A Continuous Improvement Journey in the Higher Education Sector: A Case Study of a University in Ireland

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Abstract

Purpose: The paper's purpose is to contribute to a developing literature in relation to Continuous Improvement (CI), incorporating Lean Six Sigma (LSS) in Higher Education Institutions (HEIs). This paper follows on from a previous study which focused on the initial steps taken by an Irish university on its CI journey by discussing the next steps, detailing the findings from these.

Design Methodology/Approach: A participative research approach is adopted. This is the second stage in a longitudinal study designed to support on-going evaluation and learning during the CI journey. The data sources include relevant documentation and observations supported with secondary data from literature.

Findings: Having a blend of external expertise as well as in-house developed expertise is a critical mix, supporting the need for improvement specialists consistent with previous research. In addition, the ability of the HEI to respond to the enthusiasm nurtured through training is key. Along with ongoing Senior Management commitment, active leadership at unit level was also found to be key.

Research Limitations: This paper is based on an ongoing, longitudinal, empirical study of a single case study in Ireland and the researchers' experience as practitioners.

Originality/Value: This paper tracks the development of CI in a HEI in a longitudinal manner and adds to the developing nature of the literature in this area.

Keywords: Continuous Improvement, Lean Six Sigma, Readiness Factors, Higher Education.

Paper Type: Conference

1. Introduction

The changing landscape in Higher Education has prompted an interest in transformative change initiatives that go beyond a quality management paradigm. This paper seeks to learn from the experience of a university that has taken the first tentative steps towards building a continuous improvement capability based on a Lean Six Sigma approach. This university endeavours to respond to a range of changes including, but not limited to, the following: changing student profile and changing expectations of students; public budgetary constraints and the increasing importance of non-exchequer funding, globalisation and international competition; research, innovation and technological change; employment prospects and broader societal needs.

While is increasing evidence of the potential LSS in the Higher Education Sector (Balzer, et al., 2016), there is need learn from strategies and practice within the universities themselves. This paper focuses on the deployment of Lean Six Sigma in a university environment. In doing so we share the motivation for the introduction of a Lean continuous improvement initiative, the early lessons learned and evolution to a LSS approach and the key factors that influenced the trajectory and deliverables.

The paper is structured as follows. A brief literature review and methodology description precedes the case study description. A brief background to the case study is presented. The origins and deployment of the continuous improvement initiative are described. Analysis and discussion follow. The main conclusions are presented and future research plans are outlined.

2. Literature Review

In recent years, educational institutions have turned their intention to improving performance (Hess and Siciliano, 2007) and increasingly seek to incorporate private service sector improvement approaches into operations (Gordon and Fischer, 2011), including Lean Six Sigma (LSS). Increased interest in the potential of LSS in the HEI environment is evident in pioneering work by Emiliani (2004; 2005), Waterbury and Holm (2011) and Hines and Lethbridge (2008) and more recently through cases studies, evaluations and reviews (Antony et al., 2012; Waterbury, 2015; Balzer, et al., 2016; Bateman et al., 2014). While early work in pioneering institutions reflect the experimental nature of the such initiatives, more recent work has endeavoured to identify key characteristics of the HEI environment that impact on deployment of LSS and identify key challenges faced by HEIs (Radnor and Bucci 2011; Thirkell and Ashman, 2014; Antony et al., 2012; Waterbury, 2015).

Challenges in the HEI sector abound and Antony et al., (2012) identified seven Critical Success Factors (CSFs) for the successful deployment of LSS in the HEI sector: (i) uncompromising top management support and commitment; (ii) effective communication at all levels vertically and horizontally; (iii) strategic and visionary leadership; (iv) developing Organisational readiness; (v) resources and skills to facilitate implementation; (vi) project selection and prioritisation; and (vii) organisational culture. In addressing these challenges Antony (2014) put forward a useful set of readiness factors that can both assist institutions prepare for LSS deployment and support ongoing evaluation of such deployment. These key readiness factors are considered as pre-requisite to the successful implementation, deployment and sustainability of LSS in HEIs, they are: (i) leadership and vision; (ii) management commitment and resources; (iii) linking Lean Six Sigma to University strategy; (iv) customer focus; and (v) selecting the right people.

This study employs these readiness factors as an organising framework to explore the application of LSS in a university environment, identify key factors supporting this and elucidate learning from key activities with a focus on the integral components of a successful implementation strategy.

3. Methodology

Using Six Sigma (LSS) implementation literature as an organising framework, this paper explores initial steps in a CI journey taken by an Irish university. Because this study is exploratory in nature, and is trying to answer 'How' or 'Why' questions, a qualitative research approach was chosen (Marshall & Rossman (1989, p.78), Yin (1994)). A case study research strategy was adopted and involved participative research (Chakraborty and Leyer (2013) Patton (2002)). The researchers include the CI champion, a LSS Master Black Belt in the HEI that is the subject of the case study, an academic with an interest in continuous improvement and a researcher conducting his PhD in this field. The researchers had access to all relevant documentation (Yin, p. 6, 1994) on the CI programme, including: (i) Strategy documents, including drafts; (ii) Minutes of University Management Team (UMT) meetings; (iii) Steering group minutes and working documents; (iv) communications with the University community (including presentations, web site, brochures); and (v) training materials. Thematic analysis (Miles et al., 2014) was deemed the most appropriate form of analysis: thematic analysis involves discovering, interpreting and reporting patterns and clusters of meaning within the data, working systematically through texts, with the researcher identifying topics that are progressively integrated into higher-order key themes, the importance of which lies in their ability to address the overall research question (Ritchie et al., 2014, pp. 270 – 271). Thematic analysis is the approach that is deemed most suitable to data analysis in this case as we seek to explain and describe Lean Six Sigma in previously under researched areas (Ritchie et al., 2014, pp. 270 – 271) which is certainly the case in this study.

4. Case Study

The case study site is an Irish University with over 20,000 students and over 2,700 staff. The University enjoys an international reputation and includes faculty across humanities, business, law, medicine, science and engineering disciplines

4.1. CI Programme - Origins

The origins of the university-wide Continuous Improvement (CI) programme lie in strategic planning for the 2013-17 cycle. Within this plan a 'Lean' project aims to:

> *"Introduce and apply structured Lean practices to the key enabling processes of the University to ensure optimum efficiency, effectiveness, agility and responsiveness to internal and external needs. Prioritise the application of 'Lean' to the programme approval, financial management, intellectual property and contracts processes."*

This focus on CI in the university strategic planning process emerged from senior management interest and suggestions that arose during the consultation process, mainly from staff that had experience of Lean in previous employment elsewhere. The main motivation was to become more responsive, to simplify processes and reduce bureaucracy.

4.2 Deployment

Given that the CI initiative arose through the strategic planning process the University Management Team (UMT) agreed a plan (establish a steering group, a communications programme and training programme) and considered regular progress reports from the steer group. The steering group was assembled by a CI Champion, a member of UMT with a particular interest in CI and lean six sigma experience from previous employment in the private sector. In assembling the group he sought to ensure representation from across the institution and also encouraged staff with experience and interest in CI, including those had gained experience in previous employment in the private sector. The steering group's terms of reference (as listed below) were presented to, and approved by, UMT in Q4, 2014.

Steering Group terms of reference:

- *Influence project selection to ensure alignment with the priorities of the University's strategic plan and with local needs.*
- *Provide support and advice for staff who are participating in training.*
- *Facilitate cross-office Continuous Improvement engagement.*
- *Provide support for key projects and provide guidance to IT regarding processes that are appropriate for automation.*
- *Report regularly to UMT.*
- *Set realistic goals to support the advancement of Continuous Improvement in the University.*
- *PR related to Continuous Improvement across the University.*

Over an 18 month period the steering group, with administrative assistance from HR, coordinated the roll-out of White, Yellow and Green Belt training, developed a roadmap and produced a web site to promote this initiative. The CI Champion also led university-wide communication sessions (i.e. Staff Briefing Sessions).

From the outset there was a strong emphasis on training, with White Belt (WB) and Yellow Belt (YB) training building awareness of CI concepts and Green Belt (GB) training building capability. This work was contracted to an external training provider. A number of key learnings were gained from the initial roll-out (2015). Firstly, a greater number of staff engaged with WB and YB training than expected, 46 and 112 respectively, over the first 18 months. This was a positive response to the communication sessions and resulted in a larger cohort of trained staff than originally expected. Secondly, while the GB training provided was well received trainees they required greater support to complete the associated Green Belt projects. In particular greater alignment between the training programme and the projects was required in addition to more active project sponsorship and mentoring.

In response the steering group paused training at WB and YB levels and focused on building capability to support CI projects and wider activity through GB Training and the employment of an expert (Lean Six Sigma (LSS) Black Belt) on a part-time basis. This LSS expert provided project mentoring to support a cohort of Green Belt trainees. This resulted in the delivery of projects with clear benefits that addressed specified problems. Table 1 summarises some of these projects completed in the Faculty of Medicine for illustrative purposes.

Table 1. Examples of Green Belt Projects Completed

Project Name	Problem to be addressed	Benefits
Digital Nursing Archive Recording Process	"*The process involved for booking and in using the DNA recording system is very time consuming, unclear, cumbersome and prone to mistakes*."	• Process time from start to finish improved from 27 days to 9 days with 100% accuracy.
Processing minor changes within the College of Medicine and Health	*"Currently the length of time taken to effect minor curriculum change is too long and inconsistent. At one meeting during academic year 2014/2015 16 minor changes took an average of 7.4 weeks with a range of 23 weeks"*	**Better:** • Staff have clear guidelines and a defined support structure throughout the process reducing frustration and the need for resubmission. • Development of an app style, online meeting management system to support the LEANer process. The app reduces version control issues and allows committee members access to all documentation, on all devices via user-friendly system. **Faster:** • Average approval time improved from 7.4 weeks (with a range of up to 23) to 3.8 weeks (with a range of up to 5). **Wider Impact** • All Schools within the Faculty have access to the support structure and documents for the approval of changes. • The online meeting management system has allowed the Faculty to hold paperless meetings, with the system rolling out to School level.
Review of the existing process of allocating clinical rotations to third, fourth and final medical students	*The existing process is a manual system which takes over 8 weeks to complete and has a defect rate of 25%*	• More timely allocation of placement schedules to students • Reduces risk of loss of information • More student information captured in one system • Streamline the work of three members of staff in the School
Registration Process of the MSc in Obstetrics and Gynaecology	*The cycle time for completion of registrations is taking too long at 6 months.*	• 100% of students registered by end Month 1 • 100% student access to Blackboard, Library and University systems • Complete and accurate class list on DMIS • Lead time for completion of registrations reduced from 6 months to 1 month
CPD Application Process within School	*70.5% defect rate in applications received. Cycle time for processing applications 21.9 working days*	• Standardised application form introduced • Online verification of professional status • Faster cycle time • Wider impact: Working at an interdisciplinary level between Faculty and Graduate Studies Office.

The learning gained from this exercise informed future training programme design with the LSS expert working with the training provider to customise training to the university's needs. In particular DMAIC was introduced as an overall framework, this sharpened problem statements and analysis throughout project work. Thus the earlier lean approach was changed to a LSS approach. Furthermore a case study relevant to the university was designed and the used throughout the training. This illustrated the use of DMAIC. An A3 design, based on DMAIC, was also customised for use in the Green Belt projects and to support ongoing improvement project activity. Exhibit 1 summarises the enhancement to training programmes.

Exhibit 1: Training Programme Enhancement

1. *DMAIC used as the Problem Solving methodology*
2. *The training material would have DMAIC overlaid with the appropriate tools identified for each phase.*
3. *A case study, "Office R US", employed to enable participants to use learned tools in a workshop setting during the training.*
4. *Participants come to the first day of training with a project or a*

In addition, the LSS expert worked with the steering group to produce the roadmap referred to above. This focused on attention on specific areas and incorporated training into the overall strategy. Hence Green Belt project pursued were very much linked to the unit level plans. In total 31 GB projects had been completed by the end of 2016. In addition, 14 staff pursing GB training and working in projects. These staff have benefited from a programme that is overseen by the LSS expert and delivered by the external training provider. This programme starts with recruitment of suitable trainees, includes an induction session led by the LSS expert in conjunction with HR and the external provider and project mentoring provided by the LSS expert.

Recruitment of staff for GB training and subsequent induction was based on agreed attributes of a GB qualified staff member. These attributes reflected qualities such as initiative, leadership skills, a methodical approach and a passion for engagement and improvement. They provided a guideline for Unit Directors when identifying staff for GB training. Thus expectations were set for all concerned and GB projects and expertise developed were considered integral to unit planning and operations.

5. The Key Lessons Learned to Date

Much has been learned from initiative taken to date. In particular the blend of expertise required, including the availability of LSS expertise in-house during the initial stages, as well as the role of building capacity through training. The need to integrate GB training and projects into the plans and operations at operational level were key. Likewise the capacity to respond to interest stimulated through YB and YB is key to the overall success of the initiative. Thus while it is of fundamental importance that CI is considered part of strategic planning (in this case a CI initiative included in strategic plan) and is adequately resourced (in this case senior management commitment and resources were evident), active leadership at unit level was found to be the key to 'success'. This needs to be evident through a cascading plan that includes CI projects and supports these through sponsorship and mentoring. For example, as the GB

training progressed the need for coaching and mentoring of the GBs became very clear. In addition to the part-time LSS expert provided from central resources the Director of the IT unit appointed a staff member to coordinate activity and hold projects meetings across the unit. The manager of Systems Admin recruited a part time Master Black Belt to lead and facilitate four projects over a 6-month period. The ultimate aim of this is to show the potential benefit of using the DMAIC problem solving methodology and the Lean toolset in bigger projects.

Of course ongoing senior management commitment is required, in this case it is likely that this is based on progress at unit level. For example the steering group, now working in the next phase of development, seek a full-time LSS expert (Black Belt level) supported by central resources. The inclusion of the CI programme in the university 5-year strategy and subsequent effort to align projects to the strategy framed the entire endeavour supporting Antony's (2014) emphasis on leadership, alignment with strategy and commitment of resources. The role of expertise, from many quarters, is a recurring theme. The findings support the need for improvement specialists consistent with previous research that had outlined the importance of staff trained and experienced in various roles, including Project Sponsors, Project Champions, Master Black Belts, Black Belts, Green Belts and Yellow Belts (Wu and Lin, 2009) and ultimately the importance of selecting the right people (Antony, 2014).

6. Conclusion

This case study reports on the initial steps taken by an Irish university embarking on a CI journey. Key findings in this case point to the Anthony (2014) Readiness Factors as an evaluative framework. For example, the importance of both strategic vision and senior management are evident and as this case illustrates need to cascade down to unit level plans and operations. Selecting the right people emerge as one of the key characteristics of this case, for example the approach taken to assemble the steering group, the introduction of LSS expert on a part-time basis and the recruitment of GB training cohorts. The introduction of LSS, rather than 'Lean only' approach was a key turning point in this initiative, particularly in terms of the use of DMAIC and a customised A3. .

The findings from the study identify three key practical implications for Lean Six Sigma in the University sector, namely (i) the key role of experienced LSS experts who understand/adapt to the university environment; (ii) management commitment and resourcing through a cascading deployment plan; and (iii) the role of a methodical LSS approach (i.e. concepts and tools and techniques This experience supports the fundamental importance of the three key components of Lean Six Sigma as evidenced in the literature: (i) projects focused on strategic objectives, (ii) improvement specialists, and (ii) structured method (Shah, et al., 2008; Wu & Lin, 2009; Timans, et al., 2012).

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