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# Improving business school courses by applying lean principles and practices

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## Keywords

Business schools, Customers, Education, Quality improvement, Value added

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## Abstract

Describes the application of lean principles and practices to the design and delivery of a graduate business course on leadership taken by part-time working professional students in a classroom setting. The principal objectives were to improve consistency between what was taught in the course and how the course was taught, eliminate waste, improve the quality and relevance of course materials, and deliver greater value as perceived by students. Results indicate a higher level of student satisfaction, in part through clearer expectations, less ambiguity regarding lectures and assignments, standard formats for assignments, smoothing individual and team assignments over the semester, and better management of students' time both in and outside class. This joins a growing body of work that demonstrates the applicability of lean principles and practices to service businesses, and the achievement of improved outcomes.

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## Introduction

Many manufacturing and some service businesses today are using lean management principles and practices as a means to improve business processes, which in turn improves productivity and competitiveness, and delivers greater value to end-use customers (Bowen and Youngdahl, 1998; Goland *et al.*, 1998; Lean Enterprise Institute, 2003; Swank, 2003; Shingo, 2004; Wysocki, 2004). The lean management system was initially developed by Toyota Motor Corporation (Ohno, 1988; Womack *et al.*, 1990; Monden, 1993; Womack and Jones, 1996; Toyota, 2001; Emiliani, 2004a, b) beginning in the mid-1930s, with elements of the management system dating to the late 1800s (Toyota, 1988; Kimoto, 1991). It borrowed key concepts and practices developed by Henry Ford and Charles Sorenson (Ford, 1988; Sorenson and Williamson, 1956; Ohno, 1988), as well as Frederick Taylor (Taylor, 1967).

Importantly, the lean management system as it is known today did not start out that way. It has evolved purposefully over time, driven by practitioners, in alignment with Toyota's corporate purpose (Basu, 1999), anchored in key principles (Ohno, 1988; Toyota, 2001), and by applying the scientific method to the practice of management:

- (1) observe a phenomenon;
- (2) formulate a hypothesis to explain the phenomenon;
- (3) conduct experiments to prove or disprove the hypothesis; and
- (4) reach a conclusion that validates or modifies the hypothesis.

Thoughtful application of lean principles and practices results in many benefits, including higher quality products and services, increased market share, margin expansion, revenue growth, stable employment, better customer focus, faster response to changing market conditions, and higher asset efficiency. Importantly, a key focus of lean management is time and how time is used, with the intent of improving responsiveness to customers and ensuring that associates' lives are not being wasted while at work doing unnecessary things (Minoura, 2002). Businesses that practice lean management well are formidable time-based competitors because information (e.g. parts, documents, verbal communication) flows with fewer or even no interruptions (Fujimoto, 1999; Emiliani *et al.*, 2003).

Lean management is distinctly different from conventional, or "batch-and-queue" (B&Q) business practices (Monden, 1993; Womack and Jones, 1996; Emiliani *et al.*, 2003). Batch-and-queue means that materials are processed in large batches, which result in long queue times between



operations. While the term batch-and-queue originated in manufacturing, the conventional way to deliver services is also batch-and-queue, for example processing information, documents, etc., in large batches, which again results in long queue times. Batch-and-queue processing – whether it is materials or information – has many serious deficiencies, including long lead-times, lower quality, higher cost products or services, customer dissatisfaction, and poor information flow (Womack and Jones, 1996; Bowen and Youngdahl, 1998; Goland *et al.*, 1998; Brady, 2000; Barron, 2000; Emiliani *et al.*, 2003; Swank, 2003; Wysocki, 2004). While *any* “batch-and-queue” process is considered undesirable by lean thinkers, they also recognize that the real world is imperfect, and thus some “batch-and-queue” processes may have to exist until new ideas emerge that eliminate them. Thus, lean thinkers continue to think about how to make processes and related activities consistent with lean principles and practices.

Unfortunately, most managers understand and practise lean as a set of tools – simple add-ons to conventional batch-and-queue business practices – and also view lean as a way to reduce headcount, usually through mass layoffs (Post and Slaughter, 2000; Varnon, 2003). Thus, the term “lean” has for many workers become synonymous with bad outcomes such as layoffs (e.g. *Layoff Every Associate Now*). Managers using lean principles and practices typically fall prey to an abundance of misconceptions about lean, and usually misapply some or all aspects (Smart *et al.*, 2003; Swank, 2003; Center for Lean Business Management, 2004). It is not surprising that associates, or other key stakeholders such as suppliers or customers, experience negative outcomes. As a result, most businesses fail to realize the full benefits of the lean management system (Womack *et al.*, 1990; Emiliani and Stec, 2004).

The current author had industry experience in implementing lean business practices in manufacturing and service settings, and later, as a result of a career change to become a business school professor, taught the lean management system and wrote numerous papers on lean management principles and practices. Since making the switch to teaching in 1999, the author set out to apply lean principles and practices to the design and delivery of his leadership course for two reasons:

- (1) to improve consistency between what was taught in the course and how the course was taught; and
- (2) the correct application of lean principles and practices normally results in higher customer (i.e. student) satisfaction.

The student body of the Hartford, Connecticut, department of Rensselaer Polytechnic Institute’s Lally School of Management and Technology consists of about 600 working professionals seeking Master of Science (MSc) degrees in management and Master of Business Administration (MBA) degrees part-time. They typically have ten to 15 years of work experience and hold supervisory, mid-level management, or executive positions in mid-size and large corporations. A course on leadership was developed and modified over several semesters, beginning in 2001, to be more consistent with lean principles and practices, and within parameters established by the business school and the accreditation body, AACSB International (Association to Advance Collegiate Schools of Business, 2003).

This paper describes the application of lean principles and practices to the design and delivery of a graduate business school course. The results show a higher level of student satisfaction, in part through clearer expectations, less ambiguity regarding assignments, standard formats for assignments, smoothing individual and team assignments over the semester, and better management of students’ time both in and especially outside class. The latter is a very important component of the value proposition for working professionals because they have necessary work and family life issues to attend to in addition to their academic work (Polson, 1993). For them, graduate school is not a full-time job. Additional professional and personal demands on part-time students’ time can be due to business travel, job change, added workload and project deadlines (professional reasons) or a new child, child care, care of the elderly or divorce (personal reasons). As a result, most part-time students have difficulty finding four to six hour blocks of time needed to complete an assignment. However, they can more easily find four to six one-hour blocks of time in between professional and personal activities. The students’ sensitivity to time, if recognized and accepted by the professor, challenges that professor to think critically about what he or she is trying to teach, course structure, content, and delivery, and the ultimate objective of the material presented for study.

This paper should be of interest to university management and professors because it presents an effective way to focus key concepts, increase the instructor’s effectiveness, and achieve greater satisfaction among part-time students. However, applying lean principles and practices to courses alone may not result in significant improvement, as the instructor’s speaking ability, course content, methods of analysis, overall impact and related

student services are also important determinants of part-time student satisfaction. This paper may have less applicability to students enrolled in full-time undergraduate or graduate programs because they have different demands on their time or may perceive the value of traditional modes of education differently. It is likely, however, that there are more similarities than differences in how adult students perceive value, and thus the opportunities for improvement may be much broader than initially apparent. In other words, most professors will find reasons why lean principles and practices do not apply to them, when they may indeed apply. The many misconceptions and negative perceptions of lean management create handy reasons for inaction in other practitioner communities such as service businesses, including higher education.

### Lean principles, processes, and tools

Lean is a management system which is designed to be responsive to the needs of humans in business and deliver better outcomes for key stakeholders such as associates, suppliers, customers, investors, and communities. It is rooted in key principles and supported by simple processes and tools that are designed to help people improve productivity and consistently deliver the value that customers seek in the products and services they buy. The overarching lean principles and two key objectives are presented in Table I (Ohno, 1988; Womack and Jones, 1996; Toyota, 2001).

Some of the key processes and tools that are used in the lean management system to help people eliminate waste and create value for end-use customers are presented in Table II (Imai, 1997; Rother and Shook, 1999; Emiliani *et al.*, 2003). The intent of these processes and tools is to simplify work and the workplace, improve quality,

reduce lead-times, and focus people on value-creating activities. Importantly, they also help people realize their full potential and actualize their innate desire to make positive contributions to the workplace, which enables a more consistent stream of successful outcomes.

In the lean management system, an important question is: Who is the end-use customer[1]? Normally, it is the person that pays for and uses a product or service. For example, if you buy a computer and use it, then you are the end-use customer. At Rensselaer (Hartford), the person who pays for the teaching service is often different from the person who uses it. While in some cases the teaching service is paid for and used by the student, in most cases the student receives the teaching service but their employer pays for it in whole or part. So the end-use customer, from a practical standpoint, is *both* the student and their employer. It is their perception of value that matters most, and much of that perception is based on price, time commitment, school reputation, and what the student actually learns. The end-use customer could be the person or company that buys the product or service that the student's employer sells. However, since they are likely to be unaware of the link between an employee's education and any improvement in the value proposition that they seek, the end-use customer is best recognized as the student and their employer.

Value as perceived by students and alumni is articulated through direct contact with faculty and administration, inclusive of formal and informal anonymous feedback mechanisms. This can include (Aspen Institute, 2003; Merritt, 2003):

- business school reputation;
- new career opportunities and associated financial rewards;
- stronger international business, entrepreneurship, and information technology courses;

**Table I** Key lean principles and objectives

		Explanation
<b>Lean principles</b> (Toyota, 2001)	Continuous improvement	Day-to-day activities performed to improve business processes in response to changing market conditions. Called "kaizen" in Japanese, which literally means "change for the better", and is often interpreted as "continuous improvement". Utilizes specific processes and tools to achieve improvements
	Respect for people	People (i.e. stakeholders such as associates, customer, suppliers, investors, and the community) are valuable resources to which a business owes its existence. Disrespecting people creates waste
<b>Objectives</b>	Eliminate waste	Eliminate activities and behaviors that add cost but do not add value as perceived by end-use customers. The original seven wastes are (Ohno, 1988): overproduction, waiting, transportation, processing, inventories, movement, and defects. The eighth waste is behavior (Emiliani, 1998a). Waste is called "muda" in Japanese. Important related concepts are the elimination of unevenness ("mura" in Japanese), and unreasonableness ("muri" in Japanese)
	Create value for end-use customers	Focus on the value-creating activities that end-use customers desire

Table II Lean processes and tools

Lean process or tool	Explanation
Five Ss	Stands for: sort, sweep, straighten, shine, sustain. Important for establishing an organized workplace
Just-in-time	Subsequent operation acquires parts (or information) from the preceding operation when needed, in the quantity needed
Kaizen	Literally means "change for the better", also interpreted as "continuous improvement". Process used to identify and eliminate waste
Lean behaviors	Applying lean principles and tools to improve leadership behaviors and eliminate behavioral waste (Emiliani, 1998a, b)
Load smoothing	Called "heijunka" in Japanese. Used to smoothe fluctuations in customer demand
Percent loading chart	A one-page diagram depicting the cycle time between operations or workers compared to the rate of customer demand. Helps identify workload imbalances
Policy deployment	Called "hoshin kanri" in Japanese. A process used to connect corporate strategy to key objectives and resources, including daily activities across functions
Quality function deployment ("voice of the customer")	A process used to incorporate the wants and desires of intermediate and end-use customers in the design of goods and services
Root cause analysis	Methods used to determine the root cause of a problem and identify countermeasures to avoid repeat occurrences. Key tools are "5 Whys" (asking why five or more times until the root cause of the problem is discovered) and fishbone or cause-and effect diagram
Standard work chart	A one-page diagram showing the sequence in which work is performed
Takt time	The rate of customer demand. Used to establish a direct link between marketplace demand and workplace activities
Total productive maintenance	A program used to ensure that equipment is in good operating condition and available for use when needed
Value stream maps	A one-page visual representation of material and information flows. Used to identify improvement opportunities and eliminate waste
Visual controls	Signs and other forms of visual information used to simplify the workplace and make it easy to recognize abnormalities

- dealing with organizational politics and the challenges associated with mid-management positions;
- gaining a better understanding of tangible issues associated with becoming a top manager;
- managing value conflicts; and
- integrating social responsibility throughout the curriculum.

Employers, however, often do not typically specify the value they expect to receive, or business school personnel may not actively seek an understanding of value from the employer's perspective. Among the most important voices are the managers to whom graduates report directly, not recruiters. Thus, both faculty and administration often have a poor understanding of the value that employers expect to receive. In cases where managers specify value, it can include (Doria *et al.*, 2003):

- stronger writing, public speaking, and team-building skills;
- more courses in leadership and managing human resources;
- differentiation (i.e. allowing students to focus on a particular industry, rather than exposing students to many different industries);
- learning how to apply the scientific method to business and management problems;

- learning how and when to use formal root cause analysis methods; and
- integration of business activities across functions versus silo-based pedagogy (i.e. discrete coursework in finance, marketing, operations, strategy, etc.).

These views indicate that the value proposition for students and employers can be improved. The key question is whether or not faculty and administrators are willing to respond to this feedback and improve the service that they provide. A recent report by the accreditation body for business schools, AACSB International, identified "curricular relevance" as a key issue, and suggested that business education providers must differentiate themselves relative to curricula and programs and better address basic management skills such as communications, interpersonal skills, multi-cultural skills, negotiations, leadership development, and change management; and an outward-facing curriculum designed to enhance relevance of curricula to the particular market niche targeted by the school, through discussions with business and community constituents, to generate boundary-spanning content, alternative pedagogical approaches, and diversity of participants and deliverers, including the integration of clinically experienced executives[2]

into the faculty, in accord with accreditation requirements (Association to Advance Collegiate Schools of Business, 2002). The improvement opportunities identified by AACSB International, as well as other recent calls to improve graduate business school education (Karapetrovic *et al.*, 1999; Donaldson, 2002; Etzioni, 2002; Mintzberg *et al.*, 2002; Pfeffer and Fong, 2002; Aspen Institute, 2003; Ghoshal, 2003), are consistent with the value creation approach used by lean management system practitioners. While the need to improve is clear and seems simple enough, the key question is: how do you do it?

## Discussion

Higher education in general, and graduate business courses in particular, have many “batch-and-queue” characteristics (Dahlgard and Østergaard, 2000; Alp, 2001; Comm and Mathaisel, 2003). Since “batch-and-queue” is considered undesirable by lean thinkers, they will seek opportunities for improvement based upon what they know, i.e. the lean principles (Table I) and processes and tools (Table II) used in day-to-day management practice. Table III summarizes several course elements and illustrates common approaches to each element under the heading “Conventional course”, while applying Lean principles to these same course elements are presented under the heading “Improved course”. Note that the “Conventional course” element

descriptions are generalizations of common characteristics based on the review of literature on higher education. They are not intended to imply that all business school courses are as characterized, or that professors are not interested in improving their courses or teaching abilities. Each course element is discussed below.

### Business principles

Professors typically do not explicitly disclose the fundamental basis of inquiry at the start of the course relative to any established system of business principles (Locke, 2002). Thus, students are left to infer the presence of business principles, possibly from courses taken previously, which may or may not serve as appropriate guidelines for management decision-making. Alternatively, the professor may explicitly support a single business principle such as the supremacy of shareholders, which typically manifests itself as: “the prime responsibility of senior management is to maximize shareholder value”. This unilateral business principle has serious shortcomings, as the recent financial scandals among major US corporations have shown, including widespread conflicts of interest (Kelly, 2001; Cassidy, 2002; Emiliani, 2004a).

Lean thinkers, on the other hand, view multi-lateral business principles as essential anchors for framing problems and for decision-making among senior managers, as well as people at lower levels, and believe that business has both social (i.e. human) and economic responsibilities (Basu, 1999; Kelly, 2001; Toyota, 2001; Handy, 2002;

Table III Graduate course design and delivery

Course element	Conventional course	Improved course
Business principles	None (or not explicit), or shareholder supremacy (tacit or explicit)	Lean management principles (Table I) and the Caux Round Table's <i>Principles for Business</i> (Caux Round Table, 2004)
Syllabus	Five or more pages long Ambiguous student expectations Common errors that lead to lower grades are not identified Sometimes not followed	3-4 pages Student expectations simply defined Identify common errors that lead to lower grades Closely followed and referred back to frequently
Required reading	Voluminous; confusing or complex Routinized or customary learning approach Non-deterministic solutions to business problems (i.e. broad range of possible solutions)	Focused, “less is more”, direct and simplified Scientific method, including formal root cause analysis Deterministic solutions to business problems (i.e. single or narrower range of possible solutions)
Assignments	Ambiguous, with poorly defined learning objectives Every few weeks All individual or all team-based Tens of pages in length	Clear, with well defined learning objectives Weekly assignments Balance of individual and team assignments No more than 1-3 pages
Examinations	Mid-term and final examination, or final examination only	Bi-monthly or weekly assignments, each serving as an examination
Student feedback	At end of course Professor may or may not make changes	At mid-term and end of course Professor responds to feedback when received
Course remembrance	Lecture notes, graded tests and assignments, reading materials (if saved by student)	One-page “visual control” summary of course content using diagrams and words One-page table listing common errors made by senior managers

Caux Round Table, 2004). The business principles used in the “Improved course” espouse a balanced stakeholder perspective, which students soon realize can result in better outcomes for all key stakeholders, including shareholders (Emiliani *et al.*, 2003). Introducing established multilateral business principles at the start of the course provides both a deeper and more focused basis for discussion of material presented throughout the semester. Perhaps not surprisingly, students at Rensselaer, and probably graduate business students in general, are unaware of the existence of multilateral business principles. This sets the stage for real improvement in management thinking and future practice.

### Syllabus

Academics, as well as people in general, often equate many pages of text with high quality or thoroughness. As a result, it is common to find course syllabi that are highly detailed and thus several pages in length (Altman and Cahsin, 1992). Alternatively professors may simply be responding to policy set forth by the school (University of Wisconsin-Madison, 1993) or by custom. Either way, attempts to completely detail all aspects of the course can result in confusion among students. As in the case of contracts, more pages create more opportunities for differences in interpretation of requirements, which can lead to disputes (i.e. waiting and behavioral waste; Table I) between students and professors or administrators. Further, unnecessary variation will require the professor to spend a lot of time with students clarifying matters one-on-one, and may inadvertently give inconsistent or contradictory direction to students (i.e. defects; Table I). This can make grading more difficult or less consistent.

Lengthy syllabi may be an indication that the professor is putting too much material in the course, possibly resulting in ambiguous or contradictory themes, which may diminish planned learning outcomes. In other words, the course may lack focus and relevance, despite good intentions. In addition, fancy requirements such as elaborate grading criteria can look impressive, but can in fact be difficult to manage and may result in time-consuming disputes.

Lean thinkers see things differently. Lengthy syllabi represent an opportunity to consolidate, simplify, and clarify requirements – to reduce variation in interpretation (i.e. defects; Table I) and avoid wasteful conflicts that consume time and detract from learning. Simplifying the learning contract and making it less ambiguous, including grading criteria, is welcomed as a challenging improvement opportunity. This helps the

professor improve the focus and relevance of course materials and related requirements.

Students, like any worker, are concerned about doing a good job. Among other things, they want to get a good grade for each assignment and for the course. In lean management practice, workers are made aware of common problems that make the job more difficult and lead to poor outcomes, which is consistent with the “respect for people” principle. Lean thinkers would apply a similar logic, i.e. make all students aware of the four or five most common errors (i.e. defects; Table I) that lead to lower grades. Not disclosing this type of basic job-related information would be inconsistent with the “respect for people” principle. Further, the typical assumption is that a poor grade is the student’s fault, when in fact the professor may have more to do with this form of variation than meets the eye. A lean thinker establishes an environment that facilitates learning and in which people can improve and succeed, yet without doing the job for them.

### Required reading

Conventional courses often require volumes of reading materials – books, cases, and papers. It is often up to the student to sort out the relevance of the information contained in the readings for each assignment (Paul *et al.*, 1996). Since this is probably the basis for learning that most business school professors encountered in graduate school, it seems reasonable to continue the tradition. But is it? It can result in a routinized or customary learning approach, which has been validated through tradition – though that does not necessarily mean it is valuable or effective (Mintzberg *et al.*, 2002; Pfeffer and Fong, 2002), as the recent business scandals have shown (Ghoshal, 2003). In addition, the solutions to business problems are non-deterministic in many courses, especially those that rely extensively on the case method. This outcome seems sensible given the absence of scientific method, formal root cause analysis, and multilateral business principles (Locke, 2002) as the basis for the study of business problems. After all, successful professors raised in this tradition probably see nothing wrong with it.

Lean thinkers see business problems as “abnormalities” that can and must be corrected to ensure consistency with the principles and objectives presented in Table I and achieve better outcomes. They believe in the maxim “less is more”, and that it is important to provide people with focus so as not to waste time and effort (i.e. processing, movement, and transportation; Table I). Therefore, required readings will be focused and thematically consistent in order to reduce variation in interpretation and achieve planned

learning outcomes. In addition, lean thinkers will emphasize the application of the scientific method to *any* business problem. Further, the use of root cause analysis is typically thought to be applicable only to engineering or manufacturing problems, and thus not useful for understanding business problems. Lean thinkers know that the use of formal, yet simple, root cause analysis methods will help students identify the sources of business problems and facilitate the identification of “countermeasures” to prevent their recurrence. Formal root cause analysis is very important because it helps students identify deterministic solutions, or at least a narrower range of potential solutions.

### Assignments

Typically, there is no requirement for faculty to present to students, either orally or in writing, the learning objective(s) for each class and each assignment, though there is often such a requirement for the course itself (Pennsylvania State University, 2004). Thus, questions may arise among students, especially part-time students who have strong interests related to application (Polson, 1993; Hoyt and Lee, 2002), including “What is the objective of this reading or assignment?”, “What is it supposed to teach us?”, “How does it link to previous or future materials?”, and “Why are we doing this?”. Indeed, the professor may not know the answers to these questions because they may have never given it much thought. If they don’t know, then how can students know? It is unreasonable to expect students new to a knowledge area to easily discern the learning objective (Alp, 2001; Association to Advance Collegiate Schools of Business, 2004), and may lead to mistaken impressions or missing the point of an assignment.

Assignments may be due every few weeks, which represents batching or uneven workflow. For whose convenience is the batching done, the student or the professor? Further, assignments may be all individual or all team-based. If they are all individual, students may feel that they were not given opportunities to participate as a team. If assignments are all team-based, then students may feel that they did not have an opportunity to demonstrate their individual talents and capabilities. And how many pages does the professor require students to write? It is common for students to write papers ten to 20 pages or more in length, often several times a semester. What do students think about when faced with this requirement, especially part-time students who are pressed for time? Most will focus their attention on achieving the page count and focus less on learning (which was ambiguous anyway since the learning

objective was not defined). Students will import many charts, diagrams, and photos into the paper, tighten page margins a small amount, increase the font size by half a point, or use a larger font such as Arial instead of Times New Roman. These aren’t bad people – it’s just human nature. Obviously, students are being driven to pursue a different objective.

Lean thinkers believe that they should not waste customers’ (i.e. students’) time, as that annoys and distracts them, and can result in the loss of future business. They believe that people left to guess about desired outcomes are not using time effectively, and that ambiguity and variation in interpretation obscure expectations. Clarifying expectations, succinctly in writing and emphasized verbally, helps both student and teacher do a much better job. Smaller, more focused assignments are given weekly to smooth the workflow, with a balance between individual and team-based assignments. Careful thought is given to which assignments are better executed individually or by a team. Since most professors dislike reading lengthy papers, why do they ask for them in the first place? Probably it is because that is what they were asked to do in graduate school as *full-time* students. Carrying on this tradition seems sensible if all customers are the same – but they are not.

The questions or subjects of investigation asked for in assignments are carefully constructed to ensure focused learning and to provide the professor with information that he or she can be enthusiastic about reading and can also learn from. Assignments are returned in a standard format, typically a table, which can be evaluated by the professor quickly and easily, and returned to students in time for discussion in the next class. Page count is limited to one to three pages, an amount normally sufficient to determine whether students understand the problem and have responded to it effectively, and eliminate the waste of overproduction (Table I). This approach does not diminish the potential value of extended inquiry as represented by more lengthy written assignments. Rather, it simply recognizes that long papers are not needed for most assignments, but they may be useful for certain assignments.

### Examinations

In graduate school, examinations are often given at the mid-term and at the end of the course. In some cases, one examination is given at the end of the course, or the final examination may take the form of a major semester-long project. There may also be a few additional minor grading opportunities during the semester through occasional quizzes, class participation, attendance, or team presentations. However, students typically dislike

approaches that offer few opportunities to earn grades.

Lean thinkers view having only a few grading opportunities in a semester as queuing and then downloading large batches of information, which introduces opportunities for wasteful variation. They also ask themselves some simple questions. Why are there only a few substantive grading opportunities in the semester? Is it done that way because that's the way it has always been done? Is this done primarily for the benefit of the professor, to reduce their grading workload? If it's done for the professor's benefit, then the perspective is wrong – the focus needs to be on the student. Lean thinkers increase the frequency of examinations, or use each weekly assignment as an examination, thereby giving students a dozen or so opportunities to earn grades and thus eliminate a potential source of dissatisfaction – and eliminate behavioral waste (Table I).

What about the lag time between when a mid-term or final examination is given and when students receive feedback from the professor? In most cases there is a significant delay, driven by the batch nature of examinations, the professor's schedule or interest in grading the examinations (Clio, 2003; Carroll, 2004), and possibly the absence of a school policy for when grading (other than final examinations) should be completed and returned to students. While the grade is important to students, the feedback (e.g. written comments) may no longer be important to them because they have moved on to other matters. This diminishes learning, as well as opportunities for student-teacher interaction – a situation that would not be acceptable to lean thinkers because waiting is one of eight wastes. Instead, feedback must be timely and accurate, both of which are supported by articulating the learning objective, giving weekly assignments, using standard formats for responses, and limiting the page count to one to three pages.

### Student feedback

Formal feedback on a course and the professor is generally solicited anonymously from students at the end of the semester by the administration using a survey instrument designed in-house or procured from a supplier. Importantly, the professor may not receive the results of the survey in time for use in the next semester, while formal feedback obtained at the end of a course does not give the professor a chance to make changes *during* the course. Further, professors may ignore the feedback due to arrogance, dislike of criticism from students, or an unwillingness to change (Hilt, 2001; Emery *et al.*, 2003), characteristics that part-time graduate business students will probably find

troublesome and maybe also hypocritical because in their workplace, performance evaluations impact their pay and advancement (Ahmadi *et al.*, 2001). In addition to not being timely, conventional routes for obtaining feedback may be poor indicators of teaching effectiveness (Emery *et al.*, 2003; Morgan *et al.*, 2003). In these ways, the voice of the customer may be delayed or diminished.

Lean thinkers also strive to incorporate the voice of the customer in products or services, and view formal and informal customer feedback as a valuable resource for making improvements. Formal feedback is solicited at the end of a transaction (i.e. batch mode), but it typically consists of fewer questions, 10-15 as opposed to 30-50. However, informal feedback is often obtained sooner. While a lean-thinking professor may not be able to change the administration's use of lengthy formal student surveys administered at the end of the course, he or she can ask students for anonymous feedback at the mid-point of the course (Kay, 2004) and incorporate as many suggestions as possible into the remaining classes – and tell students which suggestions were incorporated, where and how. This gives students an opportunity to shape the course in real time, while also supporting attributes commonly taught in business school: empowerment, buy-in, giving timely feedback, and responding to feedback (Ahmadi *et al.*, 2001). It gives the professor an opportunity to show he or she is serious about improvement and that students' suggestions are truly valued. Informal feedback may be given to the professor at any time, and is acted upon by lean thinkers. If a suggestion cannot be acted upon, then the professor tells the students why not, or gives an indication when the suggestion will be incorporated into the course.

### Course remembrance

When students successfully complete a course, they leave the course with inventories, such as lecture notes, graded assignments and reading materials. The textbook may be sold back to the bookstore if it is judged to have little future value. The vibrant used textbook market indicates this is a common outcome. Most students will never again return to their instructional materials, partly because it can be difficult to sort out (or process, Table I) the relevant information in relation to future job-related business problems. So it sits on a bookshelf, finds a home in the attic or basement, or ends up in the garbage. Students will move on to the next course and turn their attention to current course requirements. So what will students remember about a course in the years to come? Is it

what the professor wanted them to remember? Did the professor even indicate specifically what he or she wanted students to remember? Did the students remember it? How can the professor be sure that they did?

Lean thinkers know that most people are very busy and have a lot of things to remember. Therefore, simple “visual controls” are created to convey important information. These are signs, symbols, or one-page diagrams that, after careful thought, distil the essential information so that it can be comprehended at a glance. A lean thinker would take the challenge to summarize the entire course on a single sheet of paper (one- or two-sided) to eliminate the waste of future processing and inventories (Table I), and do so without trivializing the course or its content. It would contain a combination words and graphics, and judiciously use colors to emphasize certain points. The professor can provide the one-page summary, or teams can be challenged to create their own summary as a final assignment. Students then leave the course with a meaningful, information-rich visual control that they can display at work or at home to remind them of key teachings. The professor can also provide a one-page summary of the top ten or 20 errors that senior managers commonly make relative to the course topic. This will help students detect and avoid such errors in the future, and hopefully lead to better management.

Table IV describes how lean principles and practices can be applied to course design and delivery. This approach to improvement will help eliminate waste and create a more valuable educational experience for current and future students, and should result in better outcomes for their employers, as well as professors and the school. The improvement approach described here obviously must be used in a manner consistent with balancing the mostly shared but sometimes competing interests of the primary stakeholders of part-time graduate business programs, i.e. AACSB International, the school, students, employers, and professors.

### Outcomes

Figure 1 shows the leadership course ratings, starting with the introduction of the course through to the fifth semester that the course was taught. The course ratings were determined using the Individual Development and Educational Assessment Center (IDEA Center) survey instrument (Individual Development and Educational Assessment Center, 2004a), and administered as instructed by IDEA. Raw scores are presented instead of adjusted scores, which factor in extraneous influences. The intent of the

adjustment is to “level the playing field for purposes of administrative decisions” (Individual Development and Educational Assessment Center, 2004b), and thus is not relevant to the present work.

The ratings show improvement over time in the IDEA Center survey categories “Overall excellence of teacher” and “Overall excellence of course”, resulting in top 10 percent performance in “Teaching effectiveness” for semesters 2-5. The IDEA Center survey national averages for “Overall excellence of teacher” and “Overall excellence of course” are lower, at 4.2 and 3.9, respectively. Over the same period of time, the ratings for all courses at Rensselaer, designed and delivered in the “conventional” manner, were an average of 10.6 percent lower for “Overall excellence of teacher” and 11.8 percent lower for “Overall excellence of course”. These results indicate that the application of lean principles and practices to course design and delivery results in higher customer satisfaction, irrespective of the subject matter.

However, since the IDEA Center survey does not evaluate innovation in course design and delivery, the results may be better understood by the written comments received from students in the IDEA survey, which reflects value as they perceive it. Table V summarizes these comments, and also shows the corresponding improvement expressed as a lean process or tool, consistent with the lean principles and objectives shown in Table I.

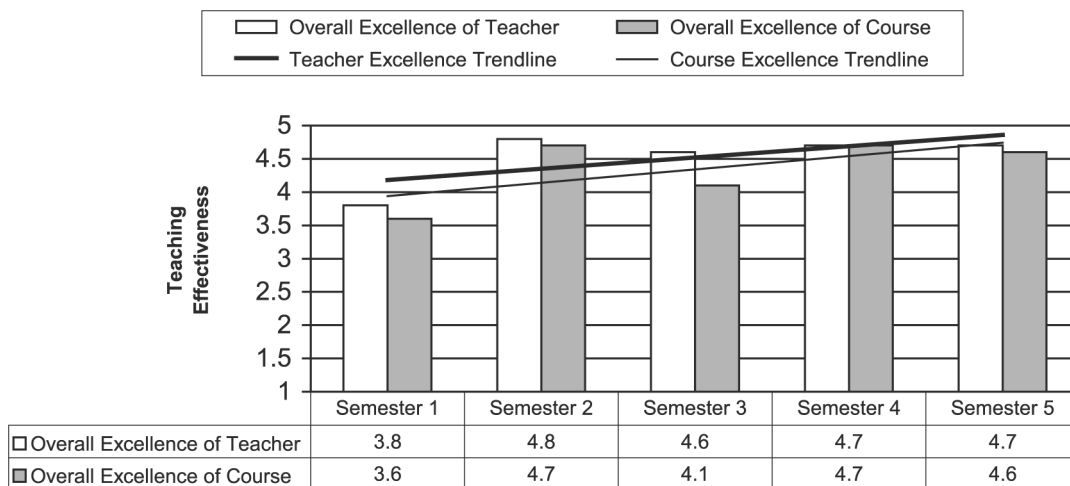
While other approaches to improvement may yield similar results, the application of lean principles and practices to course design and delivery clearly results in outcomes that part-time graduate students value. Understanding and incorporating employers’ perceptions of value is important work that remains to be done. The application of lean principles and practices is an opportunity to better understand value from both the students’ and employers’ perspectives, and offer more substantive and focused educational challenges.

Of course, the voice of the customer – both students and employers – should be incorporated in balance with the knowledge areas that the professor believes must be presented in the course to achieve the desired learning outcomes, and consistent with accreditation and school requirements. In other words, embracing the voice of the customer cannot result in a reduction in content to the point where the material becomes trivial or where the course becomes too easy, nor should it result in an exclusive focus on a particular employer’s business problems, although focusing on industry-wide challenges would probably be acceptable.

**Table IV** Applying lean principles and practices to courses

Lean principle or practice	Application to course design and delivery
<b>Continuous improvement</b>	Apply the scientific method to business problems Use formal root cause analysis in coursework (five whys or cause-and-effect diagram) to understand the source of problems and identify countermeasures Solicit feedback from students at course mid-point to incorporate voice of the customer Solicit feedback from students at end of course Respond to feedback whenever offered
<b>Five Ss</b>	Course content and sequence well organized Eliminate extraneous material
<b>Just-in-time</b>	Return graded papers and projects in time for discussion in next class
<b>Load smoothing</b>	Smoother workload throughout the semester using smaller weekly assignments Balance of team and individual assignments
<b>Respect for people</b>	Recognize that students' time is very valuable to them Select books, cases, and papers that are relevant, concise, and focused Clearly establish both professor and student expectations Clearly establish grading criteria Solicit mid-term and end-of-term feedback
<b>Standard work</b>	Standard syllabus format and simple one-page schedule Simplify assignments to focus students on the desired learning outcome Standard format for most assignments (e.g. one-page table) State the purpose and learning objective for each class and each assignment
<b>Visual controls</b>	Give examples of common mistakes that students make which reduce grades Use different color paper to indicate updated or corrected course documents Use colored paper to indicate before (e.g. red) and after condition (e.g. green) for assignments At-a-glance grading spreadsheet to quickly determine grades One-page course summary One-page table listing common mistakes made by senior managers

**Figure 1** Leadership course ratings



**Note:** Course ratings as reported by part-time graduate students using the IDEA Center survey (IDEA, 2004) administered at the end of the course, starting with the first semester the course was taught through the fifth semester. Significant changes were made to the course after the first semester, based upon student survey results and the professor's dissatisfaction. Semesters 2-5 incorporated improvements consistent with Lean principles and practices (Tables 3 and 4). The IDEA rating system for "Teaching Effectiveness" is: 1 = low to 5 = high. The IDEA national average for "Overall Excellence of Teacher" and "Overall Excellence of Course" are 4.2 and 3.9, respectively

Table V Student feedback

Comment	Improvement
Focused material	Five Ss, eliminate waste and unreasonableness
Good organization of course materials	Five Ss, eliminate waste
Clear learning objectives	Five Ss, eliminate waste
Standard homework format	Standard work, visual control, eliminate waste
Smaller assignments more frequently	Load smoothing
Use of current papers and business press stories	Just-in-time
Incorporates customer wants and desires	Voice of the customer
Consistent and timely feedback	Just-in-time, eliminate waste, unevenness, and unreasonableness
Professor "walks the talk"	Eliminate waste, unevenness, and unreasonableness
Concepts and tools can be applied to the workplace now	Just-in-time
Use of critical thinking	Formal root cause analysis (e.g. five whys)
Like the one-page course summary	Visual control, five Ss, eliminate waste

## Summary

This paper examined how lean principles and practices were applied to a graduate course in leadership taken by part-time students seeking MSc in management and MBA degrees. This activity was undertaken to improve consistency between what was taught in the course and how the course was taught, and to determine whether it resulted in higher student satisfaction. Results based on anonymous formal surveys and informal mid-semester feedback indicates that student satisfaction is indeed improved. However, the results achieved are temporary. Course content and materials change every semester, so unwanted variation will probably creep back in. The challenge then is to maintain constancy of purpose with respect to the key lean principles, objectives, processes, and tools shown in Tables I and II.

Applying lean principles and practices to course design and delivery requires professors to challenge their views regarding what they teach and how they teach it. All too often, professors teach in the same ways they were taught, and thus remain bound to convention due to a lack of critical thinking and despite the existence of compelling reasons for change. Importantly, for part-time students, professors should think about how the course consumes time and strive to reduce or eliminate waste, unevenness and unreasonableness such as that due to variation in interpretation, thematic inconsistencies, or lack of focus. This must be done in a manner consistent with balancing the mostly shared but sometimes competing interests or objectives of key stakeholders such as AACSB International, the school, students, business, and professors.

The results point to additional paths for future action. For example, how can other lean principles and practices such as kaizen (Emiliani, 2004b) and value stream maps be used to further improve course design and delivery? In addition, quality function deployment (Akao, 1990; Pitman *et al.*,

1995; Lam and Zhao, 1998; Wiklund and Wiklund, 1999; Hwarng and Teo, 2001) and policy deployment (i.e. "hoshin kanri" in Japanese; Akao, 1991; Roberts and Tennant, 2003) can be used to determine which business courses should be offered to begin with, as school focus or professor capabilities change, accreditation standards change, and the value proposition for part-time students and their employers change over time (Karapetrovic *et al.*, 1999; Dahlgaard and Østergaard, 2000).

## Notes

- 1 Referring to students as "customers" usually causes a lot of controversy among professors and administrators. Many business school and non-business school professors dislike the introduction of "corporate-speak" into academic settings, and related for-profit business practices that some view as corrupt, thus possibly destroying the *raison d'être* of learning institutions. But whatever you call them, "students" or "customers", these people have expectations regarding the value that they (and possibly their employers) expect to receive. After all, part-time students are people who work full-time as independent contributors, supervisors, managers and executives, and usually must confront the reality of the marketplaces that they serve, including understanding who the customer is. So it should not be surprising that this type of student seeks consistency. They come to the university and into the classroom seeking a value proposition, spoken or unspoken, that professors and administrators are expected to deliver on. The essential point is that non-profit institutions are also subject to market forces – witness the growth of online higher education services, both non-profit and for profit – and adjustments may be necessary (Karapetrovic *et al.*, 1999). The challenge is to adjust in ways that are balanced and fully consistent with the institution's *raison d'être*, accreditation standards, and the need to continuously improve with regards to teaching, research, and student services to achieve better outcomes. That, after all, is learning.
- 2 The phrase "clinically experienced executives" refers to faculty who have significant industrial management experience.

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