and activities since it was formed in the 90’s. However, LCI-DK may be ahead in regards of concept life-cycle to other LCI chapters around the world. Accordingly, the decline in interest experienced in Denmark may soon ‘spread’ to other countries. The proposition is therefore to pay close attention to the concept-demand side and any decline in interest and act accordingly to keep the concept fresh and interesting and keep the arena going. Barriers to lean implementation exist and should be dealt with. However, consultants and academics have a tendency to only report the successes of the concept where implemented. This may lead to ‘self-oscillation’ on the supply side decoupled from a majority on the demand side.

The Role of LCI-DK

In response to the decline in members, LCI-DK decided in 2012 to form a new strategy. Members and key-actors in the Danish construction industry were invited to a series of workshops to help form the strategy. In 2013 the strategy was launched and it consists of 4 cornerstones:

- **Increasing value:** Document that Lean creates value for customers and business partners
- **Bridgehead:** Linking national and international activities
- **Epicentre:** Centre for accumulation and dissemination of LC knowledge
- **Meeting place:** Linking, organising and profiling lean innovators in construction

These cornerstones are meant to address the aforementioned challenges. Thus LCI-DK will help its members to document the value of Lean (1st cornerstone) and in order to vitalize the somewhat missing theory development, LCI-DK will put more emphasis on translating and disseminating national and international experiences through the website and social networks (2nd and 3rd cornerstone). Accordingly, guest-speakers from other countries have made presentations at the annual meetings in 2013 and 2014, and LCI-DK is hosting the EGLC in 2015. In addition, in 2014 the secretariat has been moved to the same building, where the Danish client organisation and another industry development initiative, Value Creating Construction Processes, is located (2nd cornerstone). The goal is to work closer together with these organisations for mutual benefit and at the same time mark a revitalization of LCI-DK (4th cornerstone). Finally, a more focused effort to engage new members has been launched in 2013. As it can be seen in figure 3, there are indications that it works; for the first time in 6 years the membership curve has an upward trend.

Questions are: Will the Danish development be able to get both national and international inspiration to urge on continuous development and whether the recent rise in activity and number of new members in LCI-DK is a sign of a new dawn for LC in Denmark?

CONCLUSION

It is easily argued that LC possesses many of the general characteristics of a management concept. The endurance both internationally and in Denmark also shows that LC is not only a fad but an enduring concept capable of developing and fitting into many different contexts. The life of LC in Denmark also imitates the typical life-cycle of a management concept – including the rise and fall of interest.

By adopting the theory of management concepts, and reflecting on the Danish experience, this paper describes 5 challenges to keeping the concept alive. The suggestions to overcome these challenges include: keeping the balance between the demand and supply side in the market arena and ensuring that the concept is continuously developed, to see other concepts as complementary and to analyse implementation barriers more rigorously.

It will be interesting to see if LC will follow the same path in other national arenas or if the LC movement is now so strong that it more easily can overcome similar challenges.

In order to survive in the long run, there must be a synergetic effect between LC methods and company strategies, structures and culture (the demand side). On a macro level the construction companies act in loosely coupled systems as participants in a mesh of project-teams. Therefore, the real potential lies in an industrywide adoption of commonly agreed methods and techniques, and LC could be the missing link. But the needs on the demand-side must be analysed in more depth – why is lean not applied in all aspects of the businesses and why are some companies losing interest when there is so much to gain?

REFERENCES

- Abrahamson, E. (1991) Managerial fads and fashion: the diffusion and rejection of innovations, *Academy of Management Review*, 16(3), 586-612
- Abrahamson, E. (1996) Management fashion, *Academy of Management Review*, 21(1), 254-285
- Alvesson, M & Deetz, S. (2000) *Doing Critical Management Research*, London: Sage
- Ballard, G. (2000) *The Last Planner™ System of Production Control*, PhD Dissertation, School of Civil Engineering, The University of Birmingham, U.K., May, 192 pp.
- Barley, S. & Kunda, G. (1992) Design and Devotion. Surges of Rational and Normative Ideologies of Control and Management Discourse. *Administrative Science Quarterly*, 37, 363-399.
- Bertelsen, S. & Koskela, L. (2003) *Avoiding and Managing Chaos in Projects*, Proceedings for 11th conference in International Group for Lean Construction, Blacksburg VA, USA.
- Bertelsen, S. & Koskela, L. (2005) *Approaches to Managing Complexity in Project Production*, Proceedings for 13th conference in International Group for Lean Construction, Sydney, Australia

- CEMP (2001) The Creation of European Management Practice, Final Report, A Research Programme Supported by the European Union.
- Davenport, T. H., Prusak, L. with Wilson, H. J. (2003) What's the Big Idea? Creating and Capitalizing on the Best Management Thinking, Harvard Business School Press, Boston.
- Denerolle, S. (2011): "The application of Target Value Design to 3 hospital projects". DTR Technical Report, Project Production Systems Laboratory, University of California, Berkeley.
- Hagedorn-Rasmussen, P. (2003) Forandring som vare, Forlaget Sociologi
- Jørgensen, B. (2006) Integrating Lean Design and Lean Construction: Processes and Methods. Ph.D. thesis, Technical University of Denmark, Department of Civil Engineering.
- Kamp, A., Koch, C., Buhl, H. & Hagedorn-Rasmussen, P. (2005) Forandringsledelse – Med koncepter som ledestjerne, Nyt Teknisk Forlag, København.
- Koch, C. & Simonsen, R. (2002) Management Innovation in Construction, The Cases of Knowledge Management and Multiskilling entering Denmark, Proceedings 3rd International Conference on Decision Making in Urban & Civil Engineering DMinUCE2002, London.
- Koskela, L. (2000): An exploration towards a production theory and its application to construction. PhD thesis, VTT Technical Research Centre of Finland, Espoo, Finland.
- McGraw Hill Construction (2013) SmartMarket Report: Lean Construction Leveraging Collaboration and Advanced Practices to Increase Project Efficiency.
- Nyström, J. (2003) A Note on Partnering and Wittgenstein's Family-Resemblance Concept. Working Paper no. 45, KTH dept. of Infrastructure, Stockholm.
- Nyström, J. (2005) The definition of partnering as a Wittgenstein family-resemblance concept, Construction Management and Economics, Vol. 23, No. 5. (June 2005)
- PRECEPT (2003) Process Reengineering in Europe: Choice, People and Technology, Final report.
- Røvik, K.A. (1998) The translation of popular management ideas: towards a theory, 14th EGOS Colloquium, University of Maastricht, The Netherlands, July 1998
- Simonsen, R. & Koch, C. (2004) Shaping Lean Construction in Project Based Organisations, Proceedings for 12th conference in International Group for Lean Construction, Denmark, 2004.
- Simonsen, R. (2007) Et ledelseskoncept i politiske arenaer – Lean Construction i dansk byggeri, PhD Thesis, Technical University of Denmark
- Sarhan, S. and Fox, A. (2013) Barriers to Implementing Lean Construction in the Construction Industry, The Built & Human Environment Review, Volume 6, 2013
- Spear, S. & Bowen, H. K. (1999) Decoding the DNA of the Toyota Production System, Harvard Business Review, September-October, 1999.
- Thyssen, M. H. (2011) Facilitating Value Creation and Delivery in Construction Projects – New Vistas for Design Management. PhD Thesis, Technical University of Denmark
- Womack J.P., Jones D.T. (1996) Lean Thinking: Banish waste and create wealth in your corporation, Simon & Schuster, New York.