

In Pursuit of Quality Within The School of Business Curriculum – An Exploratory Study of Continuous Process Improvement Practices In Higher Education

Michael Ziyadeh
michael.ziyadeh@quinnipiac.edu

Bruce White
bruce.white@quinnipiac.edu

Lender School of Business, Quinnipiac University
Hamden, Connecticut 06518, United States

Abstract

This paper defines Six Sigma as a method for continuous process improvement, and its suggested use in higher education for improvement among business courses. Six Sigma tools are proposed for implementation within schools of higher education for the improvement of course material, class techniques, and student learning. While some researcher believe colleges and universities can improve processes in all areas of operation using Six Sigma, the focus of this paper is on the improvement of course material and class techniques. More specifically, it is the implementation of continuous process improvement strategies in relation to course material and class techniques which requires greater treatment within academic literature. A three pronged strategy referred to as Time, Tools, and Training is suggested for use by instructors within Business Schools, which are implemented within the context of a course through the use of goal setting, measurement and analysis tools, and leadership skills. The research suggests that this strategy contains an effective balance of elements for implementing an effective program for educational improvement.

Keywords: continuous process improvement, conceptual method, course material, classroom techniques, six sigma, teaching effectiveness, student evaluation, student feedback, mentorship, higher education, schools of business

1. INTRODUCTION

Many business professionals have by now taken a part in implementing or sustaining process improvement programs such as Total Quality Management (TQM), Six Sigma, and others. These methodologies have been actively promoted and utilized within American manufacturing or industrial operations, (and have more recently been integrated

into business processes), over the past 60 years. Recently, though, an interest has been growing in the application of continual improvement methodology to service level organizations, the most recent being college and university organizations. Today there are a number of common continual improvement programs that are recommended for use in higher education; Six Sigma, TQM, and the Baldrige Award criteria being the

most widely referenced in education literature, but what are the means by which CPI processes are implemented for course improvement?

Today, organization leaders who have experienced success upon implementing process improvement strategies within their own organizations are looking to engineering and business schools of higher education (as the suppliers of the pool of talent and knowledge to the business community), for furthering the application and sustainment of continual improvement programs within business.

This paper is largely an exploration of the academic ideas concerned with the adoption of continual improvement programs within schools of higher education. Finally, this paper offers a method for implementing a program for continual improvement by combining the tools found in Six Sigma, along with time management skills, and mentorship (used interchangeably with leadership). The latter two facets of the program, referred to as Time, and Training within the context of this paper, are designed to assist in the implementation of the tools for process improvement, simply referred to as Tools. A culture of continuous process improvement is created when all three elements, Time, Tools, and Training are used in together.

2. CPI IMPLEMENTATION IN HIGHER EDUCATION

The Quality Environment

Some academics are at a loss when seeking to define an effective strategy for CPI implementation, claiming that, "because of the intangible results of education, an objective measurement of quality is difficult or impossible". (Sahney) Furthermore, it is commonly held that implementation is frustrated further because of the multiplicity of customers who are described in the literature as beneficiaries of the educational process. (Sahney, 2004)

To make the application of quality seemingly more challenging, proponents of the systems theory of process improvement state that to effectively implement quality processes in higher education, process improvement efforts should occur at the institutional level and impact all of the areas associated with the operation of the university, whether

academic in purpose or not. According to Sahney, 'Delighting the customer', "...is the core message of TQM and, hence, there is a need to identify and apply the relevant concepts of TQM to each and every aspect of academic life; that is, to the teaching, learning, and administrative activities" (Sahney, 2004).

In response to these arguments against successful CPI implementation in higher education, Six Sigma proponents adhere to the notion that the implementation of CPI strategies yields results which are both measurable and can be further improved upon. The difficulty of implementation of continuous improvement efforts within schools of higher education offered by those who propose the adoption of a systems view of CPI, (and with respect to the arguable rigidity of CPI efforts), Six Sigma proponents suggest that there is an inherent flexibility within the program, granting independent and individual courses and departments the freedom to evolve uniquely and flexibly within business departments.

The college/university course is the smallest organizational unit within academia which can effectively implement, (independently of other courses, and departments), transferable strategies for quality improvement. By promoting time management skills, projects for continuous improvement can mature within a course independently from other courses, yet strategies have the potential to be transferred from one course to another.

It is as much the university's responsibility to provide to the student the environment which nurtures quality in student learning, while committing to provide to the student the means by which quality in class techniques and material is attained. The responsibility of the university to facilitate learning among students by nurturing the environment for CPI can be stated as follows, "Therefore, it is the responsibility of a university to provide high quality programs and **high level of rigor in the process** to produce sufficient number of high quality graduates to meet the needs of the private and public sector jobs of the society" (my emphasis, Bandyopadhyay, 2007).

An alternate view upheld by Chadwick (1995) states that because there is more

emphasis by instructors placed on class techniques and material within the curriculum, and less upon student learning, there is less academic growth among students than otherwise. According to the researcher, while it is necessary for class techniques and material to undergo continual improvement, improvements in student learning should not be neglected within the overall CPI strategy.

Therefore, in order to improve student learning, the university must be committed to improving the environment for learning by sustaining a culture of continuous improvement. To achieve a culture of continuous improvement, a Business School must continually reflect on the value it places on course quality, improve the quality of learning by actively seeking to promote mentoring relationships, and promote time management and goal setting skills within business courses.

The university must not underestimate the strength and influence of positive mentoring relationships within the university environment for developing continuous improvement within business courses. Leadership/mentorship relationships (forms of Training) form the foundation of the learning relationships which will sustain programs for process improvement by creating a culture of quality. "TQM is after all a commitment, not to instant perfection but to continuous improvement, less about the quantity of statistics than about the quality of relationships; for universities are not ultimately about "products" but about the development of human potential" (Chadwick, 1995).

In order to affect student learning, university faculty, staff, and university administrators must take decisive leadership roles, developing a pattern for others to follow. Students must understand that, though there are many outcomes resulting from the educational process, it is the immediate relationship between teacher and student, mentor and mentee, which will influence student learning to the greatest extent and which holds the greatest value and potential for all other beneficiaries of the educational process.

The use of time management skills, (simply referred to as Time) in conjunction with a program for mentorship, facilitates the adop-

tion of CPI tools within the quality program. Both, the use of time management and mentoring relationships, improve the quality environment, allowing the use of CPI tools the ability to effectively measure and analyze the quality of class techniques and course material.

Implementing CPI For Course material And Class Techniques From The Students' Perspective

The opinion that the implementation of Six Sigma within a course in higher education, particularly in business and engineering, is clear within education and business journals. There are a couple of prominent themes found within the literature related to quality improvements among business courses.

- Six Sigma prepares student for real-world working environments;
- Six Sigma improves student motivation;
- Six Sigma promotes team work, and working in partnership within diverse people and organizations.

By integrating Six Sigma tools into a curriculum for business, students will learn real world skills within the context of real problems and cases (Antony, 2008). "Engineering colleges provide direct services to industry through extension operations, manufacturing extension partnerships, and training on safety and environmental issues, ISO 9000, GMP, Six Sigma, and lean manufacturing. All these services can improve industrial competitiveness..." (John Gilligan, 2004).

Wiklund (1994) has found that student participation in the development of courses has alone increased student satisfaction. Conversely, in succeeding semesters, motivation regarding student participation in the course improvement or development process increased upon recognition that it had been the students voice (Voice of the Customer) which had impacted the design and development process in each phase of process improvement. The impact of this method of learning through relationships cannot be overstated as it positively influences the student body, employers, and the community as a whole.

"In a university, an obvious example is degree by design. By designing degrees in partnership, academic integrity is related to student, employer and community perspectives from the start. Students, employers and community groups have proved liberating influences, producing imaginative ideas for the curriculum and for teaching, learning and assessment methods. The same is true of faculty and university-wide issues" (Borzsony, 1996).

CPI programs within institutes of higher education operate like many programs within service organizations such as call centers, insurance agencies, government agencies, and non-profit agencies. An advantage to implementing a program within the university environment, some argue, is that universities are better equipped to accommodate the technical aptitude and operational challenges required to deploy of a program for improvement. As an institute of learning, universities can tap into resources such as foundations, make use of facilities for hosting larger groups of participants, and employ academics with the skill for representing facts through the use of Six Sigma tools. Furthermore, there are among those who participate in programs for improvement those faculty and staff who are more inclined to work with the organization in order to communicate goals, explain new processes, negotiate with team members and university stakeholders, and inspire enthusiasm and teamwork.

Barbara Flynn (2003), professor of operations management at Wake Forest University stated in an article that professors at the University found teaching Six Sigma attractive for the following reasons: Six Sigma provided a method for comprehensively utilizing all of the tools business graduates had learned in various courses, interest in Six Sigma can be found across various disciplines, and finally, students find this program exciting, eager to participate in projects.

According to Roger Hoerl (2004), a manager at General Electric's global research center, Six Sigma methodology is underutilized in university curricula yet many practitioners have found that Six Sigma methodology includes a structured approach to process improvement which is easier to deploy than

other programs (Hoerl, 2004). Because student participation in curricula and course development is easily attainable and recommended for improved learning, it is supported as a practice within the business educational process among academics and industry professionals. A university environment which actively promotes and designs opportunities for student participation in course development will do so with cooperation among representatives of the private and professional sectors. Learning through partnerships is key to continued development as this improves the quality of student education and development, improves the quality and speed of decision making, increases resources for all partners, and creates research opportunities for staff, students, employers, and community groups (Barzsony, 1996).

Student participation also facilitates the students' abilities to co-operate in projects with each other, which is an experience demanded by another university customer, namely the future employers. Hence, it is reasonable to assume that the active involvement of students in course design and production is of the utmost importance for the potential success of a course (Wiklund, 1999).

Implementing CPI For Course material And Class Techniques: An Institutional Perspective

In assessing whether or not a program for continual improvement will strategically and fundamentally improve the service and business operations of the university, decision makers, whether representing the executive council, board of directors, or faculty, must design the target service or product. For example, if university leadership is interested in better preparing students for current business challenges, and equipping them for leadership roles within organizations where continuous process improvements are part of the culture, then a program must be developed at the course level and ideally include the participation of students in the design and implementation of the program.

By taking an active, participatory role in impacting the delivery and content of the academic course, the student is learning skills that are highly valued in the business world.

On the other hand, if the university is interested in initially adopting ways for lowering the operational cost of the university, provide higher quality services, and improve the campus environment, then a program may be applied to one or more functional units of the organization such as security, maintenance, or human resources, to name a few.

The likely advantages of applying a program for continual improvement to the university environment are profound and can be far reaching. The following is a list representing some of the results that can be achieved through program application:

1. Better equipped staff, continuing improvement, staff readiness;
2. Improved educational service to students, with proven results;
3. Efficient services offered with decrease in service costs;
4. Unbound creativity and enthusiasm among instructors and administrators;
5. University recognition among schools and businesses.

Having reviewed the benefits of program implementation from the students' and institutions' perspectives, a combined strategy covering what has been offered in the prior sections of this paper follows. This strategy effectively combines the concepts of CPI tools with the adoption of time management skills and mentoring relationships to create the T3 Strategy.

Time

Time refers to those events or activities, goals or visions, which are assigned a time component for completion or achievement. To become effective, a program for improvement must manage events and activities according to a predetermined plan. An effective program for process improvement must require that all group and individual activities related to the CPI effort be subject to the plan established by the team. The more disciplined a team is in completing tasks within these time and activity constraints, the more likely the organization goals and vision will manifest.

On a related issue, it is also critical that program developers couch course objectives in process improvement terminology, stressing the value of course objective completion to the overall process improvement program. Notice that this element, Time, is distinct

from the Six Sigma concept referred to as Define. Within the Define phase of the DMAIC method the program team observes inefficiencies and wastes within a process or activity (which processes are generally time sensitive). Time within the T3 System, on the other hand, is a simple reminder for the discipline of setting goals which will bring improvements to bear quickly and efficiently.

Tools

Tools refer to the methodologies and technologies employed to create tangible and measurable results within a course. The model which serves as our guide for the T3 System is referred to as Design for Six Sigma (DFSS) and is an alternative to the straightforward DMAIC model. DFSS is primarily used for developing new initiatives. The components of this method are Define, Measure, Explore, and Develop. The acronym DMED guides the practitioner along the process improvement journey.

Training

Mentorship is the relationship between a mentor and mentee during which desirable traits and skills are handed down to the student. One can think of this relationship as apprenticeship. The mentor is duplicating something within him/herself in the life of the protégée, apprentice, or in this case, the Business School student.

Little is stated in the literature regarding leaders or leadership in higher education regarding CPI. Because the student must be treated as a participant in a program for process improvement, the student must be given a responsibility and role within the process. The leader and the leadership role is an essential element in the learning process and should not be understated. For one, it is the educational leaders', or mentors' responsibility to help the student define the requirements necessary for the student to grasp the intended knowledge and skills.

Leaders serve three general functions within the context of learning; to define, to assign, and to align. To "define" means to know the students' needs, to develop open communication with each student, and to promote buy-in to the program with the student as a partner in learning.

To “assign” means to invite the student into a mentoring relationship where win-win situations are sought to problems, students are empowered to make right decisions, and where there is accountability upon both the mentor/mentee.

To “align” means to first be familiar with the mission of the university and the objectives of the program for continuous improvement. It means acting as an integrator – integrating a program for continual improvement with the mission and vision of the curriculum, department and university. It means having the knowledge and ability to weave student requirements into the educational process.

3. ONE CONCEPTUAL APPROACH TO MEASURING COURSE QUALITY

Applied together, all three components, the Time, Tools, and Training, can improve the quality of courses as a whole. The T3 System is designed to improve both the teaching process by continuously improving course material and course techniques, as well as the learning process by sustaining a culture of improvement. The culture of continuous improvement in this model is supported by Time, and Training efforts. This section offers suggestions on how metrics can be used to measure the improvement of both the teaching and learning process. In other words, this section takes a closer look at the Tools element of the T3 System.

The CPI tools for higher education in the T3 System can be designed to measure discrepancies between what is expected to occur within the Educational Process and what has occurred in actuality.

Variances within the Teaching Process (those related to course material and class techniques) and the Learning Process (those related to time management skills and mentorship) are invariably found to exist between instructor and student expectations and what is exhibited in reality. These variances, or gaps between expectations and what is measured in practice, are seen here as opportunities for course improvement. When student and instructor expectations are measured within close proximity to practice, we can say that value is created or ex-

ists within either the Teaching or Learning Processes or both.

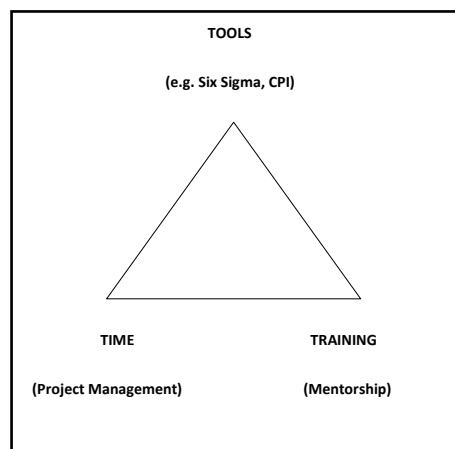


Exhibit 1. The three elements of the T3 System

There are two pairs of course characteristics that are measured using this System which are designed to improve the Teaching and Learning Processes. The first pair is a measure of the quality of the Teaching Process by evaluating the quality of course material and class techniques. The second measure is directed towards improving the Learning Process by the evaluation and improvement of time management skills and mentoring relationships.

Put another way, Tools are designed to capture information (metrics) that will give the course instructor insight into the quality of the Teaching and Learning processes.

Because it is difficult to determine from student grades alone the cause of problems within Teaching and Learning processes, it is necessary to measure instructor expectations (assuming positive expectations) against student performance in order to adjust teaching practice, thereby improving the course offering to meet student educational needs. (This type of evaluation takes a different approach than the one developed in the research conducted by Pariseau and McDaniel, 1995. In this study student expectations were compared against student perceptions of teaching quality).

These measures will give us an idea for how effective the instructor's teaching methods/techniques are in improving student

performance. Simply put, these two realities, what the student has earned as a grade, and what the instructor and student expects the student to earn, are the two factors that we will use to measure a variance for the purpose of impacting the quality of either course material or class techniques or both.

The student learning measure is referred to here as Earned Performance and can be represented by an aggregate measure of student grades on a particular exam (the student exam and survey is what we refer to in this System as the Practice Point). This is commonly represented by the learning bell curve illustrating the distribution of grades across the student population.

Expected Performance, on the other hand, is a reflection of student attitudes or student expectations regarding class techniques. The student determines at the Practice Point whether or not a correct response is given based upon how confident the student is at having learned the material as instructed. (The design and use of this instrument is best described in Bateman and Roberts, 1993) Whereas with exams based on course material, an instructor is able to measure Earned Performance and the students Cognitive Learning, with Expected Performance it is necessary to measure the students Reflexive Learning based upon class techniques. The tool utilized to measure Expected Performance is referred to here as the Confidence Survey.

The Confidence Survey is offered by the instructor concurrently with an exam (Practice Point), preferably question by question, for the purpose of capturing the students' most vivid impressions regarding the delivery of the test material.

The Confidence Survey measures Reflexive Learning. This is an opportunity for the student to document either a question based upon the particular test material surveyed, or a comment addressing the exam question in particular. This portion of the Confidence Survey is referred to as the Student Evaluation.

The Confidence Survey is designed to gauge the student's ability to reframe the test material surveyed. In this way the instructor is capturing what the student "thinks" he or

she knows regarding particular information presented, lending insight into the extent to which active learning has taken place.

Instructors must remember that following the System will ultimately help improve the overall Content and Delivery of the course, thereby improving instructor teaching and student learning. Neither every exam, nor every question needs to be surveyed by the instructor, though a representative portion of test questions, in terms of content and question style, should be measured to take advantage of every opportunity for continuous improvement.

Here are the suggested formulae that will help determine the earned and expected performance for each student according to our definitions above.

- (1) Earned Grade/Average Class Grade

$$X \cdot 100 = \text{Content Variance}$$
- (2) Expected Grade/Expected Class Grade

$$X \cdot 100 = \text{Delivery Variance}$$

Based on our rationale above, improvements in course material come as a result of minimizing variance among Earned Performance measures. Likewise, improvements in student learning come as a result of minimizing variance among Expected Performance measures. It is the Student Evaluation portion of the Confidence Survey which steers the instructor's improvement efforts in terms of continuously improving the environment for CPI. This survey information will serve to better define for the instructor the areas upon which to focus improvement efforts.

Within the Appendix is a matrix identifying the components of the T3 System, summarizing the "what?", "why?", and "how?" of the system in practice. Read from left to right, the matrix briefly describes the purpose of the two instruments referred to as the Practice Point, and Confidence Survey. See Appendix for matrix summarizing the function of the tools used for qualitative and quantitative assessment within the 3T System.

4. SUGGESTED GRAPHICAL REPRESENTATIONS OF DATA

When instructors desire to represent Teaching and Learning Process data using mea-

surement tools, they can represent their findings through the use of three graphical representations of this data.

1. Simple trend analysis comparing class earned and expected values. (Grades vs. Students). This is a generalized understanding of opportunities for improvement of student learning.
2. A question by question analysis, comparing students Earned and Expected values. (These Expected values can be as simple as "right or wrong" responses. A challenge and improvement opportunities to the instructor occur where both lines of the graph begin to offset or mirror each other). This represents a finer view of issues in either content or delivery regarding the more granular details of the Course material and Delivery.
3. A line graph comparing variances by the lowest and highest variances within the student population. This chart will be represented by three straight lines. Based on variance line pitch and its value compared to a variance of 1.0, the instructor will determine what to tackle first, course material or delivery, and to what extent.

In practice, instructors can strategize the course improvement design by rating student Earned and Expected Performance variances against certain questions/problems that are deemed to be new, experimental, unconventional, particularly challenging, particularly non-challenging, etc. In this way the instructor can more closely associate the data with a preexisting plan, method, or strategy for course improvement. Another method of tailoring student responses is to collect more data than required yet choose to analyze test material and Confidence Survey responses for which variances are particularly great, hypothetically either +/- .5 to 1.0)

After the Confidence Survey is analyzed as discussed above, the instructor will have a focus for improvement efforts. At this point, the instructor will determine if more infor-

mation is needed for making improvements in course material and class techniques. If more information is required for specificity, the instructor can develop a targeted "Market Survey", the responses to which will be adequate for directly improving the course. This Market Survey should be designed to exploit the knowledge gained from the Earned and Expected student exam values. After initial efforts at measuring course quality, efforts invested in Training will ensure that results from the measure phase will be used to create lasting impact to course quality.

5. FUTURE RESEARCH

A survey among 108 Schools of Business accredited by the AACSB is currently being conducted. This survey is designed to gather information on what CPI techniques academic leadership in Schools of Business (Deans, Associate Deans, Chairs, Directors) are currently utilizing to improve course quality. This survey will also aid in describing attitudes among educators regarding the use of CPI in courses.

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Appendix

Table 1. The 3T System Qualitative and Quantitative Assessment Tools

INSTRUMENT	MEASURES	THROUGH THE USE OF	TO IMPROVE
PRACTICE POINT (EXAM, ASSIGNMENT)	QUALITY OF COURSE MATERIAL, COURSE TECHNIQUES	TOOLS (E.G. SIX SIGMA, CPI)	TEACHING PROCESS
CONFIDENCE SURVEY	QUALITY OF LEARNING ENVIRONMENT	TIME (PROJECT MANAGEMENT) & TRAINING (MENTORSHIP)	LEARNING PROCESS