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Selected Paper

**Application of Total Quality Management (TQM) Systems and
Programs (Deming/Juran/Six Sigma) to Lower Instructional Cost and
Increase Quality of Service in Colleges of Agriculture**

Paper Presented

At

**American Agricultural Economics Association
Annual Meeting
Denver, Colorado
August 1 - 4, 2004**

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- I. History of the TQM movement
- II. Nature of the Problem: Escalating Costs of Instruction and Reduced Revenue
- III. Use of Cause-Effect Analysis (Isikawa Diagrams)
- IV. DMAIC Analysis and Six Sigma
- V. Use of Computer Software in DMAIC and Six Sigma
- VI. Summary and Conclusions

History of the Quality Movement & TQM

Many observers agree that the interest in quality began in the 1970's when the Japanese auto industry began penetrating the U.S. automobile industry. Guided by the efforts of W. Edwards Deming and others, Japanese manufacturers and automobile companies in particular began instituting measures of SPC (statistical process control) to ensure a high level of quality assurance in their products. Consumers in the U.S. began to recognize the quality difference between domestic and imported products and shifted their purchases accordingly. The pressure for U.S. manufacturers to improve quality intensified during this period, affecting all major industries.

Several concepts characterized the quality movement. First, the institution of cooperative relations between workers and management/lean/flat organizational structures occurred as a part of the movement. "Quality Circles" made up of members of labor and management worked on specific projects to ensure quality in products. Another strategy for improvement was the adoption of Deming's Fourteen Points: Create constancy of purpose, Adopt a new philosophy (quality matters), Cease dependence on inspection to achieve quality, End the practice of awarding business on the basis of price alone, Improve constantly, Institute training on the job, Institute leadership, Drive out fear (cooperative atmosphere), Break down barriers between departments/units, Eliminate work standards/quotas, Remove barriers that prevent pride in workmanship, Institute a rigorous program of education and self-improvement, and Make everyone responsible for the transformation to quality.

With the adoption of these points, it was recognized that improved quality would lead to lower costs and increased customer satisfaction.

The Nature of the Problem

The application of quality assurance methods in the service industries and including all of postsecondary education is timely. One of the criticisms of higher education is that the systems are not accountable for results. Improving performance of students will be necessary to compete in a global marketplace. Although accreditation of programs is widely conducted and is a part of ensuring results, this is usually accomplished at the department or unit levels and is based on criteria in addition to program outcomes.

Secondary education has relied increasingly on testing/state or federal standards to measure student performance. A full discussion of quality does not appear to have been addressed. Only topics such as remediation and dropouts have been investigated. The final product of higher education is acquisition of knowledge, skills and attitudes which will allow the student to meet work performance standards and enjoy a satisfactory life as a citizen.

The two vexing problems facing higher education are raising costs of instruction (intensified by declining state aid) and the limited ability to increase revenue to meet the demands placed on institutions of higher learning. One area is remediation or bringing students to the minimal level of expectations to succeed in programs. Another is the length of time to complete a program. Recent data indicates that it is taking students

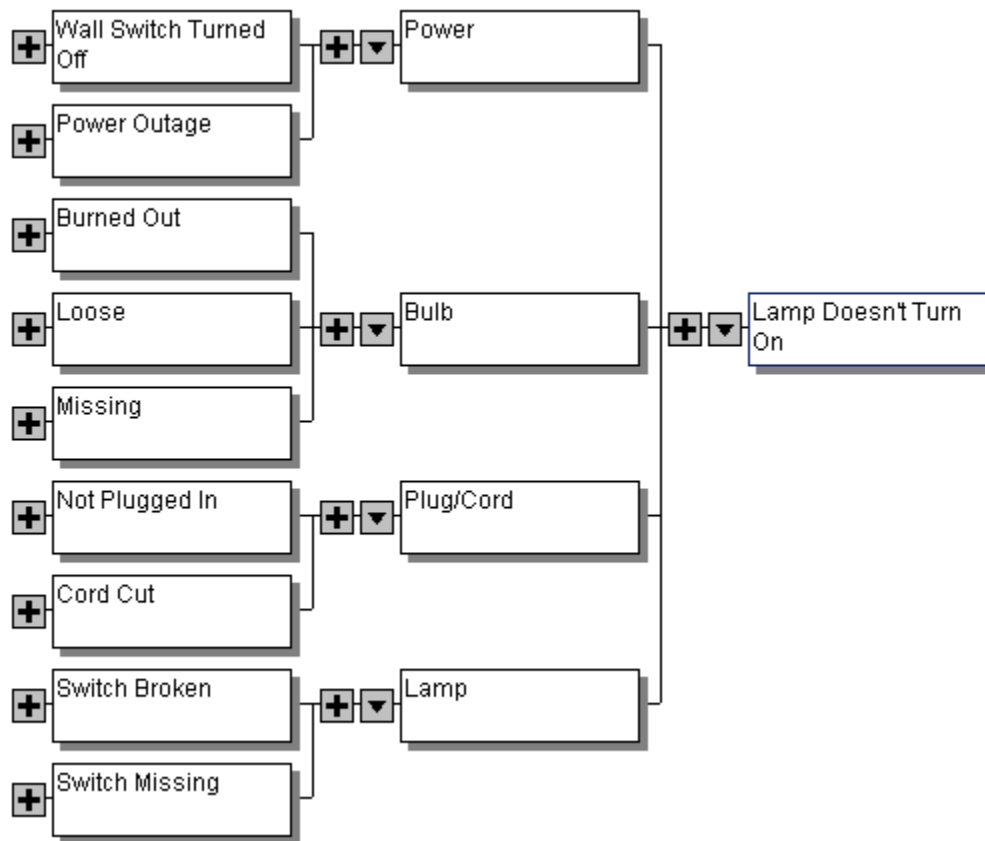
longer to complete programs. This has profound impacts on cost of delivering higher education.

The application of quality methods, specifically that embodied in established and proven programs such as Six Sigma can address these problems.

Cause-Effect (Isikawa diagrams)

One of the tenets of the quality improvement programs is to focus on solvable and narrowly defined problems. The second example proposed deals with the wide range of cost/SCH in higher education. The Isikawa framework separates causes of problems into certain clusters or groupings: machine/technology, manpower, procedures/policies, Mother Nature. An example is shown in Figure 1. where the failure of a light to turn on is attributable to these groupings.

Figure 1. Light Bulb Example



Figures 2. and 3. Apply this same philosophy to High cost/ SCH and Reduced Revenue

Figure 2. High Cost/SCH

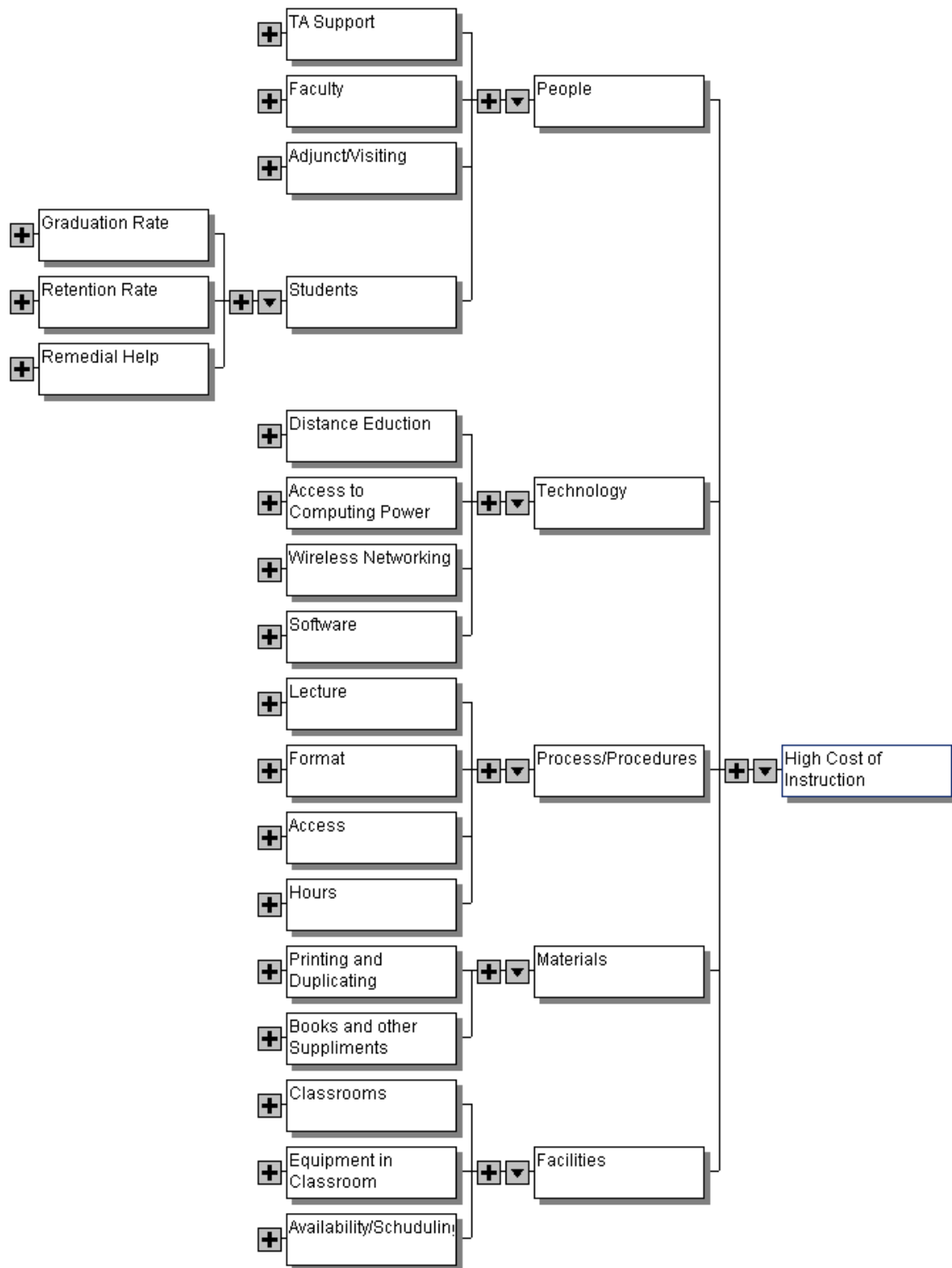
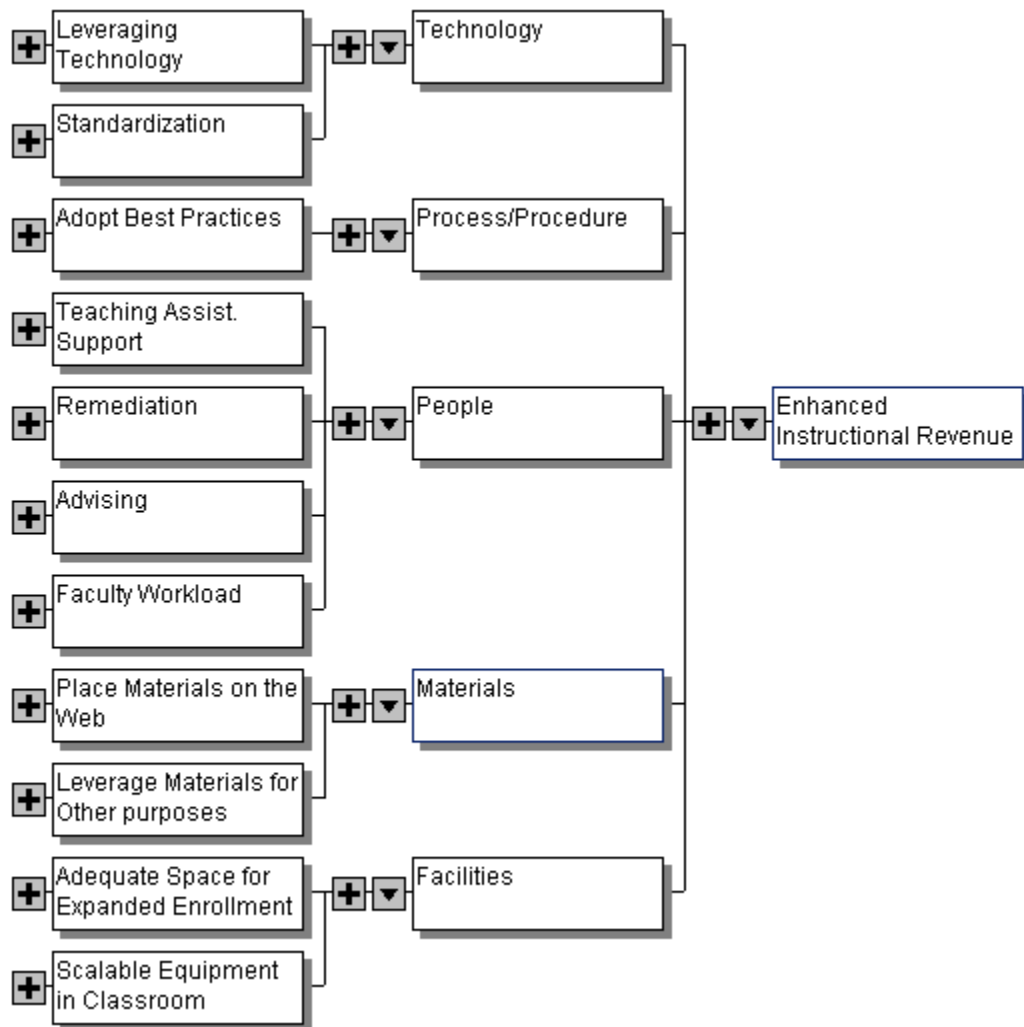


Figure 3. Enhanced Revenue Potential (ways to increase revenue)



DMAIC Analysis

This acronym established a stepwise process of improvement. The goal is to reach a higher level of measurable quality (Six Sigma- less than 3.4 defects per one million opportunities). The first phase is Define where the problem is defined. The next step is Measure where data is collected to clarify the problem. It is followed by Analyze where causes and potential solutions surface. The cause-effect analysis that precedes this discussion is an integral part of DMAIC. Next, the solution or improvement is specified. The last step is to Control or monitor performance of this process. Software such as PathMaker by SkyMark and Minitab can be used throughout this process. The following excerpts are taken from PathMaker.

Summary and Conclusions

The preceding description suggests that the application of quality improvement programs to higher education is a new effort. The project upon which this paper is based will be exploring new conceptual space as the dimensions of higher education are explored.

Earlier efforts suggest that some issues are imbedded in this discussion. 1) Increasing reliance on the measurement of outcomes in higher education is one of these. This is one the mandates which will drive the higher education system. 2) Recognizing and correcting variation in the outcomes specified will be a major achievement. 3)

Development of best practices in the instructional area will improve process elements. 4)

Empowerment of instructors is crucial to enact course quality changes. Changes in quality usually come from the more basic level of instruction. 5) Whether efficiency, which accompanies quality improvements, is or should be the primary goal of higher education. 6) Issues of efficacy (effectiveness of instruction) tend to pervade the discussion.

The proposed project will create a new awareness of these issues and the opportunity to improve quality. The utilization of PathMaker software will complete the application by allowing the creation of cause-effect (Isikawa) and other tools to be used.

The development of the Isikawa diagrams for cost control and revenue is a major first step.

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