

DIVERGENT FOCUS IN THE APPLICATION OF LEAN IDEAS: EXAMPLES FROM DENMARK AND CALIFORNIA

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ABSTRACT

Through different conceptual initiatives lean construction has entered many construction environments around the world and is now an established and widely recognised approach to the management of construction activities. The adoption of the lean philosophy has taken, and continues to take place, under different social, organisational and structural conditions. These contextual factors are reflected in different issues being emphasised through the local application of lean ideas. A phenomenon illustrated in this paper with examples drawn from Denmark and California. One concern coming out of the case study material is that early lean construction initiatives may become locally institutionalised. Rigid perceptions and practice of lean construction could, arguably, constitute an impediment to future development. Collaboration between academia and practitioners can support local dissemination of insight gained in foreign environments. This may enhance future development on a practical level and hence help actors in the construction process to implement and benefit from current good practice over the longer term.

KEY WORDS

Application strategies; Culture, Institutionalism; Organisational change.

INTRODUCTION

Since the formation of the International Group for Lean Construction (IGLC) concepts labelled as 'lean' have continued to gain acceptance and develop a foothold in a growing number of communities of construction practice and research. A diffusion process reflected in the contributions to the annual conferences of the IGLC, which clearly show increased geographical diversity among the authors.

The adoption of the lean philosophy has taken, and continues to take place, under the different social, organizational and structural conditions in which adopters operate. Naturally these contextual factors are reflected in different issues being emphasized through the local application of lean

ideas. A review of IGLC contributions over the years reveals a rich variety of aspects, dealt with through an equally rich span of angles and approaches - all under the headline 'lean construction'.

From papers, articles, reports and observations of practice it is clear that lean construction is far from being a static phenomenon; it is subject to continuous development in practical methods as well as in theoretical and philosophical argument. From frequent contact with practitioners and researchers the authors of this paper have found that 'lean construction' often appears to be perceived as something well-defined and is frequently understood and implemented narrowly in terms of tools and the procedures. Assuming that this observation does not represent an unusual

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phenomenon, this paper aims to illustrate some of the variety in approaches taken to the application of lean ideas. For this purpose we have drawn on examples from two different lean construction approaches found in Denmark and California.

CHOICE OF SCOPE AND SELECTION OF CASES

This paper will focus primarily on examples from two big construction organizations each considered among the leaders in the application of lean construction. One is a dominant contractor in Denmark and the other a large client organization in California. Both organizations *usually* lead the major projects at which they apply lean tools, the contractor within a design-build framework and the client typically through a design-assist structure. Both organizations execute project of different sizes with the largest representing contract sums equaling tens of millions US dollars. In addition to being well known by the authors and their status as leaders in lean construction, the two organizations were selected from their very different approaches to applying the lean philosophy. These are not necessarily representative for the average lean adopter in Denmark or California, but are nevertheless taken by organizations that are considered by many to be influential within the lean construction community in their areas of operation. As such their approach is considered to be of substantial interest.

A FEW REMARKS ON THE LOCAL CONTEXTS OF LEAN IMPLEMENTATION

The Danish introduction and implementation of lean construction originated in experiences from the 1990s where a large governmentally supported programme for construction process and product development paved the way for what later became known as 'trimmed construction' as concepts of lean construction are locally referred to. In Denmark design-build (DB) arrangements are the dominating contractual form behind the large projects to which lean construction is most frequently used. It was one of the largest contractors that first adopted lean construction by addressing site-based issues such as work planning, material logistics and constructability. 'Partnering' arrangements are very common on large projects, which as a general rule are tendered (somewhat contradictory) competitively. This is often done on a 'best value' basis as an alternative to lowest bid, with DB contractors bidding with a preset team of architect and engineering consultants. Here it is necessary to explain that the term partnering is used very broadly in Denmark, and is more akin to collaborative ventures than the con-

cepts, philosophy and practice of partnering as seen in other countries.

The Californian construction sector is very different from the Danish. Not only is the market several times larger and constituted by many more companies and clients, but unlike the case of Denmark there are no companies with positions anywhere near as dominating as that of the largest contractors in Denmark. Design-build is not a particularly predominant contract form, and an interesting observation is that some clients take on the role as local implementation drivers as in the example of a large network of health care providers currently studied by one of the authors. This client usually prefers design-assist contracts for its projects and has taken an approach to lean construction, which is primarily concerned with a value delivery focus (with much emphasis on facility management issues). In this particular approach e.g. production control tools are regarded as 'second-order' functions intended to support ('primary') functions of client value while limiting waste.

EXAMPLES OF ISSUES EMBRACED IN APPLICATION OF LEAN IDEAS

In the following we shall concentrate on four core lean construction issues, for which fundamentally different approaches have been observed in the organizations studied in Denmark and California. These issues that will be introduced and compared are *collaborative working*, *production control*, *'lean' design*, and *implementation strategy*:

COLLABORATIVE WORKING

A corner stone in lean philosophy (Ohno 1988; Womack et al 1990, 2003; Cooper & Slagmulder 1999) is the principle of collaborative working throughout the supply chain with focus on eliminating waste while enhancing value for the ultimate customer, and for supporting effective production for downstream suppliers.

The issue of collaborative working has been subject to massive attention in the case of Denmark where techniques for process facilitation have been among the most visible features of the local lean implementation, partly due to the introduction of a notable organizational innovation, the process facilitator working with coordination and mediation on site (see e.g. Jørgensen et al 2004). A setup focused on mainly two subjects: supporting enhanced cooperation among project participants and implementing the Last Planner System (Ballard 2000). Over the last few years the facilitation work has been extended by some companies introducing workshop based methods for

involving a wider range of different stakeholders and their representatives in a facilitated value definition process (see e.g. Emmitt et al 2004). This method serves to identify participants' values and interests (shared and conflicting), and to explicitly formulate some official project values supporting work and cooperation during later project stages. The underlying idea is to enhance mutual understanding between project participants and thus stimulate solution identification while some unnecessary iterations and conflicts are easier avoided.

For some years the two largest contractors in the Danish market have used the terms 'trimmed construction' and 'partnering' respectively for branding themselves as providers of a better construction delivery process than their competitors. Both companies make use of both partnering and trimmed construction. With a strong element of branding towards potential clients it is hardly surprising that cooperation aspects have become dominant in the local application of lean ideas. An interesting observation is that despite the lean philosophy of collaboration being very concerned with the formal relations in the supply chain (Ohno 1988; Womack & Jones 1990, 2003; Cooper & Slagmulder 1997, 1999) the adoption of lean construction does not seem to have affected these and contracts are *conceptually* the same regardless of whether they are to support a 'lean' cooperation or not. Locally this delimitation has been promoted by a very visible and passionately engaged consultant who played a key role as change agent introducing lean construction, publicly promoting some of the principles and tools, while also educating and supervising practitioners. In teaching and debate this consultant has explicitly promoted that trimmed construction should focus on processes and be separated from the contractual issues. In this regard lean construction has been promoted as a 'framework for good and efficient collaboration in spite of the contractual settings' (Jørgensen et al. 2004).

In California there are several examples of construction companies that have entirely given up traditional competitive bidding. Instead these organizations seek to work with a smaller pool of suppliers with whom they have long-term relationships and agreements (an approach to lean implementation argued for by e.g. Womack & Jones 1990, 2003; Cooper & Slagmulder 1999). At a specific project studied in California both client and general contractor work collaboratively with a pool of suppliers among whom contracts for specific jobs are rewarded on basis of competences, capacity, performance at previous projects, negotiated price and terms, and strategic issues (as e.g. potential for shared learning). In

this case collaboration is a main factor in the official strategy for lean implementation. This client has constant construction activity and is currently building for between \$500 million and \$1 billion a year in Northern California. It goes without saying that this situation is advantageous for establishing long-term relations throughout major parts of the supply chain.

In this example the client is aware of facilitation as an important factor in supporting the collaborative approach pursued but has, unlike leading adopters in Denmark, not taken a similar structured approach to develop a methodology for a specific facilitator role and how this job is to be undertaken. Instead this lean adopter seeks to improve communication and cooperation through principles from 'linguistic action' (principles for improving effective communication through better coherence between intention and its explicit expression) as suggested by Macomber & Howell (2003). This strategy builds on establishing a network of commitments as an alternative to the 'command and control' approach of more rigid project management principles.

Contrary to the example from Denmark this organization has focused strongly on contractual issues. Instead of 'working around' these to get to cooperate in the manner believed to be right, this client work with its suppliers on developing a contractual framework supporting the way they want to work and collaborate. This is recognized as constituting a major challenge and a lengthy process. For supporting this work a specialized law firm is continuously involved.

PRODUCTION SYSTEMS AND PRODUCTION CONTROL

One of the issues of lean construction that has been subject to the most attention is production control.

In Denmark the Last Planner System (LPS), and/or simply work scheduling at weekly site meetings with foremen, completely dominates lean (trimmed) construction practice. Also for production control, *communication*—both vertical as well as horizontal - is the keyword in the local interpretation of 'lean', where improved interpersonal coordination is expected to improve production control and logistics.

Also in California LPS is a popular tool but there are also other important initiatives in the field of applied research, e.g. the work concerning work structuring (e.g. Tsao et al 2004). In much traditional lean manufacturing literature (e.g. Ohno 1988; Womack & Jones 1990, 2003; Shingo 1988) the implementation of single piece flow is promoted. While this is extremely complicated to

adopt at construction projects, there are Californian efforts to develop methods for more fundamentally re-designing construction production systems based on smaller batches and buffers as well as Just-In-Time (JIT) logistics (e.g. Ballard et al 2003), in some cases by using simulation software to generate new data and insight (e.g. Alves & Tommelein 2004).

(LEAN) DESIGN

The application of lean ideas to construction design is presently far less explored than that of applying them to production phases. Lean design initiatives, as the authors have seen them in Denmark, basically consists of implementing the LPS to design and various methods for facilitating the cooperation seeking to make stakeholders commit to a set of values (see e.g. Emmitt et al 2004). The rest is business as usual. Typically a project is awarded after some process of competitive bidding, sometimes as a DB project on the background of a schematic design from an architectural competition, thus leaving the contractor and its designer and suppliers with a largely defined project bearing very limited possibilities of enhancing delivered value above that schematically specified. In Denmark 'lean design' is a framework of tools and methods applicable to the process of coordinating the work of developing from schematic design over design documents to construction drawings and specifications. Some advanced approaches additionally feature a number of workshops in which project values are discussed and subsequently established as a set of value parameters. An example of this approach is described by Emmitt et al (2004). The underlying assumption behind this strategy is the expectation that these 'common values' will serve to prevent conflicts and misunderstandings and thus enhance participant satisfaction while reducing rework through 'getting it right from the beginning'. To some degree this may well be true if misunderstandings and miscommunications are successfully avoided, but the issues of conflicting interests and the stakeholders' different possession of power and influence (not to speak of the dynamic character of these aspects over time and project progress)—all factors that can significantly complicate project cooperation—are not per se embraced by this approach.

In California and several other places in the US (see e.g. Ballard & Reiser 2004) some organizations work very ambitiously with implementing 'design-to-target-cost' principles on their projects. This method builds on the idea of making costs and cost data direct inputs to the design process instead of an outcome of it. Design-to-target-

cost is originally a technique for product development evolved by Japanese lean manufacturers (Cooper & Slagmulder 1997, 1999) seeking to develop products with potential for continuous reductions in manufacturing costs throughout product life. This concept has some obvious constraints for use in construction but many of its principles are however applicable to construction design (Ballard & Reiser 2004). Simplistically the principle is to systematically establish target costs that are fixed (meaning that their total under no circumstances can be exceeded). Additionally some tasks can be grouped so that the individual costs, but not their sum, can exceed defined group targets. By designing according to these cost targets it is possible to concurrently identify solutions that fulfill design intent while enabling an appropriate construction process through which client and suppliers can reach their profit targets. An important part of the philosophy behind this method is to set the fixed targets at a level that is realistic, yet sufficiently low to motivate innovation and reengineering of inter-organizational processes among the members of the supply chain. This method is intended to help avoid ending up having to severely compromise value and design intent through cost-cutting exercises at late stages when it is too late to change some of the basic concepts on which the schematic and detailed design is developed if these are found to cause budget overruns. Design-to-target-cost requires that all design phases are undertaken collaboratively with strong engagement from not only designers but also contractors, subcontractors and suppliers that will take part in executing the project. In an ongoing study in California a construction client is currently working on applying these principles. In this case the aim is to manage with less design iterations but foremost to manage the entire design process towards maximum client and user value while reducing financial risk.

IMPLEMENTATION STRATEGY

Strategies for implementing new tools, entire production systems or even paradigms is a very complex issue, elaboration of which lies beyond the scope of this paper. It is naturally an area of great interest about which much popular management literature offers 'the final answer of how to do it', contrary to sociological research emphasizing the crucial importance of local context, tangible and intangible factors (e.g. Rogers 2003). It is, however, illuminating to see how radically different implementation strategies may be in different contexts.

One approach was observed in Denmark where the contractor developed a relatively detailed lean construction concept based on LPS, together with concrete tools of process facilitation. The concept was tested on pilot projects, developed, adjusted and subsequently made obligatory on all of the company's large projects. Implementation was supported by education initiatives and campaigns for 'the new construction process' (as trimmed construction is often branded in Denmark).

A very different approach was observed in California. Compared to the previous example this (client) organization puts relatively little emphasis on individual tools, but has demanded from its project managers that they 'embrace the ideas' in a strategy prescribing a lean approach. Project managers are provided much room and freedom to decide on the actual implementation strategies and the use of tools for each individual project. They are also encouraged to discuss their efforts and results (successes and failures) and express criticism they may have to the lean application as this is perceived vital to the organizational learning and conceptual development.

ANALYSIS

These examples of different approaches to the four *core* lean construction issues are only a few among many areas in which the featured organizations have taken different steps in their efforts to apply lean ideas. This is, however, sufficient for illustrating some fundamental differences in the underlying conceptual framework through which the organizations have interpreted some lean ideas and 'formalized' these for implementation.

DIFFERENT AIMS AND OBJECTIVES

When comparing the two different approaches it is clear how the implementation of lean construction derives from different aims and objectives. In the approach observed in Denmark the lean initiative is based on tools aiming first and foremost to address the waste of resource input during the construction phase, whereas the actual value delivery for the client/user would appear to have been weakly addressed in practice. In a model considered leading edge in Danish 'lean design' the term is used to describe a model that "is primarily concerned with the creation of workshops to encourage effective communication and create a sense of ownership in the decision-making process" (Emmitt et al 2004). In this example the value element in 'lean design' is primarily targeted from the perspective of putting the right people together who can communicate effectively, thus avoiding conflicts and reducing

design changes during the project by 'getting it right from the beginning' (in line with the lean production philosophy)—thus helping to reduce uncertainty in production and hence reduce waste. This model provides a framework for consensus and aims to deliver better value. It is an approach that needs to be researched objectively.

Quite different is the example from California where long-term client interests in value delivery are strongly promoted through lean initiatives. This approach is less direct in addressing production aspects compared with the Danish example. In the Californian example the client's lean coordinator specifically warns about the risks of groupthink if promoting too heavily 'the right tools' for doing things, and if failing to strengthen focus on customer value aspects. Regarding issues of collaboration the coordinator warns against allowing the comfort of a common, but too low, denominator to prevent troublesome, though worthwhile, further search for potentially better solutions.

Such differences in approach are not necessarily just a matter of different understanding of the lean philosophy but also derive from the different contextual circumstances associated with application. When an organization decides to adopt an innovation (as e.g. lean construction) it is natural that the situation, position and interests of the adopter are reflected in the choice/selection of the ideas (e.g. Rogers 2003). Especially so the first adopters (the innovators), taking up lean ideas on their own initiative are in a position to shape their application to suit their particular circumstances. These early adopters then set the fashion for later adopters to follow. Later adopters, especially those excluded from parts of the market (e.g. the large projects) and/or operating as downstream suppliers and sub-contractors will be in a less influential position. In this case the later adopters will be primarily motivated by the need to comply with procedures defined by the upstream adopters.

It is important to recognize that the implementation in Denmark to a very large extent has taken place at projects organized as design-build (as broadly requested by the market), a contractual model that primarily aims to transfer risk. Embracing the value side of the lean philosophy can only be done effectively with dedicated clients and user engagement, which is not always forthcoming. If a client's main priority for the choice of (contractual) cooperation structures is managing risk through transferring it, there's little the contractor or consultants can do to effectively implement a holistic project delivery approach, which addresses all project and pre-project stages.

DIFFERENT APPROACHES TO THE SCOPE OF LEAN AND ITS IMPLEMENTATION:

The two environments studied represent two different approaches to the practical application of lean ideas. One could be described as an 'add-on' system that can be applied to jobs gained (e.g. through competitive tendering), the other represents a more holistic approach to construction delivery. One focuses mainly on late project stages while the other emphasizes more strongly the early stages (in line with the lean production ideal of addressing waste and value issues throughout from a system's perspective). The add-on approach can be applied by a more narrow coalition (e.g. a contractor and its subcontractors) and does not require the same extent of involvement from the entire upstream supply chain as in the example from California. Especially it is less dependent on the active engagement of client and users over extensive periods of time. In general the approach studied in California relies heavily on collaborative intentions by a much broader range of project stakeholders. When comparing these two examples (that perfectly illustrate two different responses to a common problem of whether it in practice is most feasible to seek to adapt inter-organizational relations to the production system or vice versa) it is important to notice that these organizations operate under very different rules and regulations and that approaches based on long-term relationships are very difficult to apply in the EU and other societies where relatively rigid rules concerning selection of project participants, prescribed models for tendering procedures, selection of winning bids etc. exist to enhance transparency and cross-national competition for large and public projects.

DIFFERENT STRATEGIES FOR APPLYING THE COLLABORATIVE APPROACH OF LEAN:

In simple terms the strategy observed in Denmark could be formulated as 'Focus on good cooperation and LPS, which separate the on-site cooperation from the contractual relations'. This is a strategy of making some lean ideas work *in spite of* contractual settings, realizing that if waiting for contractual settings to change to suit implementation of lean ideas this may well never take place. Under such circumstances it may be more advantageous to advocate change by delivering concrete examples of more efficient project management. In this regard public regulation is not necessarily the biggest obstacle. More problematic is a relatively weak support from decision makers for applying lean ideas requiring the compromising of privileges by the traditional approach. An

important characteristic of inter-organizational project relations, partnering or not, is that they are structured from a perspective of *transferring* risk rather than taking a system perspective to *managing* it, two different approaches discussed by Koskela et al (2004).

The Californian adopter followed the completely opposite strategy; instead of 'working around' contractual issues to get to cooperate in the manner believed to be right, client and suppliers work on developing a contractual framework supporting the process through which they want to collaborate. It must, however, be recognized that this client and its partners benefit from a position where they represent almost the entire supply chain and have the critical mass and resources necessary to drive long-termed change efforts; a possibility rarely available to smaller firms wishing to apply a lean approach.

While the approach observed in Denmark relies on compulsory use of a concept, a different approach is taken by the Californian client demanding 'embracement of ideas' but with more flexible application procedures. An understanding partly in line with Ohno (1988) who warned that describing a production system too well can make it static and endanger its further development. In the Californian example debate is encouraged as also critical arguments are seen as part of a continuous development activity. A strategy resting on the term that it is not open to discussion whether or not to adopt a lean approach, only a question of how its potential benefits may be most satisfactory achieved.

These two strategies also face the project managers and their organizations with very different demands. One notable difference is that the latter approach relies heavily on *all* project managers' active engagement in the conceptual development and implementation, whereas the first represents a more centralistic approach. Whether any of these ways may be more advantageous is hard to say as this depends on a large number of organizational and contextual factors.

DISCUSSION - CONSTRUCTION INSTITUTIONALIZED

In construction several practices are institutionalized to a larger or lesser extent. This goes for e.g. the transformation understanding of production (Koskela 2000, Jørgensen et al 2004), which is reflected in rather static contractual arrangements and project structures. Similar is the case for the individual companies. Structural diversity is shackled where the individual organization is dependent on exchange and interaction with others, as is the case in construction where work is

executed in temporary project organizations in which the individual firm's contribution simply reflects assignments tendered. In that respect organizational similarity is rewarded (DiMaggio & Powell 1983). In many countries current procedures are supported by public regulation as well as dominant clients who demand certain contractual settings for projects. Thus the challenge of applying lean ideas must, among other aspects, also be understood from an institutional perspective.

Scott (1995) defines institutions as consisting of "cognitive, normative and regulative structures and activities that provide stability and meaning to social behavior". This goes for several organizational levels of construction organizations where structures and roles are institutionalized not only within the sector but also in the surrounding society. There are for instance deep-rooted local perceptions of an architect's, a plumber's or a carpenter's role in construction, the scope of their work etc. In most industries, customers and other stakeholders have strong expectations in what it means to be a responsible firm (Meyer & Rowan 1977) and nothing indicates that construction should form an exception in this regard.

As construction is typically carried out by temporary multi-organizational project teams, traditionally without systematic efforts to establish a common set of shared project values and objectives, such implicit expectations are in practice likely to constitute an important prerequisite for successful interaction. The dynamic and temporary nature of construction project organizations and their dependence on exchangeability with other actors, prevent the individual company from carrying through change processes in isolation from other members of its inter-organizational network (Meyer & Rowan 1977). Obtaining 'critical mass' behind implementation of lean principles thus constitutes a necessity. In order to gain the necessary support within the project organization it may thus be vital to offer processes and methods that can be implemented and provide visible benefit already at the level of a single project.

Promoting lean ideas has been challenging not only in construction. Ohno (1988) emphasizes that development and implementation of the most famous example of lean, the Toyota Production System (TPS), took many years of efforts and experiments. Fierce organizational resistance was faced by Ohno who experienced massive skepticism and opposition from many sides. According to Ohno himself, the TPS would never have been successfully developed and implemented had the top manager not believed strongly in the new approach and refused to give in to the complaints and protests he as manager was confronted with. A support as in this example demands a leader in a

position so strong that he/she in critical phases can prioritize the implementation process above other battles to fight.

APPLICATION AND CHANGE IN THE INSTITUTIONAL PERSPECTIVE

As mentioned above, introducing concepts based on lean principles implies a shift from a well-established transformation-orientated approach to include also a value- and flow-orientated understanding of construction (Koskela 2000). Spectators may expect that in case of wider implementation of lean principles, formal structures will be sought modified to better reflect the ideas of the new production system(s). Such changes will however affect all organizational levels and have implications for hierarchal structures and must thus be expected to meet organizational resistance (Powell 1991). Also where no major conflicts of interests exist, considerable efforts may need to be invested in obtaining acceptance of a new approach. Organizations innovating in essential structural ways bear considerable exposure to the cost of legitimacy when deviating from prescriptions of institutional myths (Meyer & Rowan 1977). Failure to effectively address such issues may present considerable risk to implementation of the ideas behind lean construction.

To a large extent the principles of structuring formal relations to furthest possibly reduce and transfer risk and responsibility, are institutionalized in the business and may well stem from such institutionalized perception of the transformation understanding of production in construction. Organizations reflecting institutional rules generally tend to build gaps between formal structures and actual work activities (Meyer & Rowan 1977), a phenomenon also observed in lean construction in Denmark (Jørgensen et al 2004).

Organizational structures do not necessarily reflect rationality. Rather they stem from institutionalized perceptions of how a certain organization is supposed to be composed and function (Friedland & Alford 1991, DiMaggio & Powell 1983). Also aspects of organizational culture and its display are usually marked by ambiguity (Alvesson 2001, Martin & Meyerson 1988) and behavior, norms and cultural artefacts do not necessarily reflect rationality in relation to the context in which they are displayed. These 'irrational' issues strongly influence the contextual circumstances for application of lean ideas. Diffusion research argues that, rather than merely being copied and transferred, contextual constraints along with various interpretations and change agents' interests often cause innovations to

become 're-invented' as part of the diffusion process, i.e. *adopters* also become *adaptors* (Rogers 2003). If successfully implemented re-invented innovations may become local established practice followed by later adopters, and subsequently develop in directions very different from that of the original innovation.

CONCLUSIONS

Lean is a holistic philosophy underlying the management of the construction supply chain. The ideas embedded within lean construction must be set against the context in which they are applied to practice. It is this context that colours the way in which lean ideals are implemented, and in doing so provides for some divergence in approach.

Social and contextual mechanisms as described above are in play as lean construction is diffused and becomes implemented in practice. Thus it should come as no surprise that lean construction, as observed in the examples from Denmark and California, varies considerably in form and approach. Local practices considered as synonymous of lean construction are starting to become established, and bringing about change to these may well result in resistance since the ideas might conflict with perceptions of how lean is 'supposed' to be practiced. Thus radical improvements that reflect new insights may find local resistance if the early adopters become trapped in a dogmatic and narrow interpretation of 'lean construction'.

A core idea in the lean philosophy is the work on continuous improvements of the production system and other business processes. Essentially a 'lean' system is thus a developing and not a static set of procedures. Various concepts branded as 'lean construction' do not represent a full explanation to the question of what lean construction is. It appears that 'lean' concepts/systems are strongly shaped by the different organizational circumstances and perception of the context in which they are applied.

What locally is understood as 'lean' reflects not only lean ideas and principles but also company priorities and politics; the patterns and structures of interests and power determining the organizational support for implementing a lean approach; individual companies' different strategies for operating on the market; different beliefs and understanding regarding the lean philosophy. The lean approaches described here represent a certain stage of development regarding the adoption, application and implementation of the underlying lean ideas. Early adopters' efforts are likely to be of major influence of what is becoming established 'lean' practice. In a sector characterized by

a low degree of internationalization this is likely to be decisive for later adopters who 'go with the flow' or follow current practice. Dogmatic focus on following what might currently be seen as best practice may serve to increase gaps in interpretation and understanding of lean construction rather than contribute to its progress.

Research, development efforts and experiences from the implementation of various lean initiatives are constantly enriching the pool of knowledge, understanding and tools for construction to become 'leaner'. It is important that further debate and practical application take place with an understanding that lean construction is not static in terms of understanding and development, but evolving and emergent. As the international lean construction community grows we must try and learn from initiatives taken outside our own fields of interest. This may lead to increasingly divergent development of what is considered and promoted as lean construction. Collaboration between academia and practice is becoming increasingly important in order for construction to benefit from the growing (international) basis of experience and knowledge of lean construction.

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