A CONCEPTUAL FRAMEWORK FOR APPLYING LEAN MANAGEMENT METHODOLOGY IN HIGHER EDUCATION INSTITUTIONS

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ABSTRACT

Over the last two decades, the organizational environment of Higher Education Institutions (HEI) in many countries, has fundamentally changed. Student numbers have continuously increased since the 1980s and transformed Higher Education (HE) from an exclusive offering for a small elite to a mass product. Consequently, universities had to increasingly deal with operations management issues such as capacity planning and efficiency. In order to enable this expansion and as means to facilitate competition, the funding structure of HEI's has changed. Greater reliance on tuition fees and industry-funded research exposed universities to the forces of the market. All in all, growth, commercialization and competition have transformed HEI's from publicly funded cosy elite institutions to large professional service operations with more demanding customers. Consequently, they increasingly look at private sector management practices to deal with the rising performance pressure.

During the last two decades, Lean Management has received the reputation as a reliable method for achieving performance improvements by delivering higher quality at lower costs. From its origins in manufacturing, Lean has spread first to the service sector and is now successfully adopted by an increasing number of public sector organizations. Paradoxically, the enthusiasm for Lean in HE has so far been limited.

A conceptual framework for applying Lean Management methodology in HEI's is presented in this paper.

Key words: Higher Education, competition, performance improvement, lean management

1. CONTEXT AND JUSTIFICATION OF THE TOPIC

Over the last two decades, the organizational environment of Higher Education Institutions (HEI) in many countries, has fundamentally changed (Deem et al. 2007; Economist 2005, 2010): First, student numbers have continuously increased since the 1980s and transformed Higher Education (HE) from an exclusive offering for a small elite to a mass product. Consequently, universities had to increasingly deal with operations management issues such as capacity planning and efficiency. Second, in order to enable this expansion and as means to facilitate competition, the funding structure of HEI's was changed. Greater reliance on tuition fees and industry-funded research exposed universities to the forces of the market. Third, the globalization of HE and research unleashed a fierce competition for international students and academic staff. Especially international postgraduate students paying overseas fees have become an important but contested source of income and most universities have set up special marketing departments. Finally, the New Public Management (NPM) reforms of the 1980s and 1990s (Pollitt & Bouckaert 2004) increased the accountability of HEI's through quality standards, external audits and league tables and established a performance-based competition for shrinking government funds.

All in all, growth, commercialization and competition have transformed HEI's from publicly funded cosy elite institutions to large professional service operations with more demanding customers. Consequently, they increasingly look at private sector management practices to deal with the rising performance pressure – an indication for that is the growing number of HE management handbooks (see e.g. McCaffery 2004; Toma 2010). However, so far there has been no dominant approach or “silver bullet”.

For instance, attempts to apply TQM in a university-context have been rather disappointing (Emiliani 2005).
During the last two decades, Lean Management has received the reputation to be a “silver bullet” for achieving dramatic performance improvements by delivering higher quality at lower costs (Womack & Jones 2003, 2005). From its origins in manufacturing, Lean has spread first to the service sector and is now successfully adopted by an increasing number of public sector organizations (Radnor et al. 2006). Paradoxically, the enthusiasm for Lean in HE has so far been limited. Most business schools seem to prefer giving advice to other organizations rather than applying their Lean competence to their own institutions (Hines & Lethbridge 2008). Nevertheless, a few pioneering universities have embarked on the Lean journey. Balzer (2010) reports several projects in the US, but his and the few other available accounts remain rather uncritical and descriptive. They are largely based on anecdotal evidence.

2. LEAN METHODOLOGY BACKGROUND: FROM LEAN PRODUCTION TO LEAN THINKING

The concept that is today known as Lean has its origins at the shop floors of Japanese car plants (Liker 2004). After the end of WW2, the Japanese economy suffered from a scarcity of (qualified) labor, capital and raw materials. Even worse, it was threatened by the dominant position of the big US producers, whose sophisticated mass production systems were able to realize significant economies of scale (Cusumano 1985). However, traditional mass production had its own problems, namely poor quality, high (capital) costs and inflexibility regarding product volume and variety (Monden 1983; Ohno 1988). Turning the obstacle of constrained resources into competitive advantage, Toyota developed a production system that was superior to Western mass production as it met demand instantaneously and perfectly, i.e. with less inventory and defects, and that allowed low costs and high product variety already at low volumes (Seddon 2005).

However, it is important to note, that the development of the Toyota Production System (TPS) was not a single-point intervention (Holweg 2007; Liker 2004). As early as 1948, Taiichi Ohno, who is today seen as the intellectual father of Lean, started to experiment with new production concepts in the Toyota engine machining shop, he was managing (Ohno 1988). From there, it took more than a decade to develop an integrated production system and implement it at other Toyota production sites. It was not before the late 1960s that the TPS was rolled out to Toyota's suppliers and also other Japanese producers started to adopt some of its features (Fujimoto 1999). Also, the extension of the TPS from its original focus on manufacturing processes to other areas of the company such as New Product Development (NPD) and sales did not start until the early 1980s (Womack & Jones 2003). All in all, it can be said that the TPS emerged from a process of continuous experimentation and refinement.

The Western world only started to pay attention in the late 1970s, when the superiority of the Japanese automobile producers became threatening for its American and European rivals. The first English journal article on the TPS, published in 1977 by Toyota engineers (Sugimori et al. 1977, hereafter referred to as Sugimori paper), defined its two building blocks as “reduction of cost through elimination of waste” (ibid: 554) by leveling production, slashing inventories and preventing errors to establish a continuous one-piece flow and as making “full use of the workers’ capabilities” (ibid) by entrusting them with the running and improvement of the plant. However, despite the early availability of English literature (see also Shingo 1981; Monden 1983), it took Western business leaders more than a decade to fully embrace the underlying reasons for the widening performance gap. Holweg (2007) ascribes this largely to the highly technical focus and language and weak empirical foundations of these early accounts. But also to the reluctance of many Western companies to accept that their problems were homemade has to be noted (Womack & Jones 2003).

The critical incidence that triggered a sudden and widespread rise in awareness was the publication of the well-known book “The Machine that Changed the World” (Womack et al. 1990). It summarized the findings of a major global benchmarking study of automobile plants that was conducted by the MIT’s International Motor Vehicle Program (IMVP) since 1985. The high impact of “the Machine” was not only due to the fact that it was based on hard empirical data that clearly showed significant productivity differences between the Japanese producers and their American and European rivals. Its non-technical language and style as well as its comprehensive overview the Japanese production system that for the first time included further aspects such as Supply Chain Management and NPD
appealed to a large managerial audience (Holweg 2007). Originally coined by IMVP researcher John Krafcik (1988), the book also popularized the catchy term “Lean production”, as a defining feature of the Japanese plants was that they used less of everything – materials, space, labor and inventory. However, the concept of Lean production only marked the beginning of the Lean evolution. Hines et al. (2004) describe how the Western perception of Lean has gradually evolved and gained sophistication. Due to the temporary oblivion of the Sugimori paper and its extraordinarily concise and far-reaching definition (New 2007), the early Lean understanding was relatively narrow and confined to the adoption of a few isolated shop floor tools. The focus then continuously widened to an understanding of Lean as a holistic manufacturing system. This system thinking stressed the strategic alignment of all elements of the production system to better meet customer demand (Seddon 2005). Eventually, the strategic essence of “Lean thinking” (Womack & Jones 1996, 2003) or “Lean behavior” (Emiliani 1998) was extracted and it was argued from a contingency perspective (Donaldson 1996) that the resulting Lean core principles can be adapted to the specific circumstances of different organizations and industries. These conceptual foundations are discussed in the next section.

3. CONTIGENCIES: LEAN SERVICES

There is a long debate whether or not manufacturing and service operations can be managed based on the same concepts (Fitzsimmons & Fitzsimmons 2008). While some stress the significance of distinctive service features such as customer involvement and labor intensity (Schlesinger & Heskett 1991; Grönroos 1990), Levitt (1972) argues that this should not be an excuse for avoiding manufacturing concepts as a means of increasing the efficiency of service operations. Somewhere in between, Johnston (1994; see also Åhlström 2004) suggests that services can benefit from operations management's traditional focus on performance improvement if concepts and tools are adapted to their specific organizational context.

There is empirical evidence that Lean thinking can be applied to service companies. Case studies comprise airlines, fast food restaurants, insurances and hospitals (Bowen & Youngdahl 1998; Swank 2003; Åhlström 2004) and report cost savings of 15% to 25% and lead-time reductions (Goland et al. 1998). However, a closer look at these examples for Lean services reveals significant limitations. First, most cases refer to manufacturing-like repetitive service processes that have been described as mass services (Johnston & Clark 2008), with no evidence for Lean implementation in professional services. Second, some case studies are based on ex-post rationalization. For instance, Bowen and Youngdahl (1998) assert that Southwest Airlines and the Shouldice Hospital – both well known through Harvard Business School case studies – maintain Lean operations. While it might be true that some of their operational principles closely resemble Lean thinking, neither of the both organizations has announced that it pursues Lean implementation. Third, even where service companies deliberately embarked on the Lean journey, their application of Lean principles and methods often remains superficial and fragmented. E.g. Swank's (2003) case on application processing in an insurance company does not go beyond process standardization. Fourth and similar, in all reported cases, Lean implementation remained limited to bits and pieces of the company's value chain.

Consequently, it still seems to be early days for Lean services and there remains some theoretical groundwork to be done. There is an increasing number of conceptual works and practical guidelines that try to apply Lean thinking to a service environment (see e.g. Bicheno 2008, Seddon 2005, Seddon & O'Donovan 2010a, 2010b). According to these accounts, a context-sensitive Lean implementation needs to address a couple of special features of service operations:

First, value creation depends largely on the customer's perception of his interactions with the Service Delivery System (SDS) – the so-called “moments of truth” (Normann 2000). This has implications for the distinction between VA and NVA, as value is not only affected by objective service outcomes but also by subjective perceptions (Zeithaml & Bitner 2003). Certain activities that might not seem value adding with regards to service performance might be important for the experience of at least some customers (Åhlström 2004), e.g. face-to-face service as compared to telephone or online service.

Second, due to customer involvement and the intangible character of their offerings, many service operations face higher complexity and variation of customer demand. While manufacturers offer a predefined set of products, service providers often have to deal with unexpected requests (Seddon
Bicheno (2008) proposes to systematically analyze demand patterns and introduces the distinction between “runners”, “repeaters” and “strangers” based on the frequency of a service request. Whereas “strangers” should be dealt with on an ad-hoc basis, the organization can install dedicated procedures for “runners” and “repeaters”.

Third, Lean needs to understand the different sources of variability in service processes. Usual standardization approaches might help to tackle internal process variability that is induced by the SDS or staff. However, due to the simultaneity of production and consumption all service processes are also exposed to customer-introduced variability that is difficult to control (Bicheno 2008), e.g. different aptitude levels or different expectations and inquiries. Therefore, Lean in service operations should focus on making the process resilient and capable, rather than pursuing an ideal state of perfect customer compliance (Åhlström 2004; Seddon 2005).

Fourth, employee empowerment is the key to improving process capability and resilience. Staff must be enabled to respond spontaneously and adequately while interacting with the customer (Åhlström 2004). Consequently, there should be constraints to the use of standard work in Lean services. While service blueprints and guidelines might be a great support for staff, especially when dealing with “runners” and “repeaters” (Bicheno 2008; Shostack 1984), tight mandatory standard operating procedures can lead to a situation where the system makes it impossible for the individual employee to meet customer demand (Deming 1986), e.g. scripts and time limits that prevent call centre agents from solving a customer problem during a single call.

Finally, as services are always made-to-order because they cannot be stored, the Lean principle of pull has a different meaning. Pull in service operations means avoiding “inventories of customers” waiting for their service (Seddon 2005). It aims at replacing traditional queue management with a JIT service provision through new innovative ways of capacity management as well as visual management devices that provide the customer with clear information about the current status of the SDS (Bowen & Youngdahl 1998).

To sum up, defining value and managing variability is more difficult in service operations. Moreover, employee empowerment is critical. Regarding the Lean toolbox, most of the process-related techniques such as VSM seem to be applicable in a service environment, while other tools such as kan-ban pull or standard work are either meaningless or might even be counterproductive (Seddon 2005; Staats & Upton 2007). This might explain why service operations have so far struggled with fully adapting the Lean principles and methods to their organizational routines – most examples for Lean services closely resemble conventional process optimization.

4. RESEARCH GAP: LEAN IN HIGHER EDUCATION

HE is a very special part of the public sector with its own modus operandi (Allen & Fifield 1999). At least the academic areas of HEI's are characterized by a highly individualistic organizational culture that stresses professional autonomy (Tierney 1988). In addition, especially in older universities, the schools or colleges enjoy a considerable degree of freedom regarding their organization and often maintain structures that duplicate the university's administrative directorates and units (Dopson & McNay 1996), e.g. in areas such as student support or marketing. Moreover, decision-making in HEI's is less hierarchical than in the core administration and often based on collegial consent (Dahlgaard & Østergaard 2000). This facilitates “incrementalism” (Lindblom 1959), i.e. only small changes that largely maintain the status quo. Finally, also the long-standing tradition of many universities preserves anachronistic structures and processes. Even though there are remarkable differences between HEI's with regards to organizational culture, e.g. between “pre-1992” and “post-1992” universities (Deem et al. 2007), all this contributes to a remarkable resistance to change (Engelkemeyer 1993).

On the other hand, the increasing environmental pressures on universities, described at length in the introduction, force them to embrace large-scale change to improve their competitiveness. Just to recap, due to growing reliance on tuition fees, industry research grants and the global competition for students and academic staff, HE is much more exposed to the forces of market than other areas of the public sector. This leads to an interesting situation, in which radical change is both more necessary but also more difficult to achieve as compared to the core administration.
Lean is still a relatively new approach to HE reform. Only during the last 5-8 years universities and colleges began to experiment with Lean principles. The overwhelming majority of cases covered in the literature are from the US where most HEIs always operated in a competitive market environment and thus are more open to private sector management practices (Owlia & Aspinwall 1997). However, the quality of this literature is rather poor. Most of it falls under the category of grey literature, e.g. several online papers with rather anecdotal evidence (Moore et al. n.d.; Alp n.d.; Kusler n.d., see also Jin & Kachroo 2010). In these accounts, the authors praise the success of their own Lean projects but remain very vague with regards to the applied Lean approach and the quantitative outcomes. One conference paper (Barroso et al. 2010) and a monograph (Balzer 2010) summarize these accounts in a rather uncritical and naïve manner without making their own investigations. The few scholarly articles on the topic remain purely theoretical (Dahlgaard & Østergaard 2000) or put every type of reform activity in HE under the Lean heading (Comm & Mathaisel 2005a, 2005b) – again an example of ex-post rationalization.

In March 2011, Radnor and Bucci (2011) published an explanatory study on Lean implementation in UK business schools and universities. Their findings are an invaluable first step to develop a better understanding of if and how Lean can be applied in a HE context and will be discussed below. However, they do neither come up with a systematic theoretical model to conceptualize Lean projects from an organizational change perspective nor do they derive recommendations for an implementation framework that is tailored to the specific HE setting – their reflections remain fairly generic. Most important, the study is based on a rather weak empirical foundation. On average, only one interview was conducted per analyzed university. Furthermore, all interviewees were either involved in the initiation of Lean at their university or acted as facilitators of Lean projects and thus have vested interests in a successful evaluation, which raises problems of interviewee bias (Kvale & Brinkmann 2008). The perspective of managers and staff working in the “leaned” processes was not included. Summarizing the sparse literature on “lean universities”, and drawing mainly on Radnor and Bucci’s (2011) groundwork, it seems like the conditions for Lean implementation in HE are somehow similar to those in the wider public sector. The understanding of Lean principles and methods as reflected in the reported projects seems to be fragmented. Again the focus is on process optimization, even though the “human aspect”, i.e. rising performance pressure instead of employee empowerment, seems to be less a problem. However, it is striking that most analyzed projects are concerned with support processes (e.g. payroll, procurement, maintenance) or the administrative parts of core processes (e.g. admission and student administration), with only one case reported where Lean was applied to the organization of academic courses (Emiliani 2004, 2005). Furthermore, most optimization activities seem to focus on a few isolated (parts of) processes, with little evidence for an integrated overall coordination.

5. CONCEPTUAL MODEL: A FRAMEWORK FOR UNDERSTANDING AND IMPLEMENTING LEAN MANAGEMENT

There is no doubt that more empirical research is needed to gain a better understanding of the role and relevance of Lean in HE management. Moreover, it is interested in the impact of the initiatives as well as the mediating effect of critical success factors and barriers to change. To systemically analyze these aspects, this section develops a framework for conceptualizing Lean implementation that will refine and operationalize its building blocks (Eisenhardt 1989). Motives: Why?

Decoding the motives of Lean implementation involves three aspects – understanding the (1) project drivers and (2) objectives as well as the (3) decision for Lean as optimization method.

In the private sector, the main driver for “going Lean” is usually the desire to improve competitiveness, often sparked by a crisis (Womack & Jones 2003). Compared to that, Lean implementation in the public sector is more driven by government efficiency programs and budget cuts (Radnor et al. 2006) – an eternal topic.

In manufacturing companies, the tangible objectives of Lean initiatives are normally to reduce inventory and lead times and to boast productivity and quality. In a service context, the inventory dimension is either meaningless or less important and quality focuses on customer perception and
experience (Seddon 2005). In addition, Lean initiatives in the public sector often have to put less emphasis on staff reductions.

Regarding the decision for the optimization method, Lean has to compete with alternative approaches such as TQM, Six Sigma or more recently Agile (Hallgren & Olhager 2009). However, based on the increasing number of successful examples, Lean is often regarded as a particularly well-proven approach. Drawing on best practice might be appropriate for manufacturing companies. However, service operations in the private and public sector need to consider the contingencies of Lean implementation and the rationale of their decisions to “go lean” is only poorly understood.

Addressing these aspects with regards to Lean in HE, leads to the following five questions, to which the analysis and attempt to formulate an organizational wide response, can be the basis for a conceptual framework of implementation:

**Q1) Why do universities apply Lean principles to their work?**

a. To which external and internal drivers do their initiatives respond?

b. What are the initiatives' key objectives?

c. Why did they choose Lean as an optimization method?

Approach: How and where?

If Lean thinking is first and foremost a dynamic capability, then developing a context-sensitive interpretation and translation of the generic Lean principles and methods is key to its successful implementation. This implies two central aspects: the (1) applied Lean tools and techniques and the (2) scope or application range.

Lean production provides manufacturers with a fully developed and well-attuned set of tools to implement the five Lean principles and the two Lean methods. While it is widely accepted that Lean services require a different toolbox, it is less clear how exactly the Lean principles and methods should be adapted to the specific service context. The reported cases for Lean implementation in (public) service operations, with their focus on VSM and Rapid Improvement Events (RIE), are hard to distinguish from conventional process optimization peppeled up with some root cause analysis. In its current state, Lean services is not the revolutionary overhaul of classic service management principles that Lean production has been to manufacturing theory.

**Scope or application range** refers to the question to which of the organization's units or processes Lean should be applied, or more precisely where to start using Lean, as full implementation is almost always the ultimate goal. Implementation strategies can vary significantly between organizations. Two contrasting ideal types (Weber 1968) have been described to illustrate the width of the spectrum (Dennis 2006; Bicheno 2008; Radnor et al. 2006): While the emergent bottom-up approach (“Lean Light”) relies on a sequence of a few separate small-scale projects and tries to gradually gain momentum, the holistic top-down approach (“System Lean”) is basically a centrally initiated major change initiative starting at a strategic level by identifying the end-to-end processes of value creation in order to prioritize areas of improvement. Most organizations fall somewhere in between these both extremes and can also change their position over time, i.e. either start small and later make the link to strategy or slowly phase out central coordination once change has become self-reinforcing. However, the available case studies suggest that the more radical “System Lean” strategy is easier to implement in the private sector and that the public sector relies heavily on more or less disjointed pilot projects (Radnor et al. 2006).

**Q2) How is Lean defined for the purpose of the universities' initiatives?**

a. Which of the Lean principles are applied?

b. Which tools and techniques are used to implement Lean?

**Q3) Where is Lean implemented in the universities?**

a. Is Lean only applied to support processes or also to the core processes of teaching and research?

b. Does implementation strategy follow an emergent bottom-up or a holistic top-down pattern?

Implementation: With/ against what?

When analyzing the underlying success factors of Lean implementation, most authors point to the usual well-known elements of effective change management (Kotter 1996), namely (1) awareness that change is necessary, the (2) capacity to deal with change and a (3) supportive organizational culture.
In general, an organization's awareness of change requirements is a function of its exposure to and dependence on its external environment, e.g. customer needs or expectations of financial markets. Further drivers of awareness are top management involvement and professional internal communication that create a sense of urgency.

Change capacity depends mainly on the resources and capabilities organizations (can) commit to their optimization projects. This includes internal or external Lean expertise, the availability of a dedicated project management structure as well as senior and middle management commitment. Based on an understanding of Lean as dynamic learning capability, creating this change capacity is not only an enabler to Lean implementation but also an end in itself.

Most important, but also difficult to capture and address, is the existence of a supportive organizational culture. This comprises general aspects such as openness towards new ideas, mutual trust and staff involvement as well Lean specific issues, e.g. process-based thinking, focus on customer value or continuous improvement.

Radnor et al. (2006) summarize these enablers and barriers to Lean implementation under the concept of “organizational readiness”. All in all, the specific public sector characteristics that have been identified above seem to indicate a lower level of “organizational readiness” within public administration as compared to the private sector (see also Yasin & Wafa 2002).

Q4) Which are the critical success factors and barriers to change for Lean implementation in HE? How strong are they?
   a. How strong is the universities’ awareness of change requirements?
   b. How large is their change capacity?
   c. Does the universities’ specific organizational culture support or impede Lean implementation

Impact: What for?

The impacts of Lean implementation can be structured along two dimensions: Effects can be either (1) quantitative or qualitative and might occur either (2) intended or unintended.

Empirical evidence from the manufacturing sector suggests that Lean production actually delivers on its promises of revolutionary improvements. Based on several case studies, Womack and Jones (2003; see also AME 2008) state that already the initial phase of Lean implementation typically doubles labor productivity, cuts lead times and inventories by 90% and reduces errors, scrap and job-related inventories by half. Furthermore, Lean implementation seems to facilitate cultural change towards continuous improvement. With regards to unintended effects, manufacturers implementing Lean often report substantial cash flow improvements due to lower levels of working capital tied up in inventory. Moving from manufacturing via for-profit services to public administration, the magnitude of the reported quantitative and qualitative impacts is gradually decreasing. Also the data basis gets weaker as there seems to be less systematic quantitative impact assessment. While still significant, performance improvements through Lean implementation in (public) services are less revolutionary compared to those reported for Lean production (see e.g. Radnor 2006). In addition, especially in the public sector, Lean implementation is confronted with unintended negative effects on staff satisfaction, as it is sometimes perceived as a means of rigid standardization and increased performance pressure.

Q5) What are the results of the universities’ Lean initiatives?
   a. What are the quantitative impacts on performance in terms of lead times, quality and cost-efficiency?
   b. What are qualitative impacts on terms of cultural change?
   c. Did the impacts achieve the original objectives? Which unintended outcomes occurred?

6. CONCLUSION

While it is important to note that in reality every organization is different, i.e. features a specific set of resources, capabilities and environmental pressures, it still seems possible to make some simplifying generalization with regards to the organizational context. Put simply and applying the suggested conceptual model, for-profit manufacturing operations applying Lean seem to have the clearest motive structure and can draw on a well-attuned Lean toolkit. Together with a high level of “organizational
readiness”, this translates into substantial quantitative and qualitative impacts. On the other end of the spectrum, performance improvements in the public sector are less revolutionary as organizations have to struggle with methodological problems and several barriers to change.

However, the above mentioned changes in the Higher Education external environment and marketplace, require senior management of HEI's to evaluate all modern performance measurement and improvement approaches, especially Lean Management, to ensure continuous improvement, efficiency and increased stakeholder satisfaction.

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