

1. Lean Six Sigma in higher education institutions: an idea that has arrived?

1.1 Introduction

Lean Six Sigma has become predominate in many fields. It is among the most common continuous improvement methodologies today. Yet, Lean Six Sigma (LSS) has yet to penetrate a variety of endeavors, such as the public sector (Elias *et al.*, 2018). In a previous issue of the *International Journal of Lean Six Sigma (IJLSS)*, the topic of LSS adoption in the public sector was explored and while LSS is in its formative stages in public institutions, both empirical and theory-based studies are starting to be researched and disseminated (Elias *et al.*, 2018). While higher education institutions, or HEIs, are not exclusively public, they typically share a mission: a statement of purpose of whom HEIs serve, why they exist, and grounded in community. However, education, and in particular higher education, has come under pressure from a variety of factors, where resources are a basis for much of that stress. And while other industries, namely, manufacturing, service and transportation, have adopted LSS to improve operations and focus on efficiency and effectiveness, HEIs have largely been impervious to such continuous improvement efforts (Antony *et al.*, 2012). Indeed, considering the challenges that HEIs face, is it a time for LSS to finally arrive?

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1.2 The challenge of higher education institution's

HEIs play a critical role in our society. Since the establishment of early technical colleges to today's industrialized "Knowledge enterprise," institutions of higher education have been a corner stone in educating society's leaders, an incubator for advanced technologies, and an accelerator for economic development (Lu *et al.*, 2017). Like other institutions today, higher education finds itself under stress today. In the United States, revenue for what are called "state" supported institutions, characterized by research intensity and liberal education, has crossed a new dangerous threshold: the majority of revenue now comes in the form of student tuition, rather than state support (Brownstein, 2018). This shift of support from the public to private domain has resulted in dramatic increases of student debt; at over \$1.4tn and counting, is larger than the mortgage debt during the Great Recession (Daniels, 2018). Elsewhere, the picture looks little different: Horizon 2020, the EU's financial instrument for aimed at securing Europe's global competitiveness, remains seriously underfunding with regard to higher education support (EUA, 2019; European Commission, 2019; Highman, 2019). In China, governmental regulation on tuition has not been able to lower college tuition to the level that the public is willing to accept (Zeng, 2009). Things look similar elsewhere: in South Africa, and in East Africa in general, revenue "supplementation", or shifting of costs away from public support, has had mixed success (Johnstone, 2004). The higher education environment is not only defined by cost or resources. However, cost is a useful representation for value, a theme of the research in this issue. In this special issue of the *IJLSS*, we focus on higher education and value of HEIs create, maintain, and deliver it in the modern age. The authors of these studies focus their attention a varying aspects of higher education and LSS and review the current literature to establish the state of the art of LSS in HEIs. We briefly discuss the eight articles in this special issue and highlight some future research directions.



2. Overview of higher education institutions and Lean Six Sigma

2.1 Empirical and theoretical studies

There have been some studies of Lean Six Sigma in higher education and we discuss a few here. For a start, the variety of research of LSS/HEIs reflects the variety found within HEIs. For example, while most individuals who attended college or university may recognize the teaching mission and perhaps as researchers as well, like other organizations, HEIs also carry a number of business practices. Indeed, the multiple missions of teaching, research and engagement brings into the HEI mission a variety of practices, stakeholders, in the HEI environment. The aspect of variety reflects the state of the art of research of LSS in higher education. Some researchers focus on the institution systematically. In [Antony et al.'s \(2012\)](#) study, the authors critically assess evaluate LSS's potential for improving HEI business processes and present and success factors for successful LSS adoption. Leading from the top is critical to LSS success. In a study, [Lu et al. \(2017\)](#) describe a framework for leadership LSS in HEIs. Beyond leading the LSS effort, strategy is required for successful adoption. In a study by [Antony \(2014\)](#), the author describes readiness factors required for introducing a LSS initiative in an HEI context. The development of LSS from a historical perspective reveals potential opportunities for LSS in HEIs is the focus of a theoretical study by [Hess and Benjamin \(2015\)](#). [Jenicke et al. \(2008\)](#) describe the unique aspects of HEIs vs. other settings. In addition, the authors examine the challenges of LSS in academia and propose a guiding LSS-HEI framework ([Jenicke et al., 2008](#)). In a follow-up study, [Holmes et al. \(2015\)](#) a framework for LSS project adoption and present a weighted scorecard approach for project selection.

2.2 Case studies

To date, LSS has been adopted in a number of HEIs. In a study by [Svensson et al. \(2015\)](#) presents a case study of LSS adoption within King Abdullah university. Another case of LSS adoption comes from an Irish university where improvements to the business operations and the importance of leadership and management of a LSS methodology ([O'Reilly et al., 2019](#)). Finally, [Vijaya Sunder \(2016\)](#) presents a case study that notes the value of LSS adoption in an HEI university libraries process that follows the DMAIC approach.

In summary, there have been some LSS research studies in HEIs, primarily concerning theoretical and empirical areas. We believe this demonstrates that the LSS research in HEIs is in a nascent stage.

3. Overview of the articles in the special issue

The articles in this issue provide more direction of LSS research in this unique field and greatly add to the body of knowledge through a variety of LSS applied research studies.

3.1 Attributes valued by students in higher education services: a lean perspective

For instance, Petrusch and Vaccaro discuss the value of academic administrative services, as perceived by students and find a relationship among lean, service, and HEI amenity in their evidence based approach. The student perspective is one that is rarely adopted among the field as the student-customer idea, to put it succinctly, may vary among academic opinions. Regardless, a voice of the customer analysis of students is welcome indeed.

3.2 How to use Lean Six Sigma methodology to improve service process in higher education: a case study

In a case study by Li, Laux and Antony, the authors describe the business process of award preparation to support academic grant submission process in HEIs, a function that is crucial to research intensive universities, generalizable to other research intensive environments and describes the details of how DMAIC may be applied in this LSS for Service approach. In addition, this was a student led project, based upon a graduate level LSS course.

3.3 Implementing Lean Six Sigma and discrete-event simulation for tutoring operations in higher education institutions

Furterer, Schneider, Key, Zalewski, and Laudemberger bring us another LSS application in a case study of implementing LSS for student tutoring, an important, but very labor-intensive operation in HEIs and usually a source of consternation for both students and faculty. The ability to model the process may help other units apply this approach broadly.

3.4 A Lean Six Sigma approach for improving university campus office moves

Wheeler-Webb and Furterer bring another case of applying LSS toward HEI space allocation and add to the literature through an area of HEI costs through applying this DMAIC approach to similar fixed asset processes, an area focus for sustaining the university mission.

3.5 Lean Six Sigma in higher education institutes: an Irish case study

In O'Reilly, Healy, Murphy and Ó'Dubhail's case study, the authors describe key understandings to guide others in implementing LSS in HEIs through this longitudinal study of LSS adoption in an Irish institution. This work adds to the literature through a number of administrative improvements highlighted within.

3.6 Kaizen in university teaching: continuous course improvement

Kregel introduces a novel study of applying a LSS technique, Kaizen, to the teaching function in university. Many academic programs follow standards and Kregel's study can support the continuous improvement challenges of accreditation that many departments, and their representative faculty, confront (to use a kind word) in their academic field.

3.7 Applying Lean Six Sigma to grading process improvement

The theme of pedagogy continues in Oliver, Oliver and Chen's study of how to apply LSS methods in improving the student grading process, likely every faculty's favorite activity. Take note readers, the time savings noted should interest any representative faculty.

3.8 Evaluating university leadership performance using Lean Six Sigma framework

Not least, Tetteh conducts a critical evaluation of leadership performance in HEIs using a LSS framework. In this empirical work, Tetteh surveys what students perceive, and value, as performance management (PM) and finds a relationship between LSS and PM. Let's not forget about the students!

4. Conclusions and future concerns

HEIs provide a fundamental role in many societies. The globalization trends that have been occurring over the past 50 years do not show evidence of slowing down anytime soon. In

1998, UNESCO identified a number of trends that have only accelerated in the last decade (Altbach *et al.*, 2009). Higher education has become a competitive enterprise, with the characteristics of an organization that must compete for scarcity, as students replace funding from state resources (Altbach *et al.*, 2009). The report goes on to state that as universities compete for status and rank, the competitive nature can contribute toward a decline in sense of academic mission, community, and values (Altbach *et al.*, 2009). The ability to maintain the academy requires effort from a variety of resources, disciplines and ideas as the commercialization of higher education strains the social mission (Altbach *et al.*, 2009). LSS is one contributive effort that can impact these trends of massification of the academy and that we hope the literature presented in this work will support a concerted effort to respond to the concern for quality in higher education.

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