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# What do organizational leaders need from lean graduate programming

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## Abstract

**Purpose** – This paper aims to assess the needs for a lean continuous improvement professional certificate and/or lean leadership cognate for a Doctorate of Education in leadership focused in three main research questions: "What do organizational leaders need from a Lean graduate programming?"; "What are the preferable methods of delivery for Lean teaching/learning?" and "What are the main learner outcomes and do how these impact organizational and continuous improvement outcomes?"

**Design/methodology/approach** – A survey to 37 organizational leaders in a North-American state was conducted via telephone and email that were returned to the researcher. The survey was designed to target a solid cross-section of organizational decision makers in regard to the need for and type of lean training desired, if at all, for employees. Using a mixed methods approach, the survey was designed to collect both qualitative and quantitative information.

**Findings** – Respondents indicated that lean continuous improvement thinking and lean process-project management were most the desirable content options. The method of delivery was not as clear with on-ground and online relying on job-embedded, project-based methods as most desirable approaches. Learner outcomes of mastery of lean content along with the ability to impact organizational and continuous improvement outcomes were favored.

**Originality/value** – Lean leadership education is valued learning by organizational leaders. As so, higher education institutions must be aware of matching better organizational needs with learning experiences. This paper presents a survey that intended to do this in an original way.

**Keywords** Survey, Continuous improvement, Professional development, Lean education, Lean leadership, Organizational leaders

**Paper type** Research paper

## 1. Introduction

Lean education provides a body of knowledge (BoK) and practice to students, tapping into deeper learning achievements and desired workplace competencies

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(Flumerfelt *et al.*, 2015). Typically, lean education programs are framed either within healthcare, business, public service or engineering career tracks or as interdisciplinary or trans-disciplinary offerings. Many higher education institutions (HEIs) have demonstrated lean production (LP) (Womack *et al.*, 1990) student coursework as applied to sectors of work: manufacturing, service, IT, government, non-profit, etc. These LP learning opportunities in all of their forms promote lean education (Alves *et al.*, 2014). Lean education focuses on critical issues of workforce development, typically from entry-level to management-level positions, largely embedded in specialized career paths.

A new approach to lean education is now of interest, lean leadership education, leadership programming extended from lean education and translated to common leadership applications in various sectors. The focus of lean leadership education is to holistically prepare graduate students for leadership using the philosophy, culture, tenets and tools of LP to achieve organizational success. As a relatively new form of HEI graduate programming, adding to the BoK regarding lean leadership education is called for. In a recent attempt to benchmark and study lean leadership graduate programming, a colleague of the authors, in a personal correspondence concluded, "There is simply so little readily available information useful information [about Lean Leadership Graduate Programs]". While there is a coherent BoK on lean leadership, there currently is not a viable BoK on lean leadership graduate programs.

This article presents a theoretical case for lean leadership education. Further, findings from a study on workplace needs regarding lean leadership education are shared, including information on critical content, delivery approach and learner outcomes. This study was used to inform an American university in the Midwest regarding a new graduate lean leadership program. The main purpose of this article is to describe how this university was informed about employers' views on the scope, design, delivery and content of a proposed lean leadership professional certificate and lean leadership cognate for a proposed Doctorate in Education. The reported findings are not generalizable due to the size of the study, but they are useful as one of the first efforts to gain a better understanding of employer perspectives on lean leadership education.

## 2. Literature review

This section presents a brief literature review in three areas: LP, the lean BoK and lean leadership education.

### *2.1 Lean production*

Lean is a term that refers to a specific, but evolving, BoK and practice. LP was a term created by the best-selling authors Womack *et al.* (1990) based on a US$5 million study at the Massachusetts Institute of Technology on best practices from the manufacturing floor. At the time, the study concluded that the Toyota Production System from the Japanese automobile industry (Monden, 1983; Ohno, 1988) was an exemplary model of manufacturing. This was because it was found that Toyota reinvented production by applying a simple concept of "doing more, with less". The use of less space, less human resources and less inventory was a critical element of the Toyota Production System. The lean method, therefore, generally implies the need for system-thinking and continuous improvement (CI) to perfection by reducing all wastes from production activities.

Womack and Jones (1996) cited five lean principles as foundational to the LP system:

(1) *Value*: Specify value from the customers' viewpoints.

(2) *Value Stream*: Identify the value stream for the product/service that was identified in the first principle.

(3) *Flow*: Ensure reliability and fidelity of the value stream of the product/service throughout the organization and to the enterprise.

(4) *Pull System*: Enable the customer to pull the product/service from the organization, rather than pushing the product/service from the organization to the customer.

(5) *Pursuit of Perfection*: Engage a CI journey of reducing and/or eliminating waste.

Value and waste are distinctive concepts in LP. Waste was succinctly defined by Ohno (1988) as all organizational activities that add no value to the product/service from the viewpoint of the client. Anything that is not critical to the value proposition, such as transports, inventory, motion, waits, overproduction, over-processing, defects and legacy systems, energy loss and knowledge loss (Liker, 2004) are nine categories of waste. To eliminate waste, LP calls for critical stakeholders' involvement in the improvement of the work processes. This organizational dynamic is carried out under enlightened leadership, whereby formal and informal leadership is expected to focus on empowering and engaging employees to participate in the improvement culture in LP.

CI is a critical tenet of LP related to waste elimination. It is series of individual, team or organizational activities that promote a better future than the current state, which includes addressing paradigms and processes of concern. CI was articulated by Shewhart (1934) into the Plan-Do-Check-Adjust/Act (PDCA) cycle. PDCA was founded on statistical process control methods. Deming (1993), a protégé of Shewhart, developed the Plan-Do-Study-Adjust (PDSA) cycle into a BoK and practice, known as total quality management (TQM) (Deming, 1986). Deming's TQM, considered a cornerstone concept of LP, was achieved through collaborative cultures that allowed for employee self-efficacy and improvement. In LP, operationalizing the activities of planning, doing, checking and adjusting can be done with lean thinking and tools under lean leadership.

The benefits of LP are quantitative, such as increased productivity, increased efficiency and costs reduction. But they are also qualitative, such as the development of organizational thinker (Alves *et al.*, 2012) and employee better work conditions and motivation (Arezes *et al.*, 2015).

### *2.2 Lean body of knowledge*

Lean is continually becoming more useful and relevant to daily and strategic organizational practices. Womack (Lean Enterprise Institute, 2009) described the emerging patterns of lean knowledge and the ongoing need for the evolution of continuously improving lean practice. Breakthroughs and approaches in the lean BoK are described next.

The lean BoK is developing based on critical leadership theories. For example, it is known that the importance of leadership is critical in improvement initiatives. For instance, Blanchard (2010) stated that 70 per cent of all improvement initiatives fail due to poor leadership. Murman *et al.* (2007) discussed the lean BoK in this same manner, arguing that the BoK is not based upon laws of physics and chemistry and is not

represented by sophisticated mathematics. Instead, the roots of BoK are based on emergent and adaptive processes and organizational dynamics for which there are no explicit laws. Leadership in general has long been described in this same way, as an art, rather than as a science (Bolman and Deal, 2013; Dupree, 1989), so the lean leadership BoK is in agreement with these developments.

In addition, HEIs are working to develop and deliver quality lean education programs aligned with the lean BoK. For example, the lean BoK is rooted within TQM concepts, including the ideas of customer-centric, data-based decision-making and CI. TQM was found by Stedinger (1996) at Cornell University to be important to students. He offered a large 100-student, junior-level probability and statistics course on TQM that was a successful and desirable student experience. Consequently, Todd *et al.* (2001) alerted faculty to incorporate into business and engineering curricula, among other things, new business and manufacturing enterprise technologies, namely, lean manufacturing/production concepts. This advocacy stemmed from surveys of industry needs. These topics were identified for engineering graduate and undergraduate courses as distinctive for enterprises to stay competitive. In addition, Swearengen *et al.* (2002) named skills and competencies for the globalization of the manufacturing engineer that are highly related to the lean BoK, such as systems-based and critical thinking, among others.

The lean BoK is important to HEIs. The Lean Aerospace Initiative (LAI) Educational Network (EdNet) is an HEI collaboration. It was established in 2002 and comprises 32 universities (from the USA and UK) who share a common interest to collaborate on developing and deploying curriculum for teaching lean and lean six sigma fundamentals (Murman *et al.*, 2007). Examples of the impact of this network include a faculty collaboration effort, supported by a small staff centered at the Massachusetts Institute of Technology, from which an LAI Lean Academy®, a week-long course, was developed and delivered to multiple industry and government audiences. This course was based on the comprehend/conceive, design, implement and operate approach (Crawley *et al.*, 2011), a teaching methodology that is essential in LP.

Another network is the lean education academic network (LEAN) described by Fliedner and Mathieson (2007) as a group of university educators seeking to promote lean education within academia in the USA. LEAN also helps improve lean education through sharing of knowledge and teaching materials, collaboration and networking among colleagues. These networks, together with Lean Enterprise Institute (LEI) have been associated with lean education (Womack, 2006) and a sponsoring conference, the Lean Educator Conference (LEC), with the objective of sharing best practices in lean curriculum and pedagogy.

Moreover, an international project joined Dutch, Swedish, Polish, Portuguese and Romanian universities and companies in a project based on the framework of the Erasmus–Lifelong Learning Program (LLP). Martens (2009) presented the report of this project that considered this training program on lean manufacturing to be innovative. The objectives of the LLP and its Lean Learning Academy (Martens *et al.*, 2010; Carvalho *et al.*, 2013) were to satisfy the need to provide training on lean manufacturing principles used in organizations and to improve engineering students' employability in professional life.

In addition to HEI collaborative to support the Lean BoK, Flumerfelt *et al.* (2015) has explored a new concept for engineering education (EE), called Lean Engineering Education, as a pedagogical response to the gaps between EE and engineering

professional practice. This answered to a call from American Society of Mechanical Engineers in the context of their Vision 2030 (ASME, 2012).

Alves *et al.* (2016) revealed that lean education is already imbedded in many universities in the world. These new programs have been developed in response to workplace gaps. Fliedner and Mathieson (2007) did a survey to understand what business practitioners thought about their lean knowledge needs for graduates. Their results indicated a high level of interest in the lean BoK specifically that graduates needed to possess a systems view of organizations and value streams.

From the above description, it is evident that there is a present shift in higher education programming toward more integration of the lean BoK. This development creates a foundation for lean leadership education.

### *2.3 Lean leadership education*

Lean leadership education supports the global application of lean in all sectors (Alves *et al.*, 2014). The role of the lean leadership is critical, as explained by Liker and Houses (2008), that leadership and culture provide the strong and essential foundation for successful and expedited LP deployment. Liker and Houses (2008, p. 335) described the role of lean leaders to "develop culture" and "live core values" by retaining "less direct power" and working "hard to support the value-added workers". The image of the lean leader standing behind, observing to understand and meet team needs, is a critical essence of this type of practice.

Liker's and Houses' (2008) comparisons between typical leaders and lean leadership create clear distinctions, and, therefore, lean leadership education finds support. Conversely, without lean leadership, LP will likely falter. Emiliani (2008, p. 34) described lean leadership as:

> Beliefs, behaviors, and competencies that demonstrate respect for people, motivate people, improve business conditions, minimize or eliminate organizational politics, ensure effective utilization of resources, and eliminate confusion and rework.

Lean leadership is described, therefore, as operationalized and holistic principle-driven practice of LP deployment in any organization. In this context, therefore, lean leadership education is conceived. Lean practice redefines what leaders traditionally do and how they do it. Seven principles for lean leadership were brought forth from Womack *et al.* (1990), namely, to:

(1) adopt a holistic approach to enterprise transformation;
(2) identify relevant stakeholders and determine their value prepositions;
(3) focus on enterprise effectiveness before efficiency;
(4) address internal and external enterprise interdependencies;
(5) ensure stability and flow within and across the organization;
(6) cultivate leadership to support and drive enterprise behaviors; and
(7) emphasize organizational learning.

Much research has been done to add to support these initial understandings of lean leadership. Burton and Boeder (2003) described five lean leadership competencies, adapted from the lean principles already referred, as the ability to:

(1) specify value in a service, process or operation from the stakeholder's view;
(2) translate value into system improvement;
(3) design or reengineer culture, structures, or processes to flow with, rather than against, the value stream;
(4) to allocate resources based on the stakeholder value; and
(5) to sustain CI techniques to strive for perfection.

Enacting these five principles is to be carried out by lean leaders in a distinctive culture, known as "kata", whereby coaching empowered employees to conduct problem identification and solution is used. Lean leaders, therefore, preside over organizations where participation and distributive leadership are in evidence. But to start LP, Womack and Jones (2003, p. 133) explained that, "[…] the single most effective action in converting an organization to lean practices is for the CEO to lead the initial improvements". The critical role of lean leaders, therefore, provides rationale for lean leadership education.

In the case of Lantech presented by Womack and Jones (2003), it was discovered that leadership followed the principles of TQM, but that linking TQM to core activities was difficult. In fact, even the combination of TQM, better technology and other improvement systems were simply not enough. Lean thinking was needed, and once understood by leadership, was the point of defining success for the workforce and organization. This lean transformation required lean leadership. The distinct advantages of LP are widely known through similar cases of organizational success. For example, Ford's lean leadership as described by Hoffman (2012) was the method that saved the organization. Overall, the need for lean leadership education is further supported by many organizational examples of deep LP deployment lead by leaders who had tried other ideas and methods and found philosophical and operational success.

Leading a lean operation or a lean conversion initiative are described by Mann (2005), as relying on eight distinctive leadership behaviors including, a passion for lean, disciplined process adherence, project management, lean thinking, ownership, recognition of applied and technical tension, balanced commitment to all systems and effective relationships. Therefore, lean leadership education must take this advocacy into account in program and course design and consider how to develop lean leaders to carry out this type of work.

LP is considered a holistic enterprise engagement that requires lean leadership. Lean leaders impact organizational philosophy and culture, values and methods. Therefore, LP implementation is lead and managed in specific ways by lean leaders, namely, by cascading deliberate and disciplined lean protocols for employee empowerment and by maintaining technologies for organizational collaboration and learning.

In addition, lean services is a fertile field where this performance management system has been applied with (Bicheno, 2008). In addition to the BoK on lean leadership in LP, there is also a need to expand the BoK on lean leadership in services. This rationale for the exploring workplace perspectives on lean leadership in a variety of sectors as HEI programming is described in the study below.

## 3. The setting

The setting for the research project is described next and was carried out at an American Midwest university, supported by its lean institute. The lean institute at the university used three strategic pillars:

(1) interdisciplinary academic programs;
(2) student engagement of Lean applications in the workplace; and
(3) university-based CI.

Under the first pillar, the development of academic programs, faculty became interested in the development of graduate lean leadership programming as a Lean Professional Graduate Certificate and/or as a Lean Cognate for a Doctorate of Education (EdD) in Leadership. Several lean courses and programs were already offered throughout the university campus in the School of Education and Human Services, the School of Business Administration and the College of Engineering, but nothing addressed the lean leadership programming need on the graduate level.

## 4. Survey methodology

Not much was known about how to package a successful professional certificate program/doctoral cognate in terms of course offerings, content and method of delivery. The purpose of the study was to inform faculty regarding the proposed graduate lean leadership programming concept. Attending to this aim, the authors considered three main research questions from the workplace:

*RQ1*. What do organizational leaders need from lean graduate programming?

*RQ2*. What methods of delivery for lean teaching/learning are favored by organizational leaders?

*RQ3*. What are the main learner outcomes and do how these impact organizational and CI outcomes favor?

The list of participants was developed from professional networks and contact lists, where knowledge of the institute and/or of the institute's director were leveraged via a telephone survey. The reason for this approach was that the required telephone call interview could be expeditiously carried out with a higher response rate than an anonymous outreach. The leaders and managers contacted represented the potential organizational base of representatives interested in lean applications and employee development opportunities.

A telephone survey for business, industry and non-profit leaders and managers was carried out to gather empirical perceptions on the three research questions. In addition, the same survey was administered online and results emailed to the researchers. A combination of the two approaches was designed to ensure a high response rate if a telephone survey was not possible to conduct. The survey was designed to target a solid cross-section of organizational type decision makers in regard to the need for lean leadership training and the type of lean leadership training desired, if at all, for employees.

The survey had five sections. The first section collected demographic information. It also provided definitions of terms for a baseline of syntax. The following three sections of the survey solicited views for graduate lean leadership programming on lean content, methods of learning and learner outcomes. The fifth section inquired about the survey itself.

The questions in sections two-four are described next. These questions were derived with input and deliberation from university faculty currently teaching various lean courses or sections of courses.

The second section of the survey asked about lean content in nine themes:

(1) *C1 – lean CI thinking*: This theme is related with systems analysis, problem analysis, root cause analysis, flow analysis, CI analysis, etc.

(2) *C2 – lean CI tools*: This is related with tools learning and use like concept maps, process maps, value stream maps, kaizen, A3, 5S, Five Why's, etc.

(3) *C3 – lean leadership human resource management*: Applications of lean thinking and tools to human resource management practices.

(4) *C4 – lean leadership project/process management*: Applications of lean thinking and tools to leadership roles, project and process management.

(5) *C5 – lean data-driven decision-making*: Individual, team, leadership behaviors of data-driven decision-making; knowledge management; synthesis of lean thinking and tools with data-driven approaches.

(6) *C6 – lean systems thinking*: Applications of lean thinking and tools to systems-based approaches ranging from nano-systems to system of systems management.

(7) *C7 – lean visual management*: Understanding of collective work, team efficacy, inquiry and practice behaviors through visual management techniques.

(8) *C8 – lean sustainability*: Understanding of how to standardize and sustain best practice, impacts of sustainability, lean green methods and environmental issues.

(9) *C9 – lean risk mitigation*: Understanding of risk/safety tradeoffs, culture and customer safety, zero-defect thinking and methods, risk aversion and quality assurance.

The third section was about the methods of learning based on four choices:

(1) *M1 – on ground, face-to-face*: (Classroom-based, weekly attendance, project-based learning).

(2) *M2 – online synchronous*: (Pre-scheduled attendance, live interactive webinars, project-based learning).

(3) *M3 – online synchronous*: (24/7 participation and access, training modules, project-based learning).

(4) *M4 – hybrid*: On ground and online, synchronous and asynchronous combinations).

The fourth section of the survey, "Learner outcomes", allowed for the identification of the learner outcomes and was open-ended response.

The survey was emailed out to 37 leaders and 25 responses were obtained via telephone, corresponding to a 68 per cent response rate. The data were collected on individual hard copy surveys and then transcribed into an Excel Database and SPSS®, version 22, for statistical analysis (Field, 2009). The results and findings of the survey are presented next. Where appropriate, non-parametric test of Friedman F

(nonparametric version of two-way ANOVA) was considered for the data analysis. A significance level of 5 per cent was considered.

## 5. Findings of the study

The findings presented next are for data sets from the respondent demographic information, lean content, teaching methods, learner outcomes and survey open-ended responses. In the second and third sections of the survey, mixed method design was applied through three types of analyses from respondent selections of all preferred (based on a Likert scale considered "1" as least desirable to "5" as most desirable) and then ranked choices (in a scale from "1" highest importance to "9" lowest importance). "Other", as well as respondent open-ended comments were also included.

Due to the nature of the type of questions, quantitative analyses for the answers in the Likert scale was carried out and a qualitative analysis was completed by coding and categorizing, searching for emerging themes from the open-ended responses. Each written response or comment was read three times, then coded and categorized. Therefore, most responses were tabulated under multiple themes.

### *5.1 Respondent demographic information findings*

Respondent demographic information provided data on familiarity with lean/CI and other data points of gender, position and years of experience. Information on experience with lean and/or CI of the respondents (R1 till R25) provided some insights (Table I).

From the 25 respondents, government, healthcare, financial services, transportation, professional services and technology sectors were represented. From this sample, 64 per cent (16/25) had experience in both lean and CI, 24 per cent (6/25) had just experience in one of them and 12 per cent (3/25) respondents had no experience in either of them. Of the 22 respondents who had experience in lean and/or CI, 95 per cent (21/22) had experience with CI, but not in Lean, and 77 per cent (17/22) had experience with Lean, but not with CI.

### *5.2 Lean continuous improvement content areas findings*

Due to the two types of findings on content, they were divided into quantitative and qualitative data, although both content analyze was done quantitatively.

*5.2.1 Content quantitative findings.* Respondents answered the question: "Which nine Lean Continuous Improvement Content Areas would be the most valuable for your employees to be exposed to?" Nine choices were available (identified from C1 to C9, as previously identified), plus the option for "other".

Table II presents the descriptive statistics for the nine lean CI contents ordered by the mean obtained. The results represent a positive rate of the majority of the respondents (around 75 per cent with "4", desirable and "5", most desirable) for the contents lean CI thinking (C1), lean leadership project/process management (C4) and lean data-driven decision-making (C5) (these categories are represented in bold, Table II). The remaining six contents represent a different rate distribution with 75 per cent with rate "4" and below. So, two different category groups are identified: the first group with higher rate and the second with a moderate rate. For both groups, the differences in each are no statistically significant ($F(2) = 3.51, p > 0.05$ for the first group; and $F(5) = 5.62, p > 0.05$ for the second group).

| Sr. No. | Title | Company type | Lean | CI |
|---|---|---|---|---|
| 1 | State administrative manager | Government | Yes | Yes |
| 2 | Chief Development Officer | Health system | No | No |
| 3 | Senior Vice President | Financial services | Yes | Yes |
| 4 | President | Medical center | No | Yes |
| 5 | Senior VP Information technology | Bank | Yes | Yes |
| 6 | Former Vice President | Automobile | Yes | Yes |
| 7 | Director, Process improvement | Health foundation | Yes | Yes |
| 8 | Former CEO | Automobile | Yes | Yes |
| 9 | Partner | Consulting | Yes | Yes |
| 10 | VP-Network services | Healthcare system | Yes | Yes |
| 11 | Assistant Vice President | Cell phones | Yes | No |
| 12 | Senior Vice president | Bank | Yes | Yes |
| 13 | Chief Financial Officer | Bus manufacturer | Yes | Yes |
| 14 | Branch Manager | Cell phones | Yes | Yes |
| 15 | Manager Enterprise Systems | Motion and control technologies manufacturer | Yes | Yes |
| 16 | Medical Doctor | Health system | No | Yes |
| 17 | President | Consulting | Yes | Yes |
| 18 | Former VP | Automobile | No | No |
| 19 | Vice President | Rental | Yes | Yes |
| 20 | Director Sustainability | Automobile | Yes | Yes |
| 21 | Executive Director & CEO | Historical society | No | No |
| 22 | President & CEO | Professional corporate event planners | No | Yes |
| 23 | Director | Cell phones | No | Yes |
| 24 | Board Chair | Consulting | No | Yes |
| 25 | Instructional Design Director | Learning center | Yes | Yes |

**Table I.** Characterization and experience of the respondents with lean and/or continuous improvement CI

| Contents | Minimum | Maximum | Mean | SD |
|---|---|---|---|---|
| C1 – Lean continuous improvement thinking | **3** | **5** | **4.44** | **0.77** |
| C4 – Lean leadership project/process management | **1** | **5** | **4.24** | **1.05** |
| C5 – Lean data-driven decision-making | **2** | **5** | **4.04** | **0.84** |
| C2 – Lean continuous improvement tools | 1 | 5 | 3.64 | 1.08 |
| C9 – Lean risk mitigation | 1 | 5 | 3.63 | 1.10 |
| C8 – Lean sustainability | 2 | 5 | 3.48 | 1.09 |
| C7 – Lean visual management | 1 | 5 | 3.48 | 1.00 |
| C6 – Lean systems thinking | 1 | 5 | 3.32 | 1.00 |
| C3 – Lean leadership human resource management | 1 | 5 | 3.12 | 1.33 |

**Table II.** Descriptive statistics for the nine lean contents

*5.2.2 Content qualitative findings.* Four respondents (R4, R8, R9, R23 and R25) put notes in each of the nine lean content areas. Some of such notes are discussed and qualitatively analyzed and whenever necessary, accompanied by some citations.

For the first items, lean CI thinking and tools, it is important to retain the "most value" and the "good orientation". There was also advocacy for "common thinking" related to lean CI content as "work and approach opportunities is [sic] the cornerstone of Lean". (R25). Also, it was stated that lean and CI content "enables

everyone in the organization to challenge their individual work and the processes" (R25).

The CI theme was also considered a leadership activity. According to R25:

> Leadership is a critical component of any successful continuous improvement efforts. Leadership must be actively engaged in CI projects and efforts and their involvement must be visibly evident to the entire organization.

Lean leadership was pointed as a high added value component, supporting the content choice of Lean CI Thinking under these Content Themes. Related to Lean CI tools, R8 refers that "this information is widely available and broadly practiced by companies already. But are they?". R9 go further describing the importance of Lean Leadership Project/Process Management Content under the Content Themes. This was described as essential as organizations effectively managed their projects "in different time zones, multiple languages and different cultures". There was also a positive comment under the Lean Content theme to distinguish between "project vs permanent process change". (R4). This respondent also reflected about how they encourage their people to "think globally and operate locally" in support of lean leadership project/process management content.

Additional notes from R8 indicated that lean data-driven decision-making was seen as a "high value-add opportunity" and also that it is "really hard to do so". Information, such as "Data needs to be married with gut", (R23) "Value Chain and Cost drivers are key components" (R24) and "remember the importance of qualitative analysis based on data" were important notes.

Data-driven decision-making was also enforced through content themes regarding the importance for:

> […] a complete and accurate understanding of a process or problem and base its decision to act on objective facts and data, rather than perceptions and opinions that are often incomplete and inaccurate (R25).

These notes indicated strong support for lean data-driven decision-making among the content themes. The importance of lean thinking, including the use of data to inform, is a point that is often missed in lean deployment. A few of the respondents understood this nuance deeply.

In contrast, both "Lean Risk Mitigation" and "Lean Systems Thinking" were the least desirable content options that were described as a learning method as "applications of lean thinking and tools to systems-based approaches ranging from nano-systems to systems of system management". It was interesting to notice one respondent's feedback (R8), "I suspect that this area has not been fully developed by many companies, so there is potential for high value here". Based on this perception, it appeared that respondents might not have known or experienced the Lean BoK as a part of a holistic organizational methodology.

Nevertheless, other respondents referred to lean risk mitigation as a shortcut to "provide students with real word complexity" (R4) and that is an "important area to explore" (R9). R9 also refers risk mitigation as a key to almost "everything they do help clients", having the company provide training to "all our people tailored for their service lines". In regard to the content area of lean sustainability, respondents agreed that this content area was broadly important for "sustaining Lean efforts". Because the question covered two different aspects of sustainability, one of the respondents (R25) emphasized

the difference between the Lean green methods and environmental issues as a separate category from sustainability of results that means sustain lean implementation efforts.

Other notes from the respondents were related to the content area of lean leadership human resource management, and the respondents were divided. Two respondents (R4 and R8) were not interested in this theme and two intended to show what happened in their organizations: "HR Advisory is growing inside the company" (R9) and "HR contributes to the Lean journey success" by implementing Lean process improvement (R25). According to this respondent, lean human resource management provides the role of "selecting candidates with lean knowledge and skills and that fit into the organization's culture".

Beyond these notes, the "Other Suggestions" category in the content was filled by five respondents (R7, R13, R19, R20 and R25) that highlighted the importance of not consider lean a collection of parts but a system; do not consider lean a cost-cutting exercise and the need of coaching.

### *5.3 Delivery methods findings*

The delivery methods findings were also divided in quantitative and qualitative findings.

*5.3.1 Delivery methods quantitative findings.* The third section of the survey was about the preferred method of educational delivery. There were five choices available for the methods of educational delivery selections, and all choices were provided with definitions, plus other. Respondents selected all desirable method options from the list of four and then they ranked those selections.

Table III presents the descriptive statistics for the four delivery methods (M1, M2, M3 and M4, as previously defined), already ordered by mean. The on-ground, face-to-face method (classroom-based, weekly attendance, project-based learning) received the highest rate, followed by the hybrid method (on ground and online, synchronous and asynchronous combinations), which may be reasonable to reconcile in educational delivery. All of the four delivery methods present amplitude of rate 4, indicating that the respondents' rate by using the 5 values of the scale. On-ground face-to-face (M1) and hybrid (M4) present a positive rate with no statistical significant ($F(24) = 2.89, p > 0.05$). M1 with around 75 per cent with "4", desirable, and "5", most desirable, and 50 per cent for M4. The delivery online synchronous and asynchronous presents a similar rate distribution with 50 per cent with rate "3" and below ($F(24) = 0.82, p > 0.05$).

*5.3.2 Delivery methods qualitative findings.* Eight respondents (R1, R4, R8, R9, R17, R20, R24 and R25) provided notes and filled "Other" category. Most respondents were unanimous about the methods; preferred was project-based training in real environments with real-projects or simulations, as well as practical and hands-on approaches. R25 added that on ground face-to-face was:

**Table III.** Descriptive statistics for the four delivery methods

| Contents | Minimum | Maximum | Mean | SD |
|---|---|---|---|---|
| M1 – On ground, face-to-face | 1 | 5 | 4.08 | 1.18 |
| M4 – Hybrid | 1 | 5 | 3.79 | 1.10 |
| M2 – Online synchronous | 1 | 5 | 3.21 | 1.18 |
| M3 – Online asynchronous | 1 | 5 | 3.04 | 1.08 |

> […] critical since many CI efforts (such as kaizen workshops, waste walks, process mapping, value stream mapping as examples) are team-based and require significant communication, teaching and coaching skills.

Other respondents liked case studies from real business situations because they "resonant" professionally and enhanced the chance to "learn, retain, embrace and deploy" learning.

R9 described the need for on ground methods by mentioned that "with all the web-based learning, classroom and on the job learning are still critical to our professional's development". R20 complement saying "online does not make sense from a learning perspective as a standalone tool".

*5.4 Deliverables/Learner outcomes findings*

The third section of the survey, respondents provided their opinions about deliverables or learner outcomes that would be the most valuable for their employees to obtain and their organization to realize. For the analysis, the data were first examined for an overall perspective of broad areas of responses. Second, the data were categorized into thematic areas based on the reported successes of practice and problems of practice. Third, the categorization of data was reviewed to ensure that correct and complete coding occurred. Each response could have been categorized into more than one theme.

Attending that the survey intends to respond to the three research questions referred:

*RQ1*. Lean graduate programming.

*RQ2*. Methods of delivery.

*RQ3*. Learner outcomes, the categories were grouped accordingly.

There were nine subcategories that emerged from the analysis. These themes occurred in content areas as lean, CI, organizational issues; in delivery methods as method job embedded, method coaching, method results; and in learner outcomes as paradigm outcomes, behavioral outcomes, organizational outcomes. After the qualitative responses were coded and categorized into nine themes, they were tallied for frequency of comments. The most frequent comments were for content analysis in regard to Lean and CI. Also, comments on methods asked for protocols for translation to the workplace.

The following overview of the narrative responses provided the type of comments presented. One respondent, R1, provided a list of learner outcomes that goes from foundation of sustained change to respect, value and empower employees and adoption of a common language, methods and tools (preference for the visual tools) used throughout the company. This respondent was from a company where lean and CI were experienced, and this respondent's list proved interest in the lean journey.

Another interesting perspective on learner outcomes came from respondent R2 who did not experience lean or CI but recognizes the importance of CI and the need to a simplified application of the theory. Nevertheless, this respondent seemed to know what he wanted from a lean program, as this advocacy resembled some lean principles.

Another list of learner outcomes came from respondent R7 who had lean and CI experience as "Executive behavior change; Hoshin planning (focus on review process); Leader Standard work; Coaching Problem solving; and Leading process improvement events". These points indicate a good knowledge of lean culture.

Other important comments were related with the importance of introduction to lean as a valuable perspective for business management that could be effectively linked to other course work and curricula. At the same time, they advocated the applicability of lean thinking principles in every day and everywhere, including personal life and the importance of training workers.

Another important testimony came from respondent R11 who has lean experience, but not CI experience, where he recognized the skills missing in his organization to implement a lean or CI project. Nevertheless, his organization was currently participating in two six sigma projects where the Black Belts running the projects were driving the activity. What came from this testimony is what happens in many companies: hire a consulting company to implement lean, but, many times, they do not engage people effectively. While there are many examples of successful lean consultancy engagements for lean implementation, there are always concerns about the need for leadership within the lean journey. Unfortunately, this kind of project could finish in a disastrous way, ruining all future opportunities to implement lean efforts seriously with appropriate lean leadership.

Also, other comments provided were related with the need to understand the effectiveness of the process as ongoing process and the importance of long-term sustainability. Also, the need to use basic tools such as five Whys and PDCA to discover the root cause of the problems and the importance of on-site observation and analysis of real-world processes and problems to collect data. These comments are indicative of the discipline required and the need for leadership in lean implementation.

According to respondent R21 who had no experience with lean or CI, pointed out process/policies that enabled more efficient and accurate management of typical small functions that included, among others, the human resource matters and payroll and attendance/participation tracking. He added the need of establish clear and precise ownership and accountability criteria and guidelines for routine and extraordinary decision making to have a good business decision-making.

Others respondents wanted to see lean principles applied to create a culture of innovation that, according them, will produce lean thinking to create value, eliminate waste, etc. According to them, there was a need to "force feed" lean to every aspect of business. Additionally, respondent, R18 from an important automobile company in the marketing function who did not have experience with lean or CI, referred to the cultural change that was possible in lean in how the organization manages challenges and problems by looking at them as "opportunities for improvement". He felt that lean concepts applied best to manufacturing; however, this response showed a lack of awareness lean as a trans-disciplinary application.

## 6. Discussion related to research questions

This section discusses the findings of the survey and addresses these findings from the research questions. First, a discussion about demographics findings is presented. There were more respondents experienced in CI than lean. These respondents may have experienced some concepts and tools like the PDCA cycle, total quality control and/or TQM, but had not yet connected those experiences to the lean BoK which might have impacted the feedback on lean content, particularly in regard to CI and lean.

*6.1 Organizational leaders' content desires in lean graduate programming*

The two sets of content quantitative findings provided in Section 5.2 gave some clarity regarding lean leadership course design. The respondents demonstrated a strong theoretical understanding of lean content.

For example, the first analysis indicated a desire for lean CI thinking, lean leadership project/process management and lean data-driven decision-making. This is an important finding because this content is important to lean leadership. Additionally, respondents described lean CI tools as necessary, but they cautioned that they must be applied with purpose and inside a context. For example, visual management was understood as a tool, a powerful tool because it can help employees detect a deviation/abnormality so that it can be addressed immediately. Some respondents also understood lean risk mitigation as a tool and appointed "FMEA" as one example. Additionally, the respondents' comments in Section 5.2.2. provided insights within themes that reinforced the value in lean course offerings overall. Detailed information was also gleaned, providing guidance into program/course design. The findings indicated a strong preference of organizational leaders by lean CI thinking and lean leadership project/process management for content of a lean course. These are detailed responses that informed faculty regarding the need for depth in lean leadership theory in the graduate program. Use of expert lectures, guest speakers and other resources need to be carefully explored to ensure quality of theoretical content requested.

From the section "Other Suggestions", respondents highlighted their comprehensive views of lean content as related to lean leadership. Several points on content included the need to demonstrate lean as a system of knowledge; the importance of lean leadership understanding real lean versus fake lean deployment; the need to collect, measure and analysis data to inform decision-making; and the need for coaching cultures. The use of scientific method was described as the foundational way to drive improvement. These findings highlighted to faculty the need for application-heavy lean leadership content in the graduate program. Use of case study, site visits, simulations, virtual reality and other learning opportunities should be considered in the program design to ensure application-based content is provided.

*6.2 Preferable methods of delivery lean teaching/learning*

The quantitative analysis in regard to delivery methods does provide some clarity for delivery, but there were split findings regarding online versus on-ground delivery. However, this analysis did indicate that there are a variety of opinions on preferred delivery method meaning that either the program should offer different delivery options within a course or the program or that in selecting one method over another, an organization may lose interest in the program. This informed faculty that expertise in both online and on-ground instructional design and delivery was needed for program success. And that this need should inform selection of teaching faculty in the program so that faculty is comfortable in either teaching delivery method.

An interesting finding from the qualitative perspective was that regardless of the delivery methods choices, respondents advocated heavily for application and coaching within the work setting. This informed program design in regard to the need to ensure a protocol for employees to engage in lean project management at work under the guidance of a mentor. Therefore, high levels of workplace coordination are needed for the program, ensuring that supervisors are supportive of subordinate participation and

that willingness for mentor-mentee experiences is possible. These findings inform faculty that due to desired delivery methods, student recruiting will need to be organization based. In turn, this may limit the program availability to individuals not associated with an organization interested in a cohort model. Also, the university will need to appoint workplace coordination to deal with supervisor coordination and mentor-mentee coordination. Another consideration from this finding is that program delivery may be well-suited to intensives, where workplace focus is condensed with classroom time once a month for two-three days sequentially. This informs faculty about the program calendar.

*6.3 Learner outcomes and organizational impact*

The analysis in Section 5.4 provided insight into the number of themes that emerged in regard to learner outcomes. These comments indicated that support for lean programming had to provide organizational impact to be considered valuable training for employees. From the comments of Section 5.4, it is evident that learner outcomes expected from lean programming were the learners' ability to impact organizational and CI outcomes. This should be achieved by adopting a serious posture, acquiring system and critical-thinking, using problem-solving skills, behaving as life learning learners, enacting servant-leader behaviors, ensuring persistence and understanding in leadership, working in teams and motivating people and being entrepreneurial, among others. These learner outcomes certainly exceed a traditional list of leadership content mastery and include leadership competencies. Therefore, faculty will need to develop standards and rubrics for competency-based teaching and assessment. This represents a significant area of new approaches to program development and design at this university. Therefore, faculty appointments or endowments for this new type of graduate program research and design will be needed.

## 7. Conclusion

The main purpose of this article was to present the results of a survey promoted by a Lean Institute at a Midwestern university to inform about employers' views on the scope, design, delivery and content of a proposed Lean Continuous Improvement Professional Certificate and Lean Leadership cognate for a proposed Doctorate in Education. So lean graduate programming needs of organizational leaders, preferable delivery methods and student learner outcomes were pulled from the survey developed in collaboration with organizational leaders of the state, to better serve the surrounding community by giving them a trained workforce they need.

The mixed methods approach used in this study for the respondents, most with experience in lean and/or CI, provided evidence that the lean CI thinking and lean leadership project/process management content selections were highly desirable. The need for thinking, project/process management are very important because lean deployment requires a philosophical and dispositional approach for success that it is only achievable by a good project management. Followed is the lean data-driven decision-making content area. This is understandable as lean is not based on perceptions or opinions, but instead it is based on data measured on the shop-floor. These results answer to the first research question and informed faculty as to content.

This analysis was also done to identify preferred methods of educational delivery. On-ground face-to-face method with the higher score received the highest importance.

The second ranked, the hybrid method, received the strongest association from the respondents. The combination of the online synchronous and asynchronous responses equaled the total of on-ground face-to-face importance.

This analysis was also done to determine learner outcomes. There was clarity around learners being able to apply both lean and CI. There was concern for the impact of the program on the workplace in that respondents wanted to see onsite project management with coaching as a method to ensure learner outcomes. Also, it was seen that respondents did not want to invest in the program unless it would both impact and fit in with the organization. This may provide a bit of quandary for the lean program participants in that lean requires change agency and lean deployment may, in fact, disrupt the organization. However, it is important that any lean graduate program does translate well into the context and culture of the workplace; otherwise, it will be a meaningless exercise. These findings answer to the third question and informed program design, marketing and how to ensure the program produced results desired by these organizations.

In total, specific lean content areas of interest included depth of theory and application-based content which request access to quality resources and sources were discovered. Methods of delivery requested hybrid, intensive and work-based approaches which requires deliberate workplace-classroom coordination. Learner outcomes requests included a comprehensive list of leadership knowledge and competencies that requires a program design and build to include both content and competency demonstrations of mastery. These findings are helpful to faculty in providing a quality and relevant lean leadership graduate program.

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