

## A TOTAL QUALITY APPROACH TO HIGHER EDUCATION

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### Introduction

In recent years, attention has turned towards implementing quality programs in educational institutions, from grammar school through higher education. The driving force behind this need to update school systems is the increasingly difficult time school administrators are having maintaining adequate budgets. In terms of university systems, one solution is to attract more students. However, students today have more knowledge about the university systems as a whole, and have the ability to conduct extensive research regarding the university's ranking and reputation, as well as many pros and cons of the institution. Therefore, university systems find themselves in a more competitive position than ever. This competitive stance places universities in a position similar to businesses, which must achieve customer satisfaction or face closure.

A growing emphasis is being placed on implementing quality practices in education. Quality standards in education, such as the ISO9000: 2000 Z-1.11 guidelines and the Malcolm Baldrige Education Criteria for Performance Excellence are beneficial in that they provide a quality framework for higher education institutions.

Under ISO 9000:2000 revisions, guidelines for the application of ANSI/ASQC Q9001 or Q9002 to education and training institutions are being developed. These guidelines are provided in Z-1.11, which serves two related purposes. First, to provide education and training institutions with the benefits of nationally accepted guideline standards of quality assurance and quality management practices contained in the American National Standards Institute and the American Society for Quality Control Q9000 series. The second purpose is to improve communication between education or training institutions and their registrars as they prepare to register to Q9001 or Q9002.

The Malcolm Baldrige Education Criteria for Performance Excellence has been built upon the seven-part framework used in the Business Criteria for Performance Excellence. This adaptation to education is largely a translation of the language and basic concepts of business excellence to similarly important concepts in education excellence.

Performance excellence criteria for education are the basis for organizational self-assessments, for

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making Awards, and for giving feedback to applicants. In addition, the Education Criteria have four other important purposes:

- To help improve organizational performance practices and capabilities;
- To facilitate communication and sharing of best practices information among education organizations and among organizations of all types;
- To foster the development of partnerships involving schools, businesses, human service agencies, and other organizations via related criteria; and
- To serve as a working tool for understanding and improving organizational performance, and guiding planning and training.

The Criteria are designed to help organizations enhance their educational performance through focus on dual, results-oriented goals:

- Delivery of ever-improving value to students and other stakeholders, contributing to improved education quality; and
- Improvement of overall organizational effectiveness and capabilities as educational organizations.

Assessment programs are gaining increasing attention in higher education institutions due to the assessment criteria being mandated by various accreditation agencies. The purpose of assessment is to evaluate the quality of the educational program in order to provide feedback for continuous improvement. By evaluating, advising, and monitoring students, the educational program can determine its success in meeting its objectives.

Along with assessment is the development of policies for the acceptance of transfer students and for the validation of courses taken for credit elsewhere. The institution must also have and enforce procedures to assure that all students meet all program requirements.

It is critical to define program educational objectives in order to:

- Provide consistency with the mission of the institution,
- Determine a process based on the needs of the program's various constituencies in which the objectives are determined and periodically evaluated,
- Develop a curriculum and processes that ensure the achievement of these objectives, and
- Conduct ongoing evaluation that demonstrates achievement of these objectives and uses the results to improve the effectiveness of the program.

Documentation is key in any assessment program. Evidence should be given to demonstrate the following:

- Results are applied to the further development and improvement of the program.
- The outcomes important to the mission of the institution and the objectives of the program are being measured.

Examples of evidence that can be used in assessment documentation are student portfolios, including design projects; nationally normed subject content examinations; alumni surveys that document professional accomplishments and career development activities; employer surveys; and

placement data of graduates.

### Problem statement

Quality standards in education, such as the ISO9000: 2000 Z-1.11 guidelines and the Malcolm Baldrige Education Criteria for Performance Excellence are beneficial in that they provide a quality framework for higher education institutions. However, the translation from guidelines to practice is extremely difficult in light of the traditional environment that most universities operate under. This environment fosters autonomy among its faculty, top-down management and decision making, and mandating of requirements and regulations to its customers (students). Currently, there are no practical guidelines to assist universities in making the transition from quality standards to quality practices.

### Objective

The objective of this paper is to present a practical guideline for the implementation of quality practices in higher education. In addition, this paper will address fundamental changes that must occur in the university system to ensure successful implementation of quality practices.

### Scope

To remain competitive, universities must address the needs of many customers, internal and external: students, employers, parents, and the local community, to name a few. In this work the focus of quality in higher education is on the student as customer. Other customer needs are discussed, but student needs are emphasized.

This paper will address the following questions:

1. Institutions of higher education must satisfy what conditions in order to provide an environment that will allow quality practices to be successfully implemented?
2. What are the practical guidelines for implementing total quality practices in higher education?

### Significance of the study for engineering education

The approach developed in this paper is relevant to the many and varied programs in higher education. However, the nature of engineering programs provides a unique opportunity for such programs to be in the forefront of implementing change in education. Engineering educators must create an environment for their students in which critical thinking and innovation are a priority. This same environment is mandatory in any educational system promoting and implementing quality practices.

### Literature review

ISO has developed an educational component to either the ASQC/ANSI Q9001 or Q9002

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standard<sup>1</sup>. The guidelines are identified by Z-1.11 and were developed to serve two related purposes. First, to provide education and training institutions with the benefits of nationally accepted guideline standards of quality assurance and quality management practices contained in the American National Standards Institute and the American Society for Quality Control Q9000 series. The second purpose is to improve the communication between education or training institutions and their registrars as they prepare to register to Q9001 or Q9002.

The Baldrige National Quality Program has addressed quality in education with its Education Criteria for Performance Excellence<sup>2</sup>. It is stated that these criteria have four important purposes: (1) to help improve organizational performance practices and capabilities, (2) to facilitate communication and sharing of best practices information among education organizations and among organizations of all types, (3) to foster the development of partnerships involving schools, businesses, human service agencies, and other organizations via related criteria, and (4) to serve as a working tool for understanding and improving organizational performance, and guiding planning and training.

Accreditation agencies, such as the Accreditation Board for Engineering and Technology (ABET), are incorporating elements of quality instruction into their accreditation requirements through assessment<sup>3</sup>. In their Engineering Criteria 2000, ABET states that each accredited engineering “program must have an assessment program with documented results. The assessment process must demonstrate that outcomes important to the mission of the institution and the objectives of the program are being measured.”

In general, assessment begins when a program faculty establishes intended program outcomes and then identifies the outcome indicators that will be used to measure these outcomes. Outcome indicators can be broadly classified as qualitative and quantitative; examples include alumni surveys, capstone design courses, employer surveys, exit interviews, industrial advisory boards, and nationally standardized tests<sup>4</sup>.

Assessment of student learning is at the center of many forces currently working to transform American higher education. Currently, there are several trends taking place in the way higher education is viewed. First, there is a growing demand for public accountability, as reflected in state legislation. Approximately two-thirds of the states had developed assessment mandates by 1990, either through legislation or state agency regulation<sup>5</sup>. Since 1990, state-level measures of institutional performance have been developed in eighteen to twenty states<sup>6</sup>. Secondly, there is growing internal pressure to become more productive. Increased fiscal pressures are forcing real changes in the way colleges and universities operate. In part, these pressures are the result of a gradual downward trend in levels of public support for higher education that began in the early nineties. Historically, higher education responded to challenges in budget cuts by adding new academic requirements and types of programs – this is no longer viable<sup>7</sup>. The third trend is the way in which instruction is designed and delivered. Complex, performance-based demonstrations of competence are increasingly “engineered” into both curriculum and important academic procedures like admissions and credentialing. A number of states are looking at how statewide articulation arrangements among postsecondary institutions (e.g., between two- and four-year colleges) can be established on a competency basis – especially in such core areas as

communication and quantitative skills<sup>8</sup>.

Another influence on assessment is the growing role of technology. Delivery of instruction via the Internet allows students to learn on their selected time and selected location. This requires that learning outcomes relative to assessment be redefined to determine what is most effective in this new learning environment<sup>9</sup>.

Emphasis in assessment has shifted towards approaches that “add value” to the instructional process. This is, in part, a result of lack of student motivation to perform on examinations that don’t count for a grade or certification. Recent curricular innovations that require integrative capstone exercises can also serve as excellent settings for assessment. Therefore, capitalizing on points of contact with students, such as admissions, registration, placement testing, and the administration of end-of-course student evaluation questionnaires, can be extremely efficient in terms of data collection. Ultimately, the curriculum itself can provide the best environment for assessment; curriculum-embedded assessment that utilizes exercises to assign both individual grades and provide aggregate data on group performance for curriculum evaluation is a best practice<sup>10</sup>.

McGourty<sup>11</sup> outlines four strategies to integrate assessment into the engineering education environment. These include the following: (1) initiate a structured process to involve faculty and staff in the ongoing planning, development, and monitoring of the program; (2) offer “just-in-time” educational sessions to develop administrator, faculty and student knowledge and skills in assessment; (3) create an assessment toolbox providing administrators and faculty with templates that can be used in and outside the classroom; and (4) identify, review, and modify, as required, key institutional practices to ensure that they are aligned with educational objectives and outcomes.

The application of total quality principles to education has been addressed as a solution to the serious reforms that are needed in higher education. Diller and Barnes<sup>12</sup> described the use of Total Quality methods to improve a broad range of administrative processes in the department of Mechanical Engineering at the University of Texas at Austin. Litwhiler and Kiemle<sup>13</sup> reported the successful efforts to incorporate Total Quality Management (TQM) tools and principles into the engineering curriculum at the Air Force Academy, resulting in a customer-focused updating of their entire curriculum. Another paper discusses a third application of TQM to engineering education: strategic planning and curriculum revision<sup>14</sup>.

Houshmand et al.<sup>15</sup> developed a total quality management approach in which administrators, faculty, and students work together to develop a methodology for improving actual learning that takes place in the classroom. The Plan, Do, Study, Act (PDSA) cycle was used as a framework for improving teaching. Other work has incorporated “hands-on” experiences ranging from the use of multi-media<sup>16</sup> to the entry into collegiate design competitions<sup>17</sup>.

Indiana Southeast University (IU Southeast) recognized the need for service quality in their institution and transformed their way of doing business<sup>18</sup>. The chancellor of IU Southeast identified that the university needed to establish a reputation for providing high-quality

experiences for all students. Failure to attract or satisfy students would negatively impact enrollment and retention, and ultimately, funding, job security and the viability of the university.

Evans<sup>19</sup> and Weinstein, et al.<sup>20</sup> addressed the issue of total quality management in higher education. Specifically, whether universities in the United States were doing the right things and doing things right in providing education in total quality management. Guidelines for educational institutions were outline in an article by van Kemenade and Garre<sup>21</sup>. These guidelines included provide training in an integrated system approach, show commitment from the top, include quality objectives in the regular policy cycle, increase visibility of objectives achieved and progress made, complete the PDCA cycle, provide role models in organizational and employee behavior, recognize and respond to the needs of the customers, focus on permanent improvement, study quality's pioneers, learn the possibilities for contribution and participation as a function of willingness and skill, use self-evaluation and external auditing.

Stedinger<sup>22</sup> describes efforts to apply TQM concepts and the ideas of customer focus, data-based decision making, and continuous improvement to instruction in a junior-level probability and statistics course. As a result, serious gaps between the expectations and objectives of the teaching staff and of students were revealed.

Increasing attention is being placed on improving the quality of education at all levels. University systems are just beginning to change their view of the role they should play in the education of students. Specific quality standards have been developed, such as the Malcolm Baldrige Education Criteria for Performance Excellence and the ISO 9001 Z-1.11 standards for education. In addition, much work has been investigated into applying total quality practices to various aspects of education. However, the application of total quality to education has not been addressed in terms of practical guidelines for implementation; that is the focus of this paper.

#### Requirements for quality in education

The university environment is complex for several reasons. First, there exists a hierarchical structure with interaction and dependencies within layers and across layers. Administrators, faculty and students are dependent to varying degrees on the support staff. Students are dependent on faculty and are affected by administrative decisions. Second, individuals or units play dual roles in terms of the supplier-customer chain. For example, students are primarily customers of the university system but when working as support personnel, become producers in a service environment to a group of people who typically serve them. In other words, students are the customers of faculty in the classroom but faculty becomes the customers of students when such students are employed as office personnel. Figure 1 shows the primary entities that interact within a university system.

Success in higher education should be measured primarily by the quality of education that students received during their academic career. In part, quality of education can be measured by the placement rate of students upon graduation, time between graduation and first job, starting job salaries, and job responsibilities. In addition, college and universities should survey their graduates and their graduates' employers to assess customer satisfaction with their product. This feedback

can be utilized to redesign curriculum, improve course content, and improve services such as academic advisement. It is appropriate for some programs to solicit opinions from employers of graduates, through Industrial Advisory Boards, on how to best prepare graduates for the workforce. The focus of higher education is on the quality of the product, which also includes the educational process. In order for Universities to remain viable competitors in the marketplace, particularly when faced with reduced budgets, efficiency of operation must also be a goal.

Service quality in higher education exists on several levels:

- University level: business offices, such as admissions and records, bursar's office, library services, health services, and other nonacademic offices
- College level: Dean's office, student chapter advisors, computing laboratories
- Department level: advisement, staff, faculty mentoring
- Classroom and laboratory level: faculty, graduate assistants

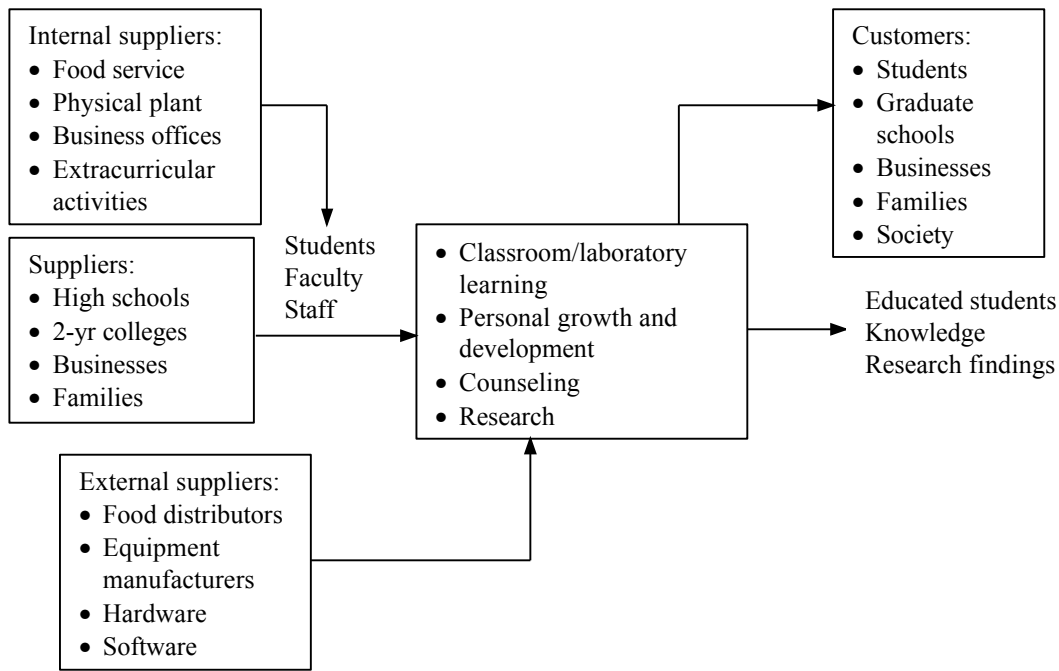


Figure 1. University system customer-supplier relationships

In order to improve the quality of education in institutions of higher learning, the principles of total quality must be applied at all levels. These three primary principles include:

- Focus on customer
- Participation/teamwork
- Continuous improvement and learning

Although all levels of higher education must practice total quality, the scope of this work will be on the Department level, and more specifically, on the student as customer. Each of the principles will be expanded on in terms of the total quality requirements for education within a department.

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Achieving customer satisfaction means identifying the customers' needs, designing the service systems to meet those needs, and measuring the results as a basis for improvement. Customer satisfaction is important in that it is necessary to meet the goals of: (1) satisfying customers, (2) achieving higher customer satisfaction than competitors, (3) retaining customers in the long run, and (4) gaining market share.

The traditional university environment has held the attitude that students do not know what they need or what they want upon entering the university, and that it is best for faculty and administrators to determine the needs of students. This fallacy has led many universities scrambling to recruit and retain students in light of declining enrollment figures. The lack of understanding of the needs of students is clearly evident in these cases. Therefore, if a program is to survive in the increasingly competitive educational environment, several customer-oriented practices must be implemented:

1. Understanding near-term and long-term student needs and expectations. Surveys and interviews should be administered annually to all potential customers including high school students, 2-year community colleges and regional businesses. Other information should be collected from competing institutions for benchmarking purposes. And, finally, student satisfaction should be monitored throughout each student's academic career to determine if customer satisfaction is being maintained.
2. Understanding the connection between student needs and expectations and the design of the educational system. This minimizes the potential gaps between expected quality and actual quality. For example, if a primary need for students is to have more flexibility in taking courses, the scheduling of courses will have to include nontraditional times, such as evenings and weekends, or on-line course development.
3. Making commitments to customers that gain their confidence and trust in their services. If student complaints are heard but no action is taken to alleviate the problem or concern, the student will not trust the university system as a whole, and will walk away generally dissatisfied.
4. Developing an effective student relationship management process so that students can easily seek assistance, comment, complain, and receive prompt resolution of their concerns. For example, student suggestion boxes should be distributed within each department and reviewed daily.
5. Measuring student satisfaction, comparing the results relative to competitors, and using the information to evaluate and improve internal processes. If students rank a particular institution higher relative to quality of classroom instruction due to lower student-to-faculty ratios, then reducing class sizes must be a goal.

Human resources development in a total quality environment accomplishes the following: communication of the importance of each employee's contribution to total quality, emphasis on quality-related synergies available through teamwork, empowerment of employees to "make a difference," and reinforcement of individual and team commitment to quality with a wide range of rewards and reinforcements.

Creating a teaming environment in a university system requires the following:

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1. Integrating human resource plans with overall strategic plans. It is necessary to include training of all employees on total quality practices, and what their contribution is to total quality efforts.
2. Involving all employees at all levels and in all functions. This includes administrators, faculty, support staff and students.
3. Using suggestion and recognition systems effectively to promote involvement and motivate employees.
4. Empower employees who perform a job to develop the job procedures and performance standards.
5. Emphasize and support teamwork throughout the university system. Traditionally, the university has functioned with autonomous work units, where very little interaction occurs within a department let alone across departments. Cross-functional groups, consisting of administrators, faculty, support staff and students should make group decisions on such issues as allocation of departmental budgets, improving department processes (such as servicing of students), and advising students.
6. Empower individuals and teams to make decisions that affect quality and student satisfaction.
7. Make extensive investments in training and education of employees. Training of all employees in total quality practices is essential. Any other education that is necessary to assist employees in achieving the strategic objectives of the department should be considered an investment in the future of the department.
8. Maintain a work environment conducive to the well-being and growth of all employees. This includes health, safety and ergonomics.
9. Monitor the extent and effectiveness of human resource practices and measure employee satisfaction as a means of continuous improvement. Employees should rate their superiors on leadership, communication and support.

### Continuous improvement

Continuous improvement and learning must be an integral part of the educational system. Improving a system implies that measurements first have to be taken to determine how the system is performing. This measurement serves as a baseline for the next evaluation period.

In higher education, the collection of assessment data is required to determine how well program needs are being met. Although assessment has an important role in continuous improvement, the current assessment practices focus on student performance only. This is too limited in scope and neglects the importance of evaluating faculty and staff on their abilities to meet student needs, as well as the general operation of the department. Figure 2 illustrates a general continuous improvement cycle for evaluating program operations and the ability to meet program goals and objectives.

All employees of the university should have a shared vision that defines what kind of place the university should be, and a set of values and ideals to live by. This vision is something that all employees should continuously strive to achieve in their own operations and responsibilities. At the forefront of this common vision is a focus on the customer.

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Defining the goals and objectives of each College and program involves extensive marketing to determine the needs of all customers. Primarily, this involves determining the specific needs and desires of students entering the university system. To gain a competitive advantage over competing institutions, the university must offer its students a product that leads to customer satisfaction. Other customers, such as employers of graduates, can provide important information on the skills and knowledge that students should acquire before entering the workforce.

Based on customer-focused research, specific objectives and goals can be developed that are aligned with customer wants. However, continuous surveys and feedback must occur in order to ensure that the objectives and goals remain congruent with the requirements of the customer. In addition, the objectives and goals must be carried through to all phases of the operation of the program to ensure customer satisfaction.

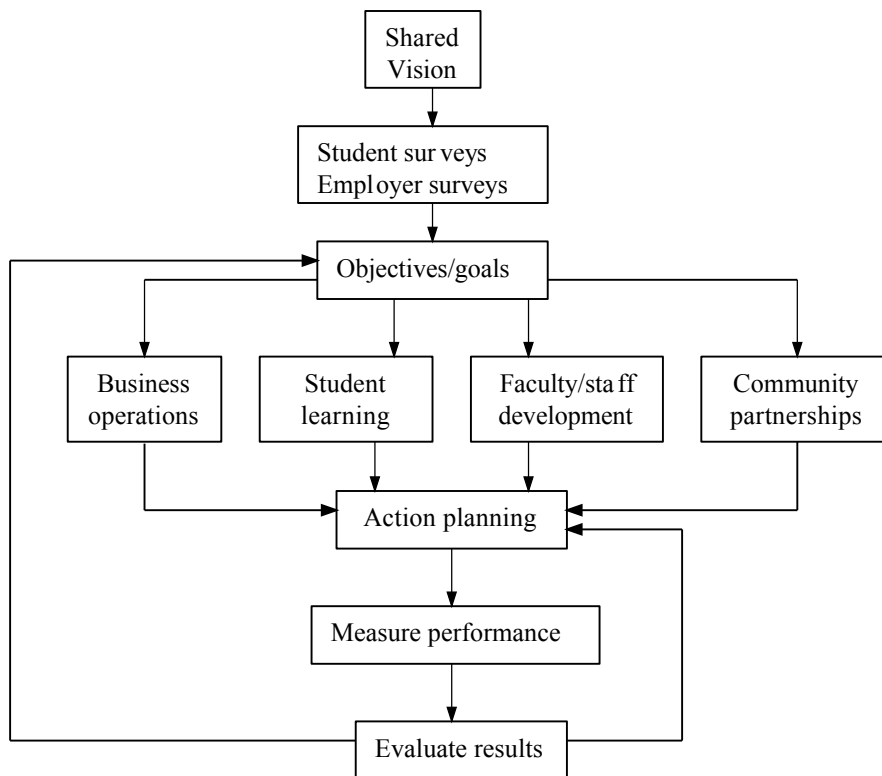


Figure 2. A general continuous improvement cycle for university programs

### Education planning components

There are four proposed planning components for a specific program: student learning, faculty/staff development, community partnerships, and business operations. Specific plans should be developed on how to accomplish the fulfillment of objectives and goals within each component. Each of these components will be discussed in more detail.

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Student learning refers to the environment necessary for students to grow academically, socially, and professionally. It encompasses the classroom experience, but also other exposures that enhance and reinforce the learning process. This includes student work experiences related to their studies, assignment of real-world projects in collaboration with businesses, multidisciplinary and cross-disciplinary team projects, and industrial tours. The factors included in the student learning process are:

- Learning goals and expectations for students
- Curriculum and program design
- Teaching and educational delivery
- Research on teaching and learning
- Student co-curricular development and achievement

Other aspects of student learning include the development of new academic programs, restructuring of existing programs and phasing out of programs that are no longer viable; reviewing course credit requirements, continuing education, recruitment and retention of students, registration, advisement, and other support activities.

As a customer-focused organization, universities need to be constantly aware of customer needs and be responsive to those needs.

Faculty/staff development involves training and education of all employees to enhance their own professional development and to improve the quality of service to customers. First and foremost, training in practices of total quality should be carried out to all employees. Secondly, faculty should be required to take courses on how to become educators. This should encompass methods of delivering instruction, motivational theories on learning, evaluation of teaching effectiveness, and efficiency of teaching methods. In addition, teaching assistants who interact directly with students should undergo an orientation to teaching in order to become more effective at delivering material to students. In the same way that faculty instruction in the classroom is assessed, the same should hold for all other methods of instruction including tutoring sessions and laboratory experiences.

More emphasis should be placed on funding to enhance faculty knowledge and learning. This includes workshops, seminars, and specialized training that will be directly disseminated to students through classroom or laboratory learning. Faculty research development is important, but as a customer-focused university, priority needs to be placed on activities that have the most direct impact on the learning experience of students. Poor teaching has a tremendous negative impact on students, while poor researchers have very little effect.

Community partnership involves the relationship of the University, or a specific program, with external partners. This includes cooperative education or internships with external businesses, outreach programs, research and business partnerships, and alumni. The focus of this component is the development of a strong relationship with the community, as well as building a strong reputation for the university in the eyes of the community. A solid relationship rests on involvement and support of local businesses, membership in local organizations, public presentations and forums, and community service.

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The business operations of the department include all daily activities that support the operation of the department and that provide assistance to faculty and students. The quality and efficiency of the support functions should be primary. From the standpoint of total quality, this involves process management. This is an area that has not been addressed by universities that have begun to improve their quality of education, yet it is a critical component of a successful total quality initiative.

Process management required a disciplined effort involving all employees within the university. Listed below are the practices necessary for successful process management:

1. Translate customer requirements into service design requirements, taking into consideration the link between service requirements and suppliers, as well as process capabilities of support operations and human resources to enhance efficiency and cost effectiveness. For example, if a requirement of students is increased laboratory experiences, collaboration between departments should occur to enhance student learning through shared resources.
2. Ensure that quality is built into services and use appropriate statistical tools during the development of the process. For instance, both qualitative and quantitative research can be conducted to determine how accurately the customer needs are understood. Market trials can provide information on how well the university satisfies customer requirements. Quality of service is more likely to occur if there is a method for measuring that quality and a mechanism for improvement. For example, all students entering a program should be provided with an introductory packet that includes important contacts within the department and College, location and hours of computing laboratories within the department and College, introduction to faculty and their areas of teaching and research, and opportunities for extracurricular activities. Incoming and outgoing student surveys can identify weak areas or deficiencies in service.
3. Manage the service development process to enhance cross-functional communication, reduce service time, and ensure trouble-free introduction of services. Standardization of the service process will ensure consistency of service from one student to the next, and from one employee to the next. Service procedures for assisting students should be developed by all departmental employees to ensure consistency and reduce erroneous responses to student inquiries.
4. Define and document important service and support processes, and manage them as important business activities. Key operations, such as student advisement, should be documented and monitored for efficiency and quality.
5. Define performance requirements for suppliers, ensure that requirements are met, and develop partnering relationships with key suppliers. Suppliers include both internal and external suppliers. Internal suppliers should be held just as accountable as external suppliers should in meeting requirements. For example, the response of the physical plant to a request for installation or repairs within the department should be completed in a timely manner. Every job completed by the physical plant should be monitored and evaluated to ensure quality of service.
6. Control the quality and operational performance of key processes and use systematic

methods to identify significant variations in operational performance and output quality, determine root causes, make corrections, and verify results. For example, suppose a student graduating within a semester receives notification that he/she falls short of the minimum credit hours required for graduation. This is a problem in the advisement process and action should be taken to ensure that this problem does not recur. If the root cause is improper training of a new employee in the requirements of students, a checklist can be developed to ensure that a more thorough job of training is carried out.

7. Continuously improve processes to achieve better quality, service time, and overall operational performance. Based on performance measures, steps should be taken to make improvements in the quality of service and timeliness of service activities. The action plan for continuous improvement needs to be developed through the efforts of all employees.
8. Set “stretch goals” and make extensive use of benchmarking to achieve breakthrough performance. Look at the performance of universities who are at the top of the list in quality of education provided to their students. It is only by setting excessively high goals that superior improvements are achieved.

Action plans determine what steps will be taken to ensure that the objectives are achieved in each of the four areas defined above: student learning, faculty/staff development, community partnership, and business operations. These plans should be detailed, provide key performance measures and standards of performance, and be developed as a team consisting of administrators, faculty, staff and students.

Performance measures should be continuously monitored and evaluated to determine subsequent courses of action. It is critical that all measures of performance have a direct link to objectives and goals, and provide a true indication of program success.

Evaluating performance results with standards allows a program to determine if the quality of service is acceptable, and the degree to which the quality standard has or has not been met. This allows the tracking of quality to ensure that improvements are always being made.

#### Total quality implementation in university systems

There are several requirements that must be satisfied within the university environment in order to ensure successful implementation of total quality. These requirements are revolutionary in that they necessitate a complete tearing down of the current university structure that exists today. Change to a total quality environment will not be easy or occur over night, but instead will require a significant amount of time and energy to do it right; a tremendous amount of patience is necessary as well as a dedicated commitment by leadership to buy in to the principles and practices of total quality.

Specific requirements required prior to total quality implementation are provided below:

- Upper administration, as leaders, must buy in to the concept of total quality and be educated in the practices of total quality to ensure its success across the entire

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- university. It must also be recognized that the university is a system of interdependent processes, linked laterally, over time, through a network of internal and external suppliers and customers. Processes are connected to the university's mission and purpose. Every process contains subprocesses and is itself contained within a higher order process. This structure of processes is repeated throughout the hierarchy.
- Upper administration, as leaders, must recognize that people are the university's true competitive edge. Leadership provides employees with opportunities for personal growth and development. People take joy and pride through learning and accomplishment, and enhance the capability of the university to succeed. People are active contributors, valued for their creativity and intelligence. Every person is a process manager, presiding over the transformation of inputs to outputs of greater value to the university and to its customers.
  - All employees of the university need to understand the definition of quality from the standpoint of total quality. Quality is defined as products and services that go beyond the present needs and expectations of customers. Innovation is necessary.
  - Recognition and acceptance of a common goal: serving the students. In total quality, self-interest and the greater good are achieved simultaneously by serving the customer. Everyone wins or no one wins. Cooperation takes the place of competition.
  - All employees must be trained in the principles of total quality. Quality embodies knowledge applicable to all the disciplines of the university, and everyone must learn and practice the philosophy of total quality.
  - Administrators need to make a transition to playing the roles of mentors, facilitators, and innovators. Quality results from the university's systems and individuals working together. The majority of problems are prevented and improvements promoted when employees understand how they fit in, and have the knowledge to maximize their contribution to the whole system. Only administration can create an environment that nurtures a team-oriented culture, which focuses on problem prevention and continuous improvement.
  - Traditional reward systems must be abandoned since they place people in an internally competitive environment. Although individual performance and accountability is important, there should also be rewards and recognition for team contributions to reinforce cooperation.
  - Tenure should be abolished since it promotes productivity in the early years of a faculty member's career, but there is little incentive for it after tenure. In the traditional university system, there is no accountability after tenure. This is a serious detriment to successful implementation of total quality. All employees must be held responsible.
  - Unions should be eliminated for both faculty and civil service employees. Based on the history of its normal mode of operation, unions are a detriment to forming a solid relationship between administrators, faculty, and staff. Under the principles of total quality, which include teamwork, employee empowerment, and employee well being and development, the existence of unions is no longer viable. Unions are a detriment to teamwork, and in all case studies is revealed as a negative contributor.
  - Teaming is necessary. Formal and informal mechanisms should be set in place to encourage and facilitate teamwork and team development across the university system. Traditional barriers must be broken down.

- Improved supplier relations. Internal and external suppliers need to establish a partnering relationship to encourage innovation, reduce variation, lower costs, and improve quality.
- Control of processes. A mechanism should be developed to control educational and business processes. This is a result of shared values and beliefs, as well as knowledge of mission, purpose, and customer requirements.
- Employee motivation. Administrators need to provide leadership to motivate employees to make meaningful contributions to what they believe is an important and noble cause and of value to the university and society.
- Eliminate internal competition. In total quality, competitive behavior is not a natural state. Instead, competitive behavior serves to improve the methods for achieving customer satisfaction.

### Application of total quality principles within a department

Previously, a potential framework for total quality in education has been discussed. In the remaining portion of the paper, implementation of total quality principles within a hypothetical department will be outlined in order to provide some insight into the translation of principles into application.

The vision of the Department is to create an environment in which students can acquire the necessary skills to prepare them for the workforce, establish life-long learning habits, and achieve personal growth and development. All stakeholders will experience ownership in the educational system. The department supports an environment in which students, faculty, and staff are actively involved in the continuous measurement and improvement of our processes.

Departmental goals are to: (1) develop methods for continuous input, planning, assessment, and subsequent improvement of our educational programs, outreach activities, and support systems, and (2) promote faculty and staff development, and educate them in total quality practices.

A focus on the students is paramount. Quality Function Deployment (QFD), an approach to identifying customer requirements, will be utilized to determine the needs of students entering the department. The results of Quality Function Deployment will highlight service requirements that must be met in order to ensure customer satisfaction. In the QFD process, potential future students will be involved: high school students, community college students, and local industry. Student input will not end with the QFD process. Student satisfaction will be monitored on a continuing basis through annual surveys and the placement of a suggestion/complaint box in the department office. Providing a system for continuous feedback will allow the students' voices to be heard when a problem occurs, follow-up to resolve conflict or problems, and ensure student satisfaction.

Student satisfaction will be measured and compared to results from competing departments and related programs. Student satisfaction measures should encompass the following:

- Number of problems/complaints filed
- Percentage of problems resolved to the satisfaction of the student

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- Degree of satisfaction within individual courses (measured within each course)
- Degree of satisfaction with advisement process
- Degree of satisfaction with faculty assistance outside the classroom
- Degree of satisfaction with staff assistance

Survey cards will be developed to address specific areas of service in the department and will be administered and collected on a bi-semester basis. To make this data collection more efficient, all survey cards will be completed as part of the course survey process. Information from surveys will be evaluated and utilized to improve department and educational processes.

Employers who hire graduates will be surveyed to determine: (1) expectations of graduates entering the workforce, (2) technical skills and knowledge required of their employees, (3) relevance of department curriculum to job requirements, and (3) how the department's graduates perform on the job.

Results of employer surveys will be reviewed and, in conjunction with an external advisory board, decisions will be made on revisions in curriculum.

For employees of the department to operate in a total quality environment, they must be trained in the practices of total quality. Once employees are trained in total quality, the foundation is laid for a teaming environment. All employees, at all levels and in all functions, should be involved in:

- Strategic planning for the department.
- A suggestion system will be formed to elicit employee input, promoting involvement in the continuous improvement of the department.
- Employees who make valuable contributions and create innovative solutions to the department will be recognized.
- Employees will develop their own job procedures and performance standards, since they know their job better than anyone else.
- Teams consisting of the department chair, faculty, support staff, and students will be involved in making decisions on the allocation of department budgets, defining service procedures in the department office, defining service procedures in advisement, and development of surveys.
- Individuals and teams will be empowered to make decisions that affect quality and student satisfaction.
- Employees at all levels, including students, will evaluate their supervisors on leadership, communication, and support. Teaching assistants will evaluate faculty, faculty will evaluate the Department Chair, the Department Chair will evaluate the Dean, student workers will evaluate staff, and staff will evaluate the Department Chair. These evaluations will be, in part, a basis for employee incentives.

Student learning objectives:

- Solicit student input throughout their academic career
- Develop a comprehensive assessment plan
- Establish learning goals and expectations for each course
- Standardize curriculum content and format for consistent and efficient delivery



- Educate students on total quality practices
- Develop innovative approaches to teaching
- Educate instructors on effective teaching methods
- Involve faculty in extracurricular activities that further promote student development

Student learning deliverables include:

- Informal and formal student surveys
- Database of detailed course competencies and course syllabi
- Assessment plan that links student performance measures to course goals and department goals
- Student learning performance measures linked to department goals

Faculty/staff development objectives:

- Train all employees in total quality practices
- Educate faculty, instructors, and teaching assistants on how to educate
- Provide funding to enhance faculty knowledge and learning
- Provide opportunities for staff development

Faculty/staff development deliverables include:

- Faculty evaluation system based on involvement in achieving department goals
- Staff evaluation system based on involvement in achieving department goals
- Performance measures that link faculty/staff development to department goals

Community partnership objectives:

- Increase involvement with local industry
- Solicit input on graduates from employers
- Solicit employer input on curriculum revisions
- Increase involvement in local organizations
- Increase involvement in community activities
- Develop effective methods of maintaining alumni relationships
- Increase involvement with high schools, community colleges
- Increase involvement with parents of college students

Community partnership deliverables include:

- Employer surveys
- External advisory board
- Performance measures linked to department goals

Business operations objectives:

- Increase efficiency and quality of support functions
- Recognize faculty, staff, and student suggestions that result in improved operations
- Promote team work in the planning and documentation of business operations
- Develop strong partnership with internal and external suppliers

Business operations deliverables include:

- Standardized service procedures
- Employee suggestion system
- Documentation of key service and support processes
- Performance requirements for suppliers
- Performance measures linking service to department goals

Table 1 lists some examples of key performance measures for the planning components consisting of student learning, faculty/staff development, community partnering, and business operations.

The list of performance measures in Table 1 is not complete and development of additional performance measures should occur with the participation of a cross-section of department employees.

Table 1. Key performance measures for planning components

Performance measures			
Student learning	Faculty/staff development	Community partnering	Business operations
1. Percentage of students participating in co-ops and internships	1. Percentage of employees trained in total quality	1. Percentage of employees involved in local organizations	1. Number of student complaints
2. Student satisfaction in individual courses	2. Percentage of faculty attending seminars and workshops	2. Percentage of graduates hired in local industry	2. Time taken to resolve student conflict
3. Student satisfaction with advisors	3. Employee satisfaction with supervisor's performance	3. Employer satisfaction with job performance of graduates	3. Percentage of problems resolved to student satisfaction
4. Student satisfaction with faculty mentoring	4. Number of employee suggestions	4. Number of companies offering co-ops and internships	4. Number of improvements made to office operations

A comprehensive assessment plan, which is included under the student learning component, must be developed as part of the continuous improvement cycle. Completion of an assessment plan for

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the department is beyond the scope of this paper, but some suggestions will be provided for assessing individual courses; these recommendations are as follows:

- Define course objectives based on employer and student requirements, and department goals.
- Define detailed competencies that are linked to course objectives.
- Develop test questions that are directly linked to at least one detailed competency.
- Track the performance of students for each individual test question and plot results. Trend individual performances within each course, as well as across the curriculum to identify problem areas.
- Evaluate the performance of students for individual test questions using techniques of statistical process control.
- If the process is out of control, evaluate teaching methods and make improvements in instructional delivery.
- Encourage continuous feedback from students on course delivery, course organization, and instructional methods.

The greatest challenge in the implementation of total quality is putting into practice the processes and procedures that have been developed. It is mandatory that the Department Chair assumes the role of coach and mentor, to support and encourage employees to become active participants in all department operations and to take ownership in the department. In addition, the Department Chair must closely monitor employee activities to ensure that employees do not fall victim to the “old way of doing things”. As a leader, the Dean should closely monitor Department Chairs in their operations, and take ownership in the College.

## Conclusion

The focus of this paper was the practical implementation of total quality principles in a university system. General guidelines and requirements for the implementation of total quality were provided, as well as a more detailed plan for total quality implementation within the department.

Total quality within a university environment demands a new way of thinking and a new set of skills. This new style includes the following characteristics:

- Thinking in terms of systems
- Defining student and other customer requirements
- Planning for quality improvements with customers
- Dealing with student and other customer dissatisfaction
- Ensuring ongoing quality efforts
- Developing a life-long learning style
- Team building
- Encouraging openness
- Creating climates of trust and eliminating fear
- Listening and providing feedback
- Leading and participating in group meetings
- Solving problems with data

- Clarifying goals and resolving conflicts
- Delegating and coaching
- Implementing change
- Making continuous improvement a way of life

There should be no misconceptions that implementing total quality is a simple process or one that does not require a substantial investment in human resources. However, it is a necessary step for universities if they are to survive and flourish in the years to come.

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