Developing Lean and Agile Service Operations Processes in a University Environment

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Abstract
This paper takes an Action Learning Research approach to explore how the principles of lean have been applied at a large European university, where the objective was to enable sustained continuous improvement across multiple service delivery processes. Through a portfolio of six projects we examine the governance mode overseeing this strategic initiative. The results are presented in terms of learning and reflection using Revans' systems of alpha, beta and gamma.

Keywords: Lean Thinking, Higher Education Service Delivery Processes, Action Learning Research, Governance Mode

Introduction
Lean implementation involves initiatives which are visual, visible and, often, simple. Correspondingly, senior management can both engage and enable the development and implementation of these initiatives in different modes. Said differently, lean implementation takes place within a white, grey or black box. In white-box governance mode, the senior management provide the staff with a full set of specifications and the detailed design (Petersen et al., 2005). In grey-box governance mode, senior management co-develop specifications and co-design activities. The senior management and the staff share the responsibility for the design of the initiative (Petersen et al., 2005). Finally, black-box mode refers to the governance mode in which the senior management gives broad specifications to the staff and the staff has complete design responsibility for the initiative (Petersen et al., 2005). Our paper takes an Action Learning Research (ALR) approach to explore the governance mode in which principles of lean have been applied at a large European university where the objective was to enable sustained continuous improvement across multiple service delivery processes. We extend our previous research in this area, which focused initially on a single service delivery process in the university's library. Here, we examine the governance of the university's strategic lean initiative and a portfolio of six projects which are either underway or completed as part of the initiative. Correspondingly, the research question posed in this paper is as follows: how can the principles of lean and the tools of six

sigma be applied at a large European university to enable sustained continuous improvement in its service delivery processes?

Lean thinking in higher education

The field of operations management research has recently seen the application of lean principles in the public sector, such as government (Radnor & Johnston, 2013), healthcare (Hicks et al., 2015) and customs (Proctor & Radnor, 2014). There is also an emerging literature in the application of lean in university service delivery processes. Radnor & Bucci (2011) describe lean implementation in higher education institutions as being highly fragmented and suggest that there is a lack of examples of excellent lean projects in the sector. Hines & Lethbridge (2008) found that the overall university setting was more resistant to change than traditional lean environments. Thirkell & Ashman (2014) concluded that the adoption and implementation of lean thinking across the higher education sector in the UK was unlikely to succeed until greater conceptual clarity was attained and more account taken of particular situation/context. We explore this literature from three perspectives: Why, How and Outcome.

The why

Lean thinking is seen as based on a set of five key principles that could be applied across a range of settings (Womack and Jones, 1996). The principles include: the identification of customer value, the management of the value stream, developing the capability to flow production, the use of "pull" mechanisms to support flow of materials at constrained operations and finally the pursuit of perfection through reducing to zero all forms of waste in the production system (Womack and Jones, 1996). Hines et al (2004) contend that lean should be regarded as more than a set of mechanistic hard tools and techniques and that the human dimensions of motivation, empowerment and respect for people are important: "*these elements are key to the long-term sustainability of any lean programme, regardless of the industry sector*" (pp.999-1000).

One sector into which lean is spreading the university sector. Hines et al (2008a) explore the early application of lean thinking in academic institutions. They note that a large part of a university's activities are of a support nature and could be regarded as non-value-adding. However, they note potential to improve customer value and eliminate waste in universities. Further, they concluded that it was evident that the academic environment was harder to change than many conventional lean environments.

The how

Many universities exist within the public sector and, so, are influenced by the norms of practice and performance which apply there. Hines et al (2008b) explored comparative cases of starting lean thinking in the public sector. They identified issues around information flow, skills and a lack of focus on change. They demonstrated that there are opportunities for the application of lean thinking in public services, and a need for a lean-friendly culture and climate that is suitable for its translation. They identified differences and modifications required in this context, including the language to be used, a need to understand the complexity of the supply chain and specific cultural issues in the sector, including terminology, a high level of buy in and sustainability once an approach is proven and a relaxation once initial targets have been achieved.

Looking towards implementation of lean thinking in UK universities, Thirkell & Ashman (2014) identified a range of problems including understanding, communicating

and transferring lean thinking into the higher education context. In particular, they noted the exclusion of human resource professionals from the implementation, with negative consequences for the outcomes achieved. More optimistically, Waterbury (2015) identified implementation choices, which can be expressed in terms of governance of the initiative, including: oversight, resource allocation, project selection and skill development.

Following a related theme, Thomas et al (2014) explored the organizational dynamics surrounding the adoption of lean in different kinds of educational institution. In particular, their interest was in the autonomy and support provided by senior management to the implementation teams. They noted evidence of a consultancy-based approach and a tool-driven mentality which influenced the extent to which and the time taken to embed lean thinking in the institutions. Holmeno et al (2018) explore the use of consultants further in a public sector setting. They conclude that although the consultants' rhetoric had been adapted to the ideal of soft lean, their practice had not: implementation remained tool-centred and external consultants took the roles of experts. They cautioned public sector organisations to consider critically what management consultants can and cannot effectively deliver in lean implementations. O'Reilly et al (2018) explored the commencement of a lean and continuous improvement programme in a public university. They noted the role of expertise, both internal and external, and the interplay between a formal top-down approach and the coming together of staff, some of whom had continuous improvement experience from previous employment. They concluded that alignment with strategy, role of specialists and use of a structured method informed by a lean six sigma approach were of relevance to implementation.

The outcome

The outcome of a lean initiative may be seen in operational terms – for today – and in more strategic terms – for tomorrow. Douglas et al (2015) explored waste identification (e.g. excessive movement of people, overproduction of materials) and elimination (e.g. through value stream mapping) in higher education institutions. Taking a longer term and strategic perspective, Balzer et al (2016) concluded that lean was most impactful in higher education institutions if it involved long term strategic planning.

The research question posed originally was as follows: how can the principles of lean and the tools of six sigma be applied at a large European university to enable sustained continuous improvement in its service delivery processes? Based upon the literature review we sharpen that question to focus on why, how and with what outcomes lean thinking might be applied in a higher education institution over an extended period of time. Within this question is a particular interest in the governance mode in evidence.

Design/Methodology/Approach

To explore the research question posed in this paper, the methodology follows an Action Learning Research (ALR) approach in which knowledge is co-developed by both the researcher and the participants in the action (Coughlan and Coghlan, 2011). In this case, the action extends over a five year period which promises a more insightful opportunity for research than from a focus on discrete and short-term initiatives. In action oriented research, data are contextually embedded and interpreted, with the researcher immersed in the setting and relates to the process in a reflective and reflexive mode (Coughlan & Coghlan, 2016). This creates a collaborative process of "*shared question formulation, data collection, analysis and testing in action*" (Coughlan & Coghlan, 2011: 240) between researchers and local stakeholders. Data sources included

researcher reflections on direct engagement, project specifications, minutes of meetings and workshops, and interviews with project leaders and steering committee members. The findings are presented in a number of sections, structured in terms of Revans' (1998) systems Alpha, Beta and Gamma.

- Alpha: focuses on the identification and investigation of the real problem in the organisation, based on analysis of the managerial value system, the external environment and the current organisation performance.
- Beta: focuses on problem solving and the repeated cycles of action required to implement improvement through observation, hypothesis, testing, evaluation and reflection.
- Gamma: the focus here is on the learning experienced by each of the managers, in particular on their thought processes and how these adapted and evolved with the actions. In action learning research, there is also focus on the researcher to inquire as to how the process of engagement with the organisational problem has challenged his/her own thought processes.

In our paper, the "researchers" were the project lead from the Agile Unit and the authors, while the "participants" were the agile steering group members. Discrete projects approved by the steering committee were implemented by university staff, some of whom had received Green, Yellow or White Belt training.

Through oversight by the Agile steering committee and by the Agile project lead facilitating interventions and observation, knowledge was developed through the initial lean implementation process, which was utilised on subsequent projects. These reflections contribute to theory on an action learning research approach to implementing lean principles in higher education services processes.

Findings

The university (referred to as "*Ad Astra University*" in this paper) provides the location for our research and is a large third level institution in western Europe, with 30,000 students and 40 academic departments ("Schools") spread across six areas ("Colleges", e.g. Arts & Humanities, Business etc.). Launched in 2015, the University's Strategic Plan to 2020 outlines six major initiatives to be undertaken. One of these initiatives, "*Increasing agility and effectiveness in our processes and procedures*" provides the motivation and question for the research in this paper. The focus of the initiative was to increase efficiency and effectiveness of the university's processes and procedures and to impact the support ecosystem for teaching and scholarship on a long-term and sustainable basis as outlined in Table 1. Table 2 provides a summary of the agile intervention timeline.

To lead this initiative, the university established a small, dedicated unit in early 2016 called "*Ad Astra Agile*". It employs the principles of lean as the structured process improvement approach and six sigma as the problem solving methodology through the Design, Measure, Analyse, Improve and Control (DMAIC) system. Staff in the Agile Unit received lean green belt training from an external provider and then became responsible for the delivery of white belt, yellow belt and other lean specific training for other staff engaged in lean projects across the university.

In addition, the university established an eight member Steering Committee comprised of senior academics and administrators from across the university. The purpose of this committee is to oversee and support the activities of Ad Astra Agile.

The steering committee is chaired by a member of the university's senior management team, thereby providing a direct link between the Agile unit and university management.

Table 1. Ad Astra University Agile Objectives

How	**Short-term outcome**	**Long-term outcome**
Empowering People	*Delivering value and excellence*	*Continuous improvement culture*
• Develop leadership capacity at all levels	• Increase capacity to deliver value to process users	• Competence in continuous process improvement
• Devolved authority	• Comparative benchmarking	• Embedded ethos to respond quickly to inefficiencies
• Capture and capitalize on creative potential across the university	• Excellence in process design	• Capacity building to enable better deployment of resources

Table 2. Agile Intervention Timeline

2014	**2015**		**2016-2017**		**2018-2019**
November	February-May	May-October	March 2016-June 2017	November 2017	January 2018-June 2019
Strategic Plan 2015-2020 launched. Includes Strategic Initiative 6	"Roadshow" – visits to other Higher Ed institutions who undertook similar intervention	Agile Unit established	Focus on "learn through doing"	New Agile Steering Committee established and Terms of Reference revised	Setting the Agenda

The steering committee defined two categories of agile projects. The first category covered small scale introductory or "immersion" projects, which focused on improving the efficiency and effectiveness of individual, lower level business processes across the university. Here, the Agile Unit provided "hands on" project management and lean six sigma support. However, the steering group maintained a blackbox governance approach, trusting in the sponsoring departments to achieve operational and learning outcomes without interference. The second category were larger scale, complex projects, covering cross-functional business processes. These were supported by external green belt training and received mentoring from Ad Astra Agile and the training provider. Here, the steering group maintained a white box approach, conscious of the university-wide implications of the changes made.

For each project category, we selected three projects for analysis of the application of lean thinking, as outlined in Table 3.

Table 3. Evidence of lean thinking applied to agile projects

Project Category	Project Description	Evidence of application of lean thinking in each intervention
Immersion	Library: Course Reading Lists	*Why:* Recommended reading lists for courses sent to library by academic staff in ad-hoc manner.
		How: To improve the process from perspective of academic rather than library staff (pull vs push).
		Output(s): New simplified online process, 50% increase in number of courses providing reading lists.
Immersion	Facilities: Invoice Processing	*Why:* Invoices returned by Accounts Payable Dept to Facilities Dept, Delayed supplier payment.
		How: Root cause analysis
		Output(s): Faster supplier payment, Accounts payable engaged with Agile initiative.
Immersion	Engineering Workshop: Student Project Requests	*Why:* No standard practice for project support requests.
		How: Streamlined and standardised request process, change in mode of interaction with students.
		Output(s): Waste elimination.
Complex	Finance Office: Cost Centre Reports	*Why:* Cost centre reports too detailed and difficult to interpret by cost centre owner.
		How: Focus on needs of cost centre owners (pull).
		Output(s): Clarity for cost centre owners.
Complex	Facilities: Support Request	*Why:* Wide variety of formal & informal support channels to respond to requests from across the university.
		How: Muda, mura, muri.
		Output(s): Central contact centre with triage system for codifying requests.
Complex	IT Services: User Account Requests	*Why:* Increase in requests for affiliate / visitor accounts (non student/staff), poor response time.
		How: Focus on needs of host and visitor.
		Output(s): Reduced overhead, more efficient process, improved response time.

Discussion

The findings are presented in a number of sections, structured in terms of Revans' (1998) systems Alpha, Beta and Gamma and are from the perspective of the Agile Steering committee. Table 4 details this learning for each project category through the elements of lean thinking categorising the literature reviewed (why, how and outcome(s)).

Immersion projects enabled the commencement of the agile initiative by focusing on low level service processes within individual units in the university. Expertise and confidence was built as well as an understanding of the deep rooted assumptions that drove the design and delivery of existing service processes. That confidence, like creative confidence, reflected the natural ability of staff to come up with new ideas and the courage to try them out. It meant having the humility to let go of ideas that were not working and to accept good ideas from other people, breaking challenges down into small steps and then build confidence by succeeding on one after another. That confidence came from overcome fears, including fear of the messy unknown, fear of being judged, fear of the first step and fear of losing control (Kelley & Kelley, 2012). The Agile Unit played a key role in overcoming these fears through the provision of training in the tools of lean six sigma, managing units' engagement with process

improvement and transferring learning from one project to the next. Through system gamma (reflection on action), the steering committee was able to identify how best to direct resources for more complex projects in different units. In addition, the meta-learning was captured and codified through the provision of reports to the university management team on the progress of the strategic initiative.

Complex projects were longer term and cross-functional and were executed by university staff and mentored by the Agile Unit. The projects were enabled by the cycles of learning from immersion projects. Given their complexity, external training in lean six sigma tools was provided to build confidence. Critically, there was a deliberate decision not to engage external consultants for project delivery as it was felt that this could lead to resistance and thereby hinder the long-term sustainability of the agile initiative.

Through a series of workshops, the steering committee captured the learning from both immersion and complex projects completed to date. This has led to the development of the agenda for the agile initiative until 2019, with the aim of embedding lean as the way of thinking for integrated business planning.

Table 4. Analysis of Action Learning Research in Projects

Project Category	**Lean Thinking Element**	**Revans' Systems**		
		Alpha	*Beta*	*Gamma*
Immersion	*Why*	Testing the ground ("pathfinder")	Executing the projects, to achieve more effective and efficient service delivery processes	Capture, codify and celebrate
	How	Short term, single unit initiatives	Agile unit "handholding" the subject area specialists / staff	"Work Smarter Together" initiative, reports and papers
	Outcome(s)	Troubleshooting, building expertise and confidence	Operations focused, preparing the ground for future more complex initiatives.	Capacity building for more complex projects. Progress reports to management.
Complex	*Why*	Experience from immersion projects enables progress to complex initiatives	To become a better place in which to study, research and work.	Reporting on progress on strategic initiative six
	How	Longer term, cross function, more invasive projects	Internally delivered but with external Green Belt training. Mentoring by Agile unit.	Steering committee workshops and reports to management.
	Outcome(s)	Agreed plan of action for implementation	Combination of operational and strategic improvement in service design and delivery	Embed lean as a way of thinking. Becomes default approach for integrated business planning

Relevance/contribution: Lean Thinking - managing for today and for tomorrow
The research question that was posed this paper focused on why, how and with what outcomes lean thinking might be applied in a higher education institution over an extended period of time. Within this question is a particular interest in the governance mode in evidence.

Lean implementation is disruptive of fit between the strategy and form of the organisation, and of the "fit" between the elements of the organisation (Tushman & Nadler, 1986). From this perspective, lean forms part of the operations strategy for the university and, as such, incorporates a focus on operations improvement and associated change. Such change is disruptive to the congruence or fit between the previous strategy and the form of the organisation. In itself, such disruption is not undesirable. However, the impact on performance may be to achieve operations improvements which are not visible to stakeholders as the focal processes may run in a more seamless (rather than problematic) manner. Lean implementation may be disruptive also of the fit between the tasks, the individuals and the formal and informal systems. Tasks may be re-defined (or removed), individuals may be up-skilled or re-skilled, informal systems may be exploited for insights which are incorporated in formal systems. To achieve such change requires the development of creative confidence on the part of those empowered or engaged in the process. The context needs also to be supportive of learning from experience and capturing of that learning for future application in the same of different settings. Creation of a context within which that confidence might be built requires a combination of governance approaches, as observed.

Looking to the future, it is interesting to consider the combination of governance approaches which might evolve as follow-on projects are initiated. Table 5 considers the potential steering committee governance mode for follow on projects in each category.

Table 5. Projected Agile Steering Committee Governance Mode by Project Category/Type

Project Category	First Project	Follow On Project
Immersion	Black, or Black/Grey, or White box	Black
Complex	Grey or White	Black or Grey

It may be that the governance mode shifts and progresses from white/grey to grey/black, as the Steering Committee gives more autonomy to the project teams to do what is necessary and what they think is possible. Such a progression would reflect a developing embeddedness and the prospect of long term sustainability of agile.

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