A proposed total quality management model for instructional supervision in vocational-technical programs

Chih-Yang Chao

Iowa State University
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A proposed total quality management model for instructional supervision in vocational-technical programs

Chao, Chih-Yang, Ph.D.
Iowa State University, 1994
A proposed total quality management model for instructional supervision in vocational-technical programs

by

Chih-Yang Chao

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CHAPTER I INTRODUCTION

Background

The problems facing education have been discussed on many occasions during recent years. From the report entitled "The Education Crisis: What Business Can Do," Perry (1988) stated:

Schools today are not preparing kids for jobs—they aren't even teaching them to read and write. In the United States, 30 percent of all high school students (one million teenagers each year) drop out before graduating. Most are virtually unemployable. (p. 71)

Other educators also have similar comments. Leonard (1991) concluded that everyone recognizes America's crisis in education. Students in the U. S. lag behind students in other countries in math, science, geography, and foreign languages. High dropout rates fuel spiraling social problems in urban areas. Drugs and violence in school corridors create fear and interfere with learning. Elmore (1990) pointed out that American education is seeing "fundamental changes in expectations for student learning, in the practice of teaching, and in the organization and management of public schools" (p. 1).

Since education is so important for individuals and society, many efforts have been made to solve these and other problems. These efforts almost always deal with individual problems and the overall picture is rarely addressed.

A new American school does not necessarily mean new bricks and mortar, nor does a new American school have to rely on technology; the quality of learning is what matters. (p. 15)

Another answer also can be seen from business and public sectors (U. S. Department of Labor, 1991).

The qualities of high performance that today characterize our most competitive companies must become the standard for the vast majority of our companies, large and small, local and global. The nation's schools must be transformed into high-performance organizations in their own right. (p. vi)

Several other authors have also expressed concern about the quality of education (Blanton 1991; Glasser 1990; Glaub 1990; Spanbauer, 1992). This concern needs to be addressed, especially in vocational technical (V-T) education where it is increasingly important to prepare students for entering the workplace. Enhancing the quality of educational products in order to solve problems is a very important duty and an exciting challenge for educators.

One approach to improving the quality of products is Total Quality Management (TQM), a new management approach that has been developed for improving the quality of products in business or service sectors. TQM can be defined as follows:

Total Quality Management is a structured system for creating organization-wide participation in planning and implementing a continuous improvement process to
meet and exceed customer needs. (GOALS/QPC, 1991, p. 1)

Companies that have used Total Quality Management practices achieved better employee relations, higher productivity, greater customer satisfaction, increased market share, and improved profitability (General Accounting Office, 1991). In the United States, many businesses are using the principles of Total Quality Management with positive results, such as Bridgestone (USA), Tri-Cities, Tennessee, and The United States Navy (Walton, 1991). Many school districts in the United States are currently considering the implementation of similar practices (Winter, 1991).

In facing an economically changing environment as business has done, and the strong need to improve the quality of school system outcomes, school leaders and reformers have begun to look to the principles of TQM as a means to help transform schools and the American education system so that both their processes and their results reflect the goals that have been identified for them (Glasser, 1990; Leonard, 1991; Meaney, 1991; Melvin, 1991; Moen, 1991). At present, some school districts have proceeded to use the TQM approach in an effort to find and reap the benefits that businesses have enjoyed. However, many schools are awaiting further information before adopting the TQM approach.

In vocational technical education, the educational goals focus on preparing students to adapt to the needs of the workplace. Therefore, the continuous improvement of the
quality of educational products in order to match employer needs is a critical and necessary goal for V-T educators. After perceiving this point of view, several community colleges are trying to utilize a TQM approach to address this goal. They include Delaware County Community College, Fox Valley Technical College, Jackson Community College, Lamar Community College, Palm Beach Community College, St. Augustine Technical Center, and the Hawkeye Institute of Technology (DeCosmo, Parker, & Heverly, 1991; Sherr, & Teeter, 1991; Spanbauer, 1992).

Need for the Study

In the educational setting, instructional supervision is one of the main approaches that has been used to diagnose teaching and learning problems relating to quality since the 1600s (Beach & Reinhartz, 1989). In facing the impact of business practices and the needs for school innovation, traditional instructional supervision is inadequate. Many educators recognized that the role of instructional supervision must be changed. For instance, Alfones, Firth, and Neville (1981) redefined supervision as a management function within the school production system. Wiles and Bondi (1986) asserted that supervision is a leadership function involved with administration, curriculum, and teaching. Beach and Reinhartz (1989) declared that this is a managerial and entrepreneurial period for instructional supervision. In
other words, instructional supervision must be a managerial approach that focuses on leadership functions to improve educational quality in a school production system.

Although the need for change is critical, there has been little progress towards change in instructional supervision practices. In the educational setting, the major types of teacher performance evaluation are common law and clinical supervision (Petrone, 1990). The managerial instructional supervision approach has seldom been applied to deal with teaching and learning problems.

Solving teaching and learning problems to improve the quality of education is a main purpose of instructional supervision. When considering the transfer of the TQM approach to the education sector to improve the quality of outputs, there is a need to determine whether instructional supervision can be modified to include TQM concepts.

Moreover, a model consists of a set of assumptions, an organizational framework, and a set of rules for manipulating the details (Matheson, Bruce and Beauchamp, 1978). It is useful for guiding a transformation. More specifically, a conceptual TQM implementation model for instructional supervision is needed in order to guide the transformation.

After a literature review and field interview process (Bonstingl, 1992; Bradley, 1993; Ciampa, 1991; Deming, 1993; GOALS/QPC, 1991; Ryan, 1992; Spanbauer, 1992; Weaver, 1991), a proposed model was generated by the researcher for
instructional supervision in V-T programs. Since the model was developed through a literature review and field interview, this model may have lacked validity. A Delphi process utilizing experts in TQM and instructional supervision was used to validate this model. Since the TQM model was being developed for use in V-T programs in Iowa, the attitudes of administrators and teachers who may utilize this model were important to the success of implementation.

According to reports from the Federal Quality Institute (1992); General Accounting Office (1991); and Sashkin & Kiser (1991), top management's recognition of the need for improvement and its willingness to learn are the first steps toward implementation. Without a strong leadership base, the whole quality policy will lack support. In fact, indifference and a lack of involvement by top management are frequently cited as the principle reasons for the failure of quality improvement efforts. Only a strong leadership team focused on quality improvement can overcome the inevitable inertia and resistance to change by creating clear quality goals and developing the systems and methods for achieving these goals. More specifically, the positive attitude of top management toward TQM will help assure an organization achieves the goals of quality improvement. Therefore, measuring the perceptions regarding the TQM instructional supervision model of the V-T administrators is a necessary step prior to any proposed implementation.
Employee participation is another one of the basic features that is necessary for a successful TQM implementation. The employees' attitudes regarding a proposed implementation may be related to the amount of effort that they demonstrate during the implementation. In other words, the employee must feel that there is a real need to attempt a TQM model. Thus, before one can initiate a TQM instructional supervision model in V-T programs, it would be useful to determine the attitudes of the teachers regarding this TQM model. Such a measure would serve as a benchmark for subsequent training and help effectively focus initial training efforts.

Therefore, following the Delphi process, the measurement of the attitudes of V-T administrators and teachers regarding the TQM model is a necessary step in order to accomplish the purposes of the study. Through the attitude measurement process, perceived weaknesses can be identified and modifications can be made to improve the model. The administrators and teachers may perceive a greater degree of ownership that will also enhance the probability of success.

Statement of the Problem

The problems addressed in this study were as follows:

1. Can experts envision the basic components of a TQM based instructional supervision model and achieve consensus regarding the components?
2. What attitudes toward this model exist between V-T administrators and teachers? Are there differences in attitudes toward the model between the groups?

Purpose of the Study

This study proposes a total quality management implementation model that can guide instructional supervision in community college V-T programs in Iowa. Such a model promises to improve the quality of instruction in Iowa community college vocational technical programs.

Research Questions and Hypotheses

Research Questions

In order to generate an initial model for implementing TQM in instructional supervision practices, a literature review and a field interview were conducted. During the field interview, the following questions were posed:

1. What circumstances existed when a school considered utilizing the TQM approach?
2. What conceptual elements and models were applied in the process?
3. What were the results of utilizing the TQM approach?
4. What do these results mean to the people involved with them?
5. What are the resulting attitudes of the people in this institute?
6. Did they apply TQM in instructional supervision?
7. What are the major frustrations or problems this institute has?

After the initial model was proposed, a Delphi study was conducted to address the following questions:
1. Can experts agree about the common components in the proposed model?
2. Can experts agree about the degree of importance of these components?

With an implementation model that has been refined by the Delphi panel, an attitude survey process was completed, and the following questions were answered:
1. Will V-T professionals show positive attitudes toward the components of the model?
2. Can these attitudes guide further model refinement?

Research Hypotheses

For the purpose of testing the model, the following hypotheses were formulated for the Delphi and attitude study:

Research hypothesis one: The variances of attitude scores in each second round question will be significantly smaller than the variance calculated for the first round questions.

Rationale: The model was refined based on the results from the first round Delphi. Therefore, one could expect the level of agreement to be higher for the second round. The
variance in each second round question will decreased than first round question.

**Independent variable:** The order of the Delphi is the nominal independent variable of hypotheses one. The levels of the independent variable are: the first and second round Delphi.

**Dependent variable:** The attitude score of each question is the interval dependent variable in hypothesis one.

**Research hypothesis two:** The attitude of experts regarding the model in the second round is more positive than the first round. In other words, the mean of each question in the second round will be higher than the first round mean of the same item.

**Rationale:** The model was refined by the researcher based on the suggestions from the experts. Therefore, the model will be accepted by the experts after the revision.

**Independent variable:** The order of the Delphi is the independent variable of hypothesis two. The level is the first and second rounds.

**Dependent variable:** The mean attitude values for the first and second round Delphi survey are the interval dependent variables in the hypothesis two. The levels of these dependent variables are the seven points from strongly disagree to strongly agree on a Likert-types rating scale.

**Research hypothesis three:** Those in administration will demonstrate more positive attitudes regarding the TQM
implementation model than those teachers not in an administrative position.

Rationale: Storm (1993) and Teigland (1993) indicated that teachers and administrators had different attitudes regarding the implementation of TQM in schools. Hong (1993) suggested use of employee classification as an independent variable in a TQM related research. Administrators are in a position where they need to make decisions about the future of an organization. They have to collect new managerial information about new trends in school development and they usually have the chance to attend workshops or lectures on TQM. Therefore, administrators will receive more knowledge about TQM than others. The more TQM knowledge the administrators have, the greater the extent of the need they will perceive. This will result in higher positive attitudes toward the TQM model.

Independent variable: The position of V-T professionals is the nominal independent variable of hypothesis three. The levels of the independent variable are: administrators and teachers.

Dependent variable: The attitude value toward the TQM model in the final survey is the interval scored dependent variable in hypothesis three. The levels of this dependent variable are the seven points from strongly disagree to strongly agree on a Likert-type rating scale.
Research hypothesis four: V-T professionals with more work experience will have more positive perceptions toward the TQM implementation model.

Rationale: V-T professionals with more work experience will have participated in more workshops that support the working need. In other words, they have more opportunity to obtain TQM knowledge from lectures or articles. Therefore, they will display a higher positive attitude towards the TQM implementation model.

Independent variable: The years of work experience is the independent variable of hypothesis four. The levels are the different years of work experience.

Dependent variable: Same as hypothesis three.

Research hypothesis five: The more TQM training V-T professionals have, the more positive attitudes they will perceive regarding the model.

Rational: TQM Training experiences and the attitudes regarding work behaviors have been investigated by several researchers (Hong, 1993; Lane, 1992). A significant difference existed between the perceptions of respondents who had received TQM training and those who did not. It is reasonable to assume that V-T professionals who attended TQM training may be more positive about the TQM model.

Independent variable: The number of TQM training hours is the independent variable of the hypothesis.

Dependent variable: Same as hypothesis three.
**Research hypothesis six:** The teachers belonging to different vocational groups will perceive different attitudes regarding the model.

**Rational:** Different background may perceive different knowledge and attitude regarding the educational innovations. It is important to determine whether teachers in different vocational groups have different attitudes regarding the instructional supervision model.

**Independent variable:** The vocational groups: industry, business, health care, others, are the independent variables in the hypothesis.

**Dependent variable:** Same as hypothesis three.

**Hypothesis seven:** The V-T professionals in different community colleges will demonstrate different attitudes regarding the model.

**Rational:** V-T professionals in different organizations may demonstrate different attitudes regarding the educational innovations. It is important to determine whether V-T professionals in one community college may have a different attitude regarding the model than professionals in another community college.

**Independent variable:** The community college selected: Des Moines Area Community College, Hawkeye Community College, Iowa Western Community College, Kirkwood Community College, Northwest Iowa Community College, and North Iowa Community college were the independent variable in this hypothesis.
Dependent variable: Same as hypothesis three.

Research hypothesis eight: There is no interaction between the following independent variables when taken two at a time: schools, position, program, working experience in years, and TQM training hours that affect the attitude regarding the model.

Procedure of the Study

In order to accomplish the purposes of this study, the following steps were completed:

1. Review the literature on TQM implementation.
2. Review the literature on instructional supervision in V-T programs.
3. Generate the interview questions regarding the implementation of TQM.
4. Conduct a field trip and interview the leader of a V-T institute where TQM has been implemented.
5. Analyze the data collected during the preceding steps.
6. Determine the components that may be used in implementing a TQM approach.
7. Synthesize the results from a literature review and interview, construct a proposed TQM model that can be used for instructional supervision.
8. Conduct the Delphi study.
9. Modify and validate the model through the use of a Delphi process.
10. Review the attitude measuring literature.
11. Develop a draft of a TQM attitude measuring instrument.
12. Establish validity for the instrument and revise the instrument as needed.
13. Conduct a pilot test of the instrument and revise the instrument as needed.
14. Conduct a field test to obtain data.
15. Analyze the data and test the hypotheses.
16. Modify the tentative model based on the results.
17. Propose a TQM-based instructional supervision model.

**Limitations of the Study**

Because the population for the attitude measurement in this study was from Iowa, the model is most appropriate for Iowa community college V-T programs. Since there were no related attitude measuring instruments which could be used in this study, the attitude measure for the TQM model was created by the researcher. Based on the time and cost limitations, lengthy reliability and validity testing of this instrument could not be completed. Therefore, application of this instrument to other research efforts requires obtaining suitable reliability and validity data for that research. The proposed model was based on analysis and design processes only; field implementation and evaluation processes are needed so that one can validate the final effectiveness of this model.
Statement of Assumptions

The assumptions on which this study was based included the following:

1. The experts involved in the study can properly present their expertise in the TQM and instructional supervision areas.

2. The experts who were involved in the Delphi process accurately presented their opinions regarding the proposed model.

3. The attitude measuring instrument created by the researcher was valid and reliable.

4. The V-T professionals could accurately respond to the questions in the attitude measuring instrument.

Significance of Study

Since this study covered all Iowa community college V-T programs, the proposed model will be applicable to these programs.

Definitions of the Terms to be Used

1. Vocational Technical (V-T) Program: A post secondary educational program that focuses on professional jobs preparation. It refers to the job preparation programs in community college levels in this study.
2. V-T professionals: The people that work in the V-T school system. In this study, this refers to both administrators and teachers.

3. TQM components: The most important issues in a TQM model that must be considered and proceeded when one applies this approach.

4. Attitudes: An attitude is an individual's predisposition to evaluate an object in a favorable or unfavorable manner. An attitude consists of affective (emotional), cognitive (belief), and behavioral components (Organ & Bateman, 1986 p. 219).
CHAPTER II LITERATURE REVIEW

In order to develop the instruments and the initial model, the literature regarding Total Quality Management, TQM in schools, instructional supervision practices, model construction, Delphi techniques, and attitude measures were reviewed. Related research was also discussed so that the status and the possible weaknesses regarding the study can be ascertained and prevented.

Total Quality Management

Total Quality Management is an approach that comes from quality control and scientific management efforts. Although the scientific management and quality concepts were created and introduced to American industry earlier this century, the term "TQM" was discovered and applied only since the late 1980s (Tenner & DeToro, 1992). According to Pines (1990):

The birth of Total Quality Management, like most later TQM efforts, was in adversity. The year was 1942. Facing an unprecedented demand for materials, the U. S. War Department established a Quality Control section, staffed largely by employees from Bell Telephone Laboratories. (p. 5)

The concept of quality control came from a Bell Labs statistician, Walter A. Shewart. In 1931, Shewart published his ideas on quality control and defined acceptable upper and lower limits for tasks and introduced "statistical control" charts that workers could use to plot and adjust variations.
This was the beginning of statistics as applied in the quality control field. Shewart's method replaced traditional end of line inspection with an "on-line" awareness of variation.

After World War II, American businesses and industries enjoyed the war's legacy of consumer prosperity and did not have the same interest in quality. Although the methods of quality control had been introduced, there was little significant progress in the quality field.

In the early 1950s, W. Edwards Deming, an American expert in quality control, began working for industries in Japan. The concept of quality control was introduced and a new stage of TQM history had begun.

Deming told the presidents of Japan's leading companies that quality was essential to their survival. He explained to them that the consumer is the most important part of the production line. He urged them to work in partnership with their vendors, to develop instrumentation and to gain control over their processes. In addition, statistical control methods were also introduced (Aguayo, 1991; Walton, 1991; Walton, 1986). Japanese top management listened to Deming's words and "Made in Japan" became a high quality label all over the world.

In the 1980s, with American businesses facing high pressure from Japanese market competition, Americans rediscovered quality. Several large companies began to discover the reasons why the quality of products in Japan had improved so
rapidly. American business found that quality precepts and practices permeated every level of enterprise in Japan. From the boardroom to the factory floor, the effort toward quality was in a word "total" (Pines, 1990). They found that quality was established by addressing customer needs, obtaining top management's commitment, assuring employee participation, utilizing statistical methods, and so on. "Total quality management" began to be recaptured by some American businesses from Japan.

Definitions of Quality

Through the development of different approaches, different definitions of quality evolved. A comparison of definitions of quality is shown in Table 1 (Garvin, 1988; Hunt, 1992).

Table 1

The Definition of Quality

1. Transcendent

"Quality is neither mind nor matter, but a third entity independent of the other two...even though Quality cannot be defined, you know what it is..."

Robert Pirsig

"...a condition of excellence implying fine quality as distinct from poor quality...Quality is achieving or reaching the highest standard as against being satisfied with the sloppy or fraudulent."

Barbara W. Tuchman
Table 1 (Continued)

2. Manufacturing-based

"Quality [means] conformance to requirements."
Philip B. Crosby

"Quality is the degree to which a specific product conforms to a design or specification."
Harold L. Gilmore

3. Product-based

"Differences in quality amount to differences in the quantity of some desired ingredient or attribute."
Lawrence Abbot

"Quality refers to the amount of the unpriced attribute contained in each unit of the priced attribute."
Keith B. Leffler

4. Value-based

"Quality is the degree of excellence at an acceptable price and the control of variability at an acceptable cost."
Robert A. Broh

"Quality means best for certain customer conditions. These conditions are (a) the actual use and (b) the selling price of the product."
Armand V. Feigenbaum

5. Customer-based

"Quality is fitness for use."
J. M. Juran

"Total Quality is performance leadership in meeting customer requirements by doing the right thing right the first time."
Westinghouse

"Quality is meeting customer expectation. The Quality Improvement Processes is a set of principles, polices, support structures, and practices designed to continually improve the efficiency and effectiveness of our way of life."
AT&T
Through this comparison, it is obvious that conventional definitions of quality began to have an impact in manufacturing organizations producing physical, tangible products. Product and user-based quality systems were implemented which allowed the worker to receive immediate feedback if the subassembly being passed on was faulty (Tenner & DeToro, 1992).

After the 1980s, a new consumer-oriented economy brought the concept of quality closer to the user-based/value-based approach. The new definitions of quality are all structured around satisfying the customer. Deming (1993) stated that top management must satisfy customer needs. Juran (1988) described quality as "fitness for use" and Crosby (1979) defined quality as conformance to customer requirements. Today, quality is recognized as the totality of features and characteristics of a product or service that bears on its ability to satisfy implied or stated need (ASQC, 1987).

In addition to the customer oriented concept, it was also noted by Deming (1993), Crosby (1979), Juran (1988) and other experts that quality is not determined by the worker on the shop floor, nor is it determined by the service technician working at the customer's site. Quality is determined by the top management of an organization, who by virtue of the positions they hold, are responsible to customers, employees, suppliers, and shareholders for the success of the business. These top managers allocate resources, decide which markets
the firm will enter, and select and implement the management processes that will enable the firm to fulfill its mission and, eventually, its vision. In other words, quality is not a single issue, the language of quality must include the following components:

- Process
- Customer requirements
- Top management commitment
- Supplier specifications
- Statistical process control
- Cross-functional teams
- Employee empowerment
- Culture change
- Continuous improvement

Without considering each of these basic features, the vision of quality cannot be reached.

Features of TOM

In order to meet quality requirements, many approaches and techniques have been applied in industry and service sectors, such as Statistical Process Control (SPC), Statistical Quality Control (SQC), and Quality Circles (QC). However, recommendations resulting from the use of these techniques frequently were not implemented by the existing decision-making structures (Pico, 1989). There is no specific decision-making and operating framework which is effective
enough to take corrective action on the quality control finding. In other words, single efforts can not reach the quality requirements since quality must permeate the total system. As a result, the concept of Total Quality Management was developed and firms began to develop a specific decision-making and operating framework to deal with product quality. This approach has become a new hope to improve the quality of industries and services.

Several definitions of TQM were proposed in recent years. Perigord (1990) wrote:

Total Quality is a set of principles and methods organized as a comprehensive strategy with the goal of mobilizing the entire company in order to achieve the greatest client satisfaction at the lowest cost. (p. 54)

Gilli & Gilli (1991) recognized that total quality management is performance leadership in meeting customer requirements by doing things right the first time. Weaver (1991) indicated that TQM is a participative management style which focuses on satisfying customer expectations by continually improving the way business is conducted. The United States General Accounting Office (1991) stated that TQM is a relatively new approach to the art of management that seeks to improve product quality and increase customer satisfaction by restructuring traditional management practices.
Although there are slight differences among these definitions, three important aspects of TQM were identified (Sashkin & Kiser, 1991):

1. Counting-tools, techniques, and training in their use for analyzing, understanding, and solving quality problems;
2. Customers-quality for the customer as a driving force and central concern; and,
3. Culture-shared values and beliefs, expressed by leaders, that define and support quality. (p. 3)

Moreover, the following TQM components can be used when considering implementation (General Accounting Office, 1991):

Customer-driven quality
Strong quality leadership
Continuous improvement
Action based on facts, data, and analysis
Employee participation. (p. 9-10)

Implementation Procedures of TQM

In order to implement TQM properly in an organization, several approaches have been discussed. Based on systems concepts, Deming (1990) asserted that the Plan-Do-Check-Act cycle can be applied to continually improve quality (Figure 1). He also created his well known "fourteen points" for improving the quality of products in an organization (Deming, 1993).

1. Create constancy of purpose toward improvement of product and service.
2. Adopt the new philosophy.
3. Cease dependence on inspection to achieve quality.

4. End the practice of awarding business on price tag.

5. Improve constantly and forever the system of production and service.

6. Institute training on the job.

7. Institute leadership.

8. Drive out fear, so that everyone may work effectively for the company.


10. Eliminate slogans, exhortations, and targets for the workforce asking for zero defects and new levels of productivity.

11. Eliminate work standards on the factory floor.

12. Remove barriers to pride of workmanship.

13. Institute a vigorous program of education and self-improvement.

14. Put everyone in the company to work to accomplish the transformation. (p. 23-24)
A similar approach was also proposed by Hunt (1992) as follows:

Step 1  Top management commitment to "Quality First"
Step 2  Create a vision and philosophy
Step 3  Establish a quality council
Step 4  Identify customer needs
Step 5  Develop your own "Quality First" Strategy
Step 6  Select organization(s) to implement "Quality First"
Step 7  Conduct training needs analysis
Step 8  Determine resources for implementation
Step 9  Conduct training
Step 10 Identify performance measures. (p. 194)

Since TQM is based on systems, a systematic approach to TQM is advocated by GOALS/QPC (1991). This approach includes seven stages:

Define System
Assess Current Situation
Analyze Causes
Try Out Improvement Theory
Study the results
Standardize Improvements
Plan Continuous Improvement

In general, TQM is a system-based approach that consists of several basic features. No matter where this approach is applied, there are dynamic factors that people need to consider. An overall strategy starts with a clear set of aims for the system, the processes must be emphasized, and continuous improvement is the never ending goal of the system.
Applications of TQM in Business

The pressures of losing competitiveness and market forced American business to make efforts to improve the quality of products and services. Several large companies such as the Ford Motor Company, Texas Instruments, Xerox Corporation, DEC, Goodyear Tire & Rubber, 3M, Milliken, and Motorola have been deeply involved with TQM since the 1980s. In addition, many health care institutes are also utilizing the TQM approach (Demouy, 1990; Lane, 1992).

According to a report from the General Accounting Office (1991), companies that have used Total Quality Management practices achieved better employee relations, higher productivity, greater customer satisfaction, increased market share, and improved profitability. These implementations have the following characteristics:

1. Successful companies integrate the ideas of several quality experts and tailor these ideas to their unique environments.

2. Successful companies are committed to defining the expectations and requirements of external and internal customers.

3. Successful companies strive to establish a constancy of purpose in daily activities.

4. Successful companies empower their work forces to achieve organizational objectives.

5. Successful companies are driven by vision and strong leadership—a future orientation. (p. 20-25)

Although positive results were reported, some problems were mentioned when implementing a TQM approach in business.
A failure to determine customers, insufficient training, and a lack of support from top management were cited as the major barriers to success (Balano, 1994; Goodman, Bargatze, & Grimm, 1994).

**Total Quality Management in Schools**

In comparing an educational system with an industry, the utilization of a systems approach is the first similarity detected. Production is a system in industry (Deming, 1993). TQM is a systems approach to achieving quality requirements. Education is also a process-based system with a desired output. It appears that education could apply TQM as industrial production does to obtain improved results. Moen (1991) has compared industry and schools in a systems framework as in Table 2.

In this comparison, it is obvious that an education system is similar to a production system in industry. Moreover, since one of the important issues in a TQM implementation is to define the customers of the products or services, to determine the customers of education is another way to think about the possibility of transfer. Sallis (1993) noted that education is a service other than a production and defined the customers of education as shown in Table 3. Although the products or services in the education settings are complex, the concept of customer-driven quality in education is also very important.
Table 2

The Comparison of Industry and School

<table>
<thead>
<tr>
<th>Industry</th>
<th>School</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw material</td>
<td>Student without knowledge</td>
</tr>
<tr>
<td>Suppliers</td>
<td>Family of student</td>
</tr>
<tr>
<td>Stages of production</td>
<td>Grades K, 1, 2,....,12</td>
</tr>
<tr>
<td>Internal customer</td>
<td>Next grade</td>
</tr>
<tr>
<td>Inspection</td>
<td>Testing</td>
</tr>
<tr>
<td>Final customer</td>
<td>Society</td>
</tr>
<tr>
<td>Customer requirements</td>
<td>Course requirements</td>
</tr>
<tr>
<td>Redesign of product</td>
<td>Redesign of curriculum</td>
</tr>
<tr>
<td>Board of directors</td>
<td>School board</td>
</tr>
<tr>
<td>President</td>
<td>Superintendent of schools</td>
</tr>
<tr>
<td>Middle manager</td>
<td>Principal</td>
</tr>
<tr>
<td>Supervisor</td>
<td>Teacher</td>
</tr>
<tr>
<td>Workers</td>
<td>Students</td>
</tr>
<tr>
<td>Service</td>
<td>Sports, concerts, plays</td>
</tr>
<tr>
<td>Final product</td>
<td>Student with knowledge</td>
</tr>
</tbody>
</table>

Table 3

Customers of Education

<table>
<thead>
<tr>
<th>Education</th>
<th>The Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>The learner</td>
<td>Primary External Customer or Client</td>
</tr>
<tr>
<td>Parents/ Governors/ Employers</td>
<td>Secondary External Customer</td>
</tr>
<tr>
<td>Labor Market/ Government/ Society</td>
<td>Tertiary External Customer</td>
</tr>
<tr>
<td>Teachers/ Support Staff</td>
<td>Internal Customers</td>
</tr>
</tbody>
</table>
Therefore, it is reasonable to assume that the transfer of the TQM approach to the education setting has a chance to improve the quality of education. When considering the utilization of TQM in an education system, it is important to define the quality of education. From the viewpoint of a principal, quality is defined as providing an innovative and sound education that satisfies the requirements of our students, their parents, the colleges who accept our graduates, and the companies who employ them (Blanton, 1991). Consumer-driven quality seems the same idea both in schools and businesses. From a report by the Maryland Commission on Vocational-Technical Education (1989) the same belief was also expressed.

Applications of TQM in Education

Since many educators perceive TQM as a new paradigm for improving the quality of education, several TQM implementations can be found at different levels of education and in different geographical areas. Horine, Hailey, and Rubach (1993) reported that 105 of the nation's public and private school districts were using total quality management to improve school quality and forty six community colleges were involved in TQM. Among these educational settings, Fox Valley Technical Community College is one of the TQM pioneers. Other implementation sites include (Decosmo, Parker, & Heverly, 1991; Moor-Norman Vo-Tech Center, 1991; Schargel,
1991; Seymour, 1991; Tribus, 1990): Delaware County Community College (Media, Pennsylvania), Jackson Community College (Jackson, Minnesota), Northern Essex Community College (Haverhill, Massachusetts), Oregon State University (Corvallis, Oregon), University of Wisconsin (Madison, Wisconsin), Mt. Edgecumbe High School (Sitka, Alaska), and George Westinghouse Vocational High School (Brooklyn, New York) and many others.

These educational settings started by searching for the areas that need to be improved, defining the customers and the quality of education, involving teachers and staff together, using statistical techniques to analyze data and make decisions, and making efforts to initiate a continuous improvement paradigm.

The areas where process improvement efforts have been concentrated included: administration, teaching methods, student achievement, communication, maintenance, and purchasing. In general, these implementations focus on services, such as registration procedures, mail distribution, cafeterias, and so on. The results of these implementations are significant (Seymour & Collett, 1991; Spanbauer, 1992). On the other hand, the applications to academic settings, such as curriculum development, instructional strategy planning, and instructional supervision are rarely addressed. Since TQM is a long term approach, reports regarding the short term
effects are insufficient to prove the real potential of this approach.

**Instructional Supervision**

Instructional supervision is composed of four interrelated elements that guide and shape supervisory practices and procedures. These interrelated elements are as follows (Beach & Reinhartz, 1989):

1. The historical development of instructional supervision, including the body of knowledge that has been accumulated concerning what supervisors do.

2. The theoretical base, including an understanding of organizations, leadership, communication, and teaching principles, that supports and validates supervisory behavior.

3. The knowledge of how the models of supervision (particularly clinical and developmental) function.

4. The specific techniques and procedures that supervisors need as they work with teachers. (p. 6)

In order to provide a working knowledge of instructional supervision, this section will discuss the historical background, the basic features, the models used, and the contemporary roles of instructional supervision.

**History and Basic Features of Instructional Supervision**

The word "supervision" comes from the Latin root meaning to "oversee" or "have oversight of." Dictionary definitions
expand on this early generic definition and indicate that to supervise means to direct or manage the work of others.

The supervision function has been used to improve educational quality in this country since the 1600s (Beach & Reinhartz, 1989). There are several different definitions regarding supervision in an education setting:

1. A change process (Harris and Bessent, 1969; Lovell and Wiles, 1983).
5. A leadership function involved with administration, curriculum, and teaching (Wiles & Bondi, 1980, 1986).
6. A management function within the school production system (Alfones, Firth, & Neville, 1981).
8. A service provided to teachers for the purpose of improving instruction. (Oliva, 1989)
9. A process by which persons with the same or different rank within an organization help each other for their mutual benefit. (Heller, 1989 p. 7)
10. The process of working with teachers to improve classroom instruction. (Beach & Reinhartz, 1989)
From these definitions, supervision has diverse features that have been applied in different ways. It is obvious that the role of supervision is changing.

In facing critical quality problems, instructional supervision processes must be: collaborative, use scientific decision-making techniques, prepare reasonable teaching materials, uses effective methods, help students to adapt to employers' needs and continue to improve the quality of instruction.

**Instructional Supervision Models**

Several supervision models have been developed. They are clinical supervision, developmental supervision, self supervision, and peer supervision.

**Clinical supervision:** This is the practice designed to improve the teacher's classroom performance. It takes its principle data from the events of the classroom. The analysis of these data and the relationship between teacher and supervisor on the basis of the program, procedures, and strategies designed to improve the students' learning by improving the teacher's classroom behavior (Cogan, 1973).

**Developmental supervision:** This recognizes teachers as individuals who are at various stages of growth and development. Supervisors must foster thinking skills in teachers to help them diagnose classroom instruction and become aware of the many options for change (Glickman, 1985).
Self supervision: The main purpose of self supervision is to help teachers become aware of their own instructional performance. This model asks the teacher to compare data collected from self-assessment inventories with input from other sources.

Peer supervision: Another approach that has been used to deal with instructional problems. According to Hellar (1989), supervision is a process by which persons with the same or different ranks within an organization help each other for their mutual benefit. The process is not one of checking up on or evaluating one another. Rather, it is a helping relationship that provides mutual support. When this process involves individuals at the same rank within an organization, it is called peer supervision. (p. 8)

From this definition, the peers are colleagues whose jobs are at the same level within the school system hierarchy. In public education, peers do not have to be in the same grade, subject area, experience level, or even in the same school building.

In general, peer supervision and self supervision can be accepted as types of formative assistance provided through the instructional process by most supervisors and teachers. It refers to a process by which teachers work together for the purpose of mutual professional development. Developmental and clinical supervision can be kinds of summative (formal) activities to determine the teachers' performance. Although these supervision models are used to improve the quality of
instruction, a holistic strategy that focuses on the processes of an instruction system is never addressed.

Instructional Supervision in V-T Programs

Many instructional supervision efforts are documented for secondary and elementary schools. In vocational technical programs in community colleges, instructional supervision has also been implemented. Teacher evaluation is the major activity constituting instructional supervision practices.

For instance, at the Des Moines Area Community College (DMACC), faculty performance appraisals are the major activity of supervision (Van Ast, 1993). Each contractual employee in the instructional division will receive the following evaluations:
1. Probationary employees: at least twice during each academic year.
2. Full-status employees: at least once during each academic year.

Within these evaluations, the annual evaluations are recorded on the contracted faculty performance appraisal, evaluations will be conducted by the supervising dean/campus executive dean or director. All evaluations are discussed personally with the employee. Each evaluation is signed by the supervisor and employee to show that the evaluation was discussed. Each evaluation is based on the following criteria: knowledge of subject matter, effectiveness in
teaching techniques, responsiveness to student needs, commitment to professional growth, and contributions through non instructional activities. All performance appraisals are forwarded to Human Resources prior to February 1 of each academic year.

Therefore, instructional supervision at the community college level in Iowa is still passively focused on teacher evaluation. Since the V-T programs focus on job preparation for students, the quality of instruction helps determine whether students can obtain the necessary skills and knowledge to fulfill the employers' needs. Quality assurance is a very important issue in the instructional process. The supervisors of the V-T programs have to implement effective supervision that not only evaluate teachers' performance but also creates a better learning environment for students and helps teachers to achieve their goals.

The Role of Instructional Supervision in V-T Programs

Based on the above discussions, several needs must be fulfilled so that instructional supervision in V-T programs can be expected to improve the quality of instruction:

1. An active implementation model is needed:

   In considering the ease of implementation, the instructional supervision models that have been used for the secondary and elementary level might not be suitable for V-T programs. A more democratic system that
emphasizes customer orientation and teacher involvement may be more reasonable for these programs.

2. Improving instructional quality through the process:

Traditionally, instructional supervision focuses on identifying and solving the problems through an evaluation process (such as clinical supervision). In other words, it is similar to the inspection function at the end of the production process in industry.

As a matter of fact, in today's education systems, effective learning has become a new goal recognized by most educators. In a production system, defects require reworking, or scrapping, and are costly and useless. End-of-line inspection is also costly and wasteful because the inspectors add no value to the goods produced. Therefore, helping teachers to do the right thing the first time, and helping students to learn in an efficient way, are important tasks for today's supervisors.

3. Collaborating with supervisors and teachers:

Instructional supervision is an improvement function for teaching and learning. The model must be accepted by both teachers and supervisors. Otherwise, it will cause anxiety and resistance. Therefore, teacher participation is a very important component of the model. The concept of peer assistance must be involved to strengthen the functions of supervision (Oliva, 1989). In addition,
self evaluation is another way to provide feedback and continuous improvement of instruction.

4. Remove the annual rating system:

Deming (1993) asserted that an annual rating system nourishes short-term performance, annihilates long-term planning, builds fear, demolishes team-work, and nourishes rivalry and politics. The same viewpoint also comes from Sgonebarger (1991) and Moen (1991), who noted that merit rating rewards employee who do well in the system and not those who try to change the system or make the system work better.

5. Continuous improvement should be embraced:

Instruction is a continuous process. The concept of continuous improvement must be addressed in the instructional process as in industrial processes so that quality can be maintained.

The TQM Model for Instructional Supervision in V-T Programs

After the previous discussion of TQM and instructional supervision, it is apparent that TQM is a suitable approach that can be used to address the current difficulties of instructional supervision in V-T programs. The establishment of a TQM-based instructional supervision model would likely be very useful in improving the quality of instruction.
Instructional Model Construction

The term "Model" has been used in many instances. Several definitions of model have been proposed.

Model as a conceptual analog, generally of a physical or mathematical nature, which is used to suggest empirical research. (Marx, 1966)

Model can be defined as: Something that serves as a pattern or representation for something else. (Hopkins and Antes, 1990). Paradigm is a model, pattern, or example (Hopkins and Antes, 1990).

Model is sometimes used interchangeably with theory. Both models and theories are best seen as conceptual (explanatory) schemes, with models somewhat more in the context of a descriptive analogy designed to help visualize a complex phenomenon. Models can be drawings, verbal analogies, or even physical replicas. Models can be used in the sense of a strategy or plan. (Mouly, 1978 p. 38-39)

A model consists of a set of assumptions, an organizational framework, and a set of rules for manipulating the details of the model. (Matheson, Bruce and Beauchamp, 1978 p. 11)

In sum, a model consists of principles, a logical framework, and processes that explain a complex phenomenon. It provide a simple representation of the complex and make it more readily understood.

There are many educational models have been developed and utilized for different purposes. In the education setting, a model can be a curriculum developing framework or an instructional supervision paradigm.

When considering the development of a model for educational purposes, it is useful to involve the concept of
instructional system development (ISD) so that the model has a logical process and has a dynamic feedback structure. The concept of instructional system development evolved during World War II and has been used since that time with increasing sophistication (Nervig, 1990). Several authors (Banathy, 1968; Briggs, 1977; Briggs and Wager, 1981; Gagne and Briggs, 1979) have done extensive research and development to establish ISD in the educational environment. At the most general level, ISD is a process that is used to determine what to teach and how to teach it (Dick, 1993). More specifically, ISD is a logical method of developing curriculum to satisfy an instructional need and then determining if that need is being met (Macchia, 1992).

Based on these concepts, ISD can be broken down into five steps (Macchia, 1992):

- Analysis
- Design
- Development
- Implementation
- Evaluation/Quality Assurance

Since design and development are similar steps, it can be combined as in Figure 2.

Through the entire process, a curriculum or course can be defined, prepared, implemented, and evaluated in a systematic manner. Feedback can be obtained, in this system, through the dynamic paths. In addition, the system focuses on the
holistic process not just segments. Each process can then be directed to the purpose of the system.

Since the ISD is a process-oriented approach dealing with curriculum development and instructional implementation, it can improve curriculum and instruction based on the aims of the total system. The framework of this system is a good reference for creating an instructional supervision model.

In addition, when comparing the nature of TQM and ISD, Macchia (1992) pointed out that ISD can adapt the principles of TQM and, in fact, it already does. But, like TQM, ISD requires the commitment of leaders to make it work. It also requires this same commitment from the customers: teachers, students, staff, and the community.

When attempting to establish a TQM based instructional supervision model, it is reasonable to utilize ISD concepts and involve additional features of TQM to complete the functions of this model.
The Construction of a TQM Based Instructional Supervision Model

When considering applying a TQM approach to instructional supervision in an education settings, a logical model consisting of components, rules, and processes should be very useful for the guiding of a transformation.

Appreciation for the system is the first issue that must be addressed. It is one of the necessary profound knowledge that can guide the transformation (Deming, 1993). Deming stated that a system is a network of independent components that work together to try to accomplish the aim of the system. A system must have an aim, and the aim must be clear to everyone in the system. A system must be managed. Therefore, based on the discussion of ISD and Deming' belief, when generating a TQM-based instructional improvement model, the concept of system must be addressed.

Determination of the TQM and instructional supervision components of the model is the second consideration. Components of the model are the clear elements to be used to present the aims of the system. Since this model seeks to combine two concepts: TQM and instructional supervision, both of these must be addressed simultaneously.

Determination of the processes is the third consideration. Based on the components determined, processes can be developed to accomplish these components. The process
design must reflect the system concept so that the feedback in each stage can be reasonably communicated to each participant.

Some TQM models with components and/or processes have been developed for educational settings. Spanbauer (1992) proposed the following components for application in schools:

1. Increased involvement by faculty and staff in the management and decision making of the schools.
2. More authority and responsibility delegated to levels of expertise in the schools.
3. Greater autonomy for individual schools and more latitude for individual departments.
4. Increased faculty and staff professional development and training.
5. School decision based on customer requirement and data collection, using scientific methods and statistical analysis.
6. Improved leadership skills for those in management positions.
8. Continued commitment to quality, with concern for excellence in all processes of the school.
9. School practices and decisions based on customer needs as depicted in quality elements with accompanying conforming requirements.
10. Continued analysis of how well the new methods are working. (p. 53)

Bradley (1993) recognized that a total quality management paradigm in education must emphasize client priority, lack of hierarchy, self monitoring and inspection, collaboration,
horizontal communication, cooperation, flow charts, and responsibility.

Kaufman (1992) generated a process for infusing TQM in education:

* Citizen, learner, and employer satisfaction
* Quality graduates and completers
* Quality in-school performance (classes, activities, etc.)
* Teacher and learner partnership in performance
* Quality resources and inputs. (p. 146)

Similar implementation processes were proposed by Sallis (1993):

* A clear and distinctive mission.
* A clear customer focus;
* A strategy for achieving that mission;
* The involvement all of their customers, both internal and external, in the development of strategy;
* The empowerment of staff by removing barriers and assisting them to make the maximum contribution to the institution through the development of effective work groups;
* The assessment and evaluation of the institution's effectiveness against the goals negotiated with customers. (p. 125)

In summarizing the above items, the steps and components (Table 4) were generated as a TQM based educational model. These steps and components were used to generate an initial model in the Delphi study.
Table 4

Steps and components for TQM Based Educational Model

<table>
<thead>
<tr>
<th>TQM approach in business</th>
<th>Action in schools</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Top management commitment</td>
<td>Administrators and board members recognize the importance of quality improvement and willing to support and participate</td>
</tr>
<tr>
<td>2. Customer needs identified</td>
<td>Define the customers of instruction: employers, higher education, students as customers. Analyze the customer needs</td>
</tr>
<tr>
<td>3. Vision and goals established</td>
<td>Establish general goals for the program</td>
</tr>
<tr>
<td>4. Products and services defined</td>
<td>Design and development instructional system. Define the behavior objectives for students</td>
</tr>
<tr>
<td>5. Measurements established</td>
<td>Evaluate student achievements by using statistical methods</td>
</tr>
<tr>
<td>6. Participation and partnership</td>
<td>School members work together</td>
</tr>
<tr>
<td>7. Continuous improvement</td>
<td>Revise program, school members retraining</td>
</tr>
</tbody>
</table>

The Delphi Technique

According to Hudson (1974), the term "Delphi Technique" refers to one type of procedure, developed by Messrs Dalkey and Welmer of the Rand Corporation, for the forecasting of
time-related future events. It has been most commonly employed in the estimating of the probable time of achievement of specific technological or social goals. Several definitions have been provided by the researchers.

Delbecq, Van de Ven, and Gustafson (1975) defined the Delphi Technique as a group process utilizing written responses rather than face to face contact. Linestone and Turoff (1975) presented a more comprehensive definition of the Delphi technique by characterizing the Delphi as a method for structuring a group communication process so that the process is effective in allowing a group of individuals, as a whole, to deal with a complex problem. To accomplish a structured communication process the following conditions must be present: feedback of individual contributions of information and knowledge; assessment of the group judgment or view; opportunity for individuals to revise views; and a degree of anonymity for individual responses.

In general, the Delphi technique involves repeated consulting with numbers of informed persons as to their best judgment as to when a specified event is likely to occur and providing them with systematic reports as to the totality of judgments rendered by the group. The responses of all participants are assembled and returned to the participants, inviting them to reconsider and to offer any defense they may have for an estimate that seems out of line with others made by the group. This information, and revised estimates, may
then be circulated to the participants for further analysis and so on. The procedure can vary considerably, but its primary utility is that it produces a well-considered consensus of the intuitions of a plurality of informed witnesses without injecting the bias of leadership influence, face-to-face confrontation, or group dynamics. Respondents as individuals are expected to clarify their own thinking, and the final decisions—according to the theory, at least—will tend to converge by narrowing the range of estimates in response to the most convincing arguments.

Advantages and Disadvantages

In sum, the Delphi technique has the following advantages and disadvantages (Enzer, Little, and Lazer, 1971; Linstone and Turoff, 1975; Larreche and Montgomery, 1977; Madonis, 1969; and Weaver, 1971):

1. It focused attention on issues.
2. Individuals could work together on a problem through the framework.
3. Psychological communication barriers were minimized, such as hidden agendas and personality conflicts.
4. Persuasion was minimized.
5. Each participant had equal opportunities for influence.
6. It provided precise documentation.

The disadvantages of the Delphi:
1. Some future events are unknowable.
2. Current understanding of basic societal change is limited.
3. Incorrect estimates of future development is common.
4. The ability to foresee basic changes and goals is limited by unquestioned beliefs and values.
5. There is an inherent difficulty in imagining the future even when certain important events are assumed;
6. It is difficult to define and integrate cross-impacts among specific forecasts;
7. Important possibilities are sometimes overlooked.

**Delphi Studies in Educational Research**

Dean (1982) applied a Delphi technique to determine the relative importance of evaluation standards for vocational/technical programs. The rank ordering of the standards provided a framework for deriving the overall quality rating of programs and institutions. Roberts (1984) used a Delphi technique to identify indices of effectiveness for an accreditation process. The survey process was used to analyze, refine, weight, and select 19 measures of instructional effectiveness and 15 measures of administrative effectiveness. Huss (1990) identified critical issues related to advisory committee composition and role in a four-year hospitality education program by utilizing a Delphi technique. It was shown that the Delphi technique is useful for
developing criteria, functions, or indices in education settings.

An education model consists of several components, and a framework for completing these components. The suggestions from Delphi experts would be useful to provide general guidelines to set up functions and to select the components for the model, and also to give an in depth vision for the framework development. A model may then be generated in a proper condition.

Delphi Expert Panel Size

Tersine and Riggs (1976) recommended that the Delphi panel size should be at a minimum to achieve accurate results. Bunning (1979) recognized no best guidelines existed that indicate the appropriate number for the panel. In general, the number of the panel varied from 10 to 50 were used in the studies (Cochran, Phelp, & Cocharn, 1980; Dalkey, 1969; Larreche and Montgomery, 1977). The larger the number used, the lower the response resulted (Sappe, 1984). Martino (1983) noted that the response rate on large-scale Delphi surveys runs at 50 percent or less.

Delphi Procedure

According to Brooks (1979), Delbecq, Van de Ven & Gustafson (1975), and Huber (1980), a Delphi process can
include the following steps regardless of its variety of applications:

1. Define the problem to which the Delphi study is a solution.

2. Design the first round questions for the panel. These must be broad questions.

3. Determine who should participate in the process.

4. Request the panel to participate.

5. Mail the appropriate background material and the first round questions to the panel.

6. Tabulate and summarize the results from the first round questions and design the second round questions.

7. Mail the appropriate summaries, feedback messages and the second round questions to the panel.

8. Analyze the results of the second round.

In order to obtain consensus opinions, steps 6-8 may be repeated for a number of rounds when necessary. It is important to enable group-input to be examined by each participant for assessment and react to other group members positions, and to reassess his/her position based on group response.

In sum, the Delphi process appears to be a useful tool when developing new educational models; especially so when this model is regarding a field that must utilize specific knowledge, such as TQM and instructional supervision.
The Attitude Measurement

Attitudes are important determinants of behavior within an organization. Because of their possible predictive value, attitudes are often measured in educational research. Without supported attitudes from the stakeholder an educational reform can be difficult to execute. Gibson, Ivancevich, & Donnelly (1991) indicated that an attitude is a positive or negative feeling or mental state of readiness, learned and organized through experience, that exerts specific influence on a person's response to people, objects, and situations. The affective component of an attitude is the emotional or feeling aspect. Ary, Jacobs, and Razavieh (1990) defined attitude as a positive or negative affect toward a particular group, institution, concept, or social object. As such, the affective component of an attitude toward an object or person is conditioned by what the object or person has been associated with in a person's experience (Organ & Bateman, 1986).

Methods and Scales of Attitude Measurement

In general, attitude can be measured by the following methods (Baron, 1983; Henerson, Morris, & Fitz-Gibbon, 1990):

1. Self-report: interview, survey, pulls, questionnaires and attitude rating scale, logs, journals, and diaries.

2. Report of others: interviews, questionnaires, logs, journals, reports, and observation procedures.

4. Records referencing: counselor files, attendance records.

Within these methods, the self-report measures are commonly used where the people whose attitudes will be measured (Henerson, Morris, & Fitz-Gibbon, 1990):

1. are able to understand the questions asked of them,
2. have sufficient self-awareness to provide the necessary information, and
3. are likely to answer honestly and not deliberately falsify. (p. 22)

The questionnaires and attitude rating scales in the self-report measure can easily be conducted and analyzed. These are used in today's research to obtain individual attitude values.

A scale is a set of numerical values assigned to subjects, objects, or behaviors for the purpose of quantifying and measuring qualities. Scales are used to measure attitudes, values, and other characteristics (Ary, Jacobs, and Razavieh, 1990). Four main types of attitude scales have been used in education research: (1) Likert scales (2) Thurstone scales (3) Guttman scales, and (4) Semantic differential scales (Borg & Gall, 1989).

A Likert-type scale can assess attitudes toward a topic by asking respondents to indicate whether they strongly agree, agree, are undecided, disagree, or strongly disagree with each
of a serious of statement about the topic. According to Tittle and Hill (1967), the Likert-type scale is superior to all other scale types (Guttman, Semantic differential, Thurstone, Self-rating) in predicting objective indices of voting behavior. In addition, the Likert technique is usually the easiest method of developing a scale needed in a research project (Borg & Gall, 1989). In order to accomplish this research, the Likert-type scale was chosen and used to develop an attitude measurement instrument by the researcher.

**Attitude Instrument Construction**

When developing an attitude measure, the reliability and validity of the instrument are the major concerns. In order to develop a valid and reliable instrument to measure attitudes from individuals, the following procedures were suggested by several researchers (Ary, Jacobs, and Razavieh, 1990; Borg & Gall, 1989; Henerson, Morris, & Fitz-Gibbon, 1990):

1. Accumulate a large number of favorable or unfavorable statements that are based on the components regarding the attitude researcher wish to measure.
2. Ask a pilot group to respond to these statements.
3. Using numbers from one to seven (or five) points to represent the degree form most favorable to least favorable.
4. Compute a score for each respondent by totaling the points corresponding to his or her responses.

5. Identify high scorers and low scorers.

6. Analyze each statement according to how high and low scorers responded to it.

7. Retain those items which provide good discrimination between high and low scorers.

8. Revise possible communication difficulties in these statements when necessary.

9. Construct the questionnaire by listing the retained statements in random order.

10. Administer the instrument.

11. Compute a score for each respondent by totaling the scores corresponding to his or her responses.

Based on the above discussions, it can be concluded that the Likert-type scale attitude instrument is suitable to be used for an attitude study. Construction processes were applied to develop the instrument used in this research following the Delphi process so that the model could be further refined (see Chapter III).

**Related Research**

Research involving the use of a TQM approach in education and industry is presented here to indicate the current status of the research efforts.
Hong's research: The development of an instrument to measure the level of TQM implementation was carried out by Hong (1993). This study was conducted to develop a reliable instrument to measure employees' perceptions regarding the Total Quality Management (TQM) practices in manufacturing organizations. The Total Quality Management Profile (TQMP) was developed using a review of the literature and based on the results of panel justifications and recommendations. Among the independent variables examined were different sizes of companies and different lengths of exposure to TQM. The findings of the study revealed that: 1) employees of medium sized companies have the most positive perceptions toward current practices regarding continuous improvement efforts, 2) employees of small companies have the most positive perceptions toward current "leadership" practices, 3) employees with a longer exposure to TQM have less positive perceptions regarding current company practices toward the five aspects of TQM, and 4) employees with low levels of exposure to TQM have less positive perceptions toward the current practices regarding continuous improvement efforts. Suggestions for future research of current practices included: 1) include organizations other than manufacturing, 2) use employee classification as an independent variable, 3) include highly recognized companies by adopting a quality improvement program, and 4) include different geographical areas.
Teigland's research: Teigland (1993) used Deming's 14 points and conducted a study to assess the beliefs of Superintendents, board members, and teachers regarding total quality management. After the review of literature was completed, 42 belief statements were created to assess and compare educator's beliefs concerning Deming's 14 points (three beliefs for each of the 14 points) as they apply to education. The sample used in this study represented the responses from one board member, one superintendent, and one teacher from 42 school districts in the State of Iowa.

The findings of this research were: if schools are going to implement total quality management, there appear to be several major areas that are going to have to be addressed: 1) continuous improvement, 2) the use of goals and slogans, 3) the use of tests and grades, 4) using statistical assessment, and 5) employee evaluation/merit system.

Storm's research: In an effort to achieve organizational quality and excellence, some community colleges have begun the transformation to the Total Quality Management process for continuous improvement. Strom (1992) conducted a study in a community college that focused on the assessment of organization climate as part of an institutional effectiveness model (total quality management). The purpose of this study was to explore the perceptions of organizational climate and
culture in community college settings and examine the effects of natural work group teams on the perceptions of climate.

Four groups of employees: administrators, faculty, support staff, and maintenance staff were used this study. Factor analysis of the climate perception variables produced seven factors: Motivation to Perform, Continuous Improvement Philosophy, Work Goals for Quality Performance, Institutional Strategic Planning, Pride in College and College Mission, Leadership Support, and Receptivity to Change. There was a statistically significant relationship between the Continuous Improvement Philosophy factor and employee group classification. There were statistically significant differences between the four employment groups for three of the seven factors: Motivation to Perform, Continuous Improvement Philosophy, and Work Goals for Quality Performance. The mean score perceptions of climate were highest for the administrator and maintenance groups, followed by the clerical/support staff, and lowest for the faculty.

**Demouy's Research:** In order to generate a TQM model for health care, Doumey (1991) surveyed hospitals and examined attitudes about quality and the extent to which TQM techniques have penetrated the health care community. This research presented a strategic plan for implementing TQM, identified issues related to organizational change, discussed training
concerns and adapted a technique called Quality Function Deployment to the health care setting.

The survey results showed a limited knowledge and understanding of experts, and concepts related to TQM or techniques for objectively measuring and monitoring quality. Obstacles to TQM included organizational issues, management commitment, resources, education and information systems. Quality measures identified were clinical outcomes, satisfaction surveys, nosocomial infections, readmissions, standards of care, peer review and accreditation.

Moore-Norman research: The Moore-Norman Vo-Tech Center (1991) has conducted research entitled: Total Quality Management in vocational-technical education. This study was conducted to provide vocational educators with resources regarding implementation of Total Quality Management (TQM). Data were gathered through development of a bibliography of resources; a survey of all Oklahoma vocational-technical schools regarding specific industries in their area using TQM components (10 responses) and site visits to Oklahoma organizations using TQM concepts. The project defined TQM and determined that it was applicable to vocational education. A general outline and flowchart describing the implementation of TQM in an educational facility were developed. Five phases were listed: commitment, organizational development, customer focus, process orientation, and continuous improvement.
In sum, Hong focused on the development of a TQM instrument. The procedures applied and the components determined were valuable to be referenced in this research. Teiglend's study showed an exploration of TQM implementation in the secondary school level and the major TQM components (areas) that must be addressed were determined. The study by Moore-Norman Vo-Tech Center provided vocational educators with resources regarding implementation of TQM. It also supported TQM as a useful approach that can be utilized in vocational education. Storm explored the perceptions about organizational climate and culture regarding TQM in community college settings. Demouy surveyed hospitals and examined attitudes regarding quality and the extent to which TQM techniques have penetrated the health care community. Storm and Demouy provided the example of research design and variable selection for this study.

Summary

In this chapter, TQM in industry, TQM in schools, and instructional supervision in V-T programs were reviewed so that the initial model could be established. In order to provide sufficient knowledge to refine the model, further investigation related to Delphi techniques and attitude measurement were conducted. Six related research studies were also described to obtain a total picture of TQM studies in industry and education. These studies supported the
development of the research structure and the implementation of the Delphi and attitude survey.
CHAPTER III METHODOLOGY

Research Design

In order to accomplish the purposes of this study, several research methods were used. A literature review was used to obtain an initial TQM implementation model for instructional supervision. A Delphi study was then used to refine the initial model. Finally, an attitude survey regarding the initial model was conducted using V-T administrators and teachers. Based on the results of the attitude measurement, the model was revised to enhance the chance of a successful implementation. After completing all the studies, a final TQM model was proposed that can be used for instructional supervision purposes in vocational technical programs in Iowa community colleges. These steps are shown in Figure 3.

Proposal of The Initial Model

Through a literature review process, several TQM implementation models were studied and the critical needs of instructional supervision in vocational technical programs were identified. Following this, a field interview was conducted at a community college that had implemented TQM, and the experience of TQM implementation in the educational setting was discussed. Finally, an initial model was developed.
Figure 3. Model development process
This initial model was based on several assumptions, guidelines and included five flowcharts. The first flowchart (Figure 4) was produced to present the holistic processes and address the components. In order to show the initial model in a more detail, four other flowcharts (Figure 5, 6, 7, 8) were produced to explain each stages (analysis, design/development, implementation, and evaluation) within the model.

**The assumptions and guidelines:**

1. The participants (teachers, administrators) in the process must have an orientation to TQM concepts and principles before specific tasks are addressed.

2. Based on the quality standards of the institution defined by the customers.

3. The systematic Instructional System Development processes: analysis, design, development, and evaluation will be used in the model.

4. Teamwork will be an integral part of the process. Teams will be formed for each stage.

5. Provide feedback to the system. The feedback from students, supervisors and peers will be offered to individual teachers.

6. The evaluation stage will focus on continuous improvement. A professional growth plan will be established by supervisor and teacher.

7. Teachers can work well if they know what to do and how to
Establish a steering committee to:
1. Identify the analysis, design, development, and evaluation team
2. Use the following components to guide the process:
   A. TQM training for every professional
   B. Top management commitment at each stage
   C. Teamwork
   D. Participation of all appropriate parties
   E. Continuous improvement
   F. Utilization of scientific decision making techniques
      (Include statistical methods)

1. Establish the analysis team
   2. have the analysis team complete the following:
      A. identify the customers of instruction
      B. define the needs of customers
      C. state the mission of the instruction
      D. conduct a formative evaluation for the above processes

1. Establish the design team
   2. have the design team complete the following:
      A. identify the objectives of instruction
      B. generate the competencies (outcomes) for students
      C. prepare teaching materials
      D. conduct a preevaluation conference
      E. conduct a formative evaluation for the above processes

1. Establish the development team
   2. have the development team complete the following:
      A. help teacher present the outcomes to the students
      B. help teacher present course materials
      C. collect students feedback
      D. initiate self evaluation
      E. establish peer coaching activities
      F. conduct formative evaluation by supervisor
      G. conduct a formative evaluation for the above processes

1. Establish the evaluation team
   2. have the evaluation team complete the following:
      A. identify the summative evaluation goals
      B. conduct the summative evaluation
      C. complete a postevaluation conference
      D. create a professional growth plan
      E. conduct a formative evaluation for the above processes

---

Figure 4. A TQM model for instructional supervision in a vocational-technical program
Analysis step:

Establish the analysis team:
- team members will be selected by the steering committee
  and may include:
  - chairman of the department or program leader
  - teachers of the course or content area
  - teachers from related programs
  - representatives of related industries
  - students

Identify the customers of instruction:
- internal customers might be:
  - students involved in the course
  - administrators of the program
  - teachers in the next course or group of courses
- external customers might be:
  - employers from related industries
  - representatives from the community

Define the needs of customers:
- ascertain the needs of the customers by the data collected from
  survey, interview, nominal group, Delphi processes
- decisions based on the analysis of data

Modify course purpose if necessary:
- the purpose of the course might be "to help students gain the
  necessary skills and knowledge to adapt to the customers needs"

Conduct the formative evaluation of the above processes:
- evaluate each stage and modify if necessary

Figure 5. The analysis model for instructional supervision in a V-T program
Design step:

Establish the design team:
- team members will be selected by the steering committee and may include all related discipline representatives, for instance: chairman of the department, or program leader
- teachers related to the course
- representatives of related industries
- students

Identify the student performances for the course based on the customers' needs and use decision making techniques to establish the expected students performances for the instruction

Prepare teaching materials:
- the materials must be performance and self-learning oriented so that students can continue improve themselves

Conduct a preinstruction conference:
- discuss the instruction improvement activities in a conference involving the design team, supervisor, and teacher of the course

Conduct the formative evaluation for the above processes:
- evaluate each stage and modify if necessary

Figure 6. The design step for instructional supervision in a V-T program
Development step:

Establish the development team:
- team members will be selected by the steering committee and may include all related discipline representatives, for instance: chairman of the department, or program leader
- teachers related to the course
- students from the course

Communicate expected performance standards with students:
- the students must know the expected performances before they start learning

Facilitate communication in the teaching process:
- interactive communication between teacher and students

Collect student feedback:
- use survey questions or individual contacts to collect feedback
- use statistical and decision-making techniques to detect the instructional problems

Initiate self evaluation:
- teacher evaluate the instruction by him/her self

Establish peer coaching activities:
- observed and advised by peers

Conduct an informal evaluation:
- observed and advised by supervisors

Conduct the formative evaluation for the above processes:
- monitor each stage and correct when necessary

Figure 7. The development step for instructional supervision in a V-T program
Evaluation step:

Establish the evaluation team:
- team members will be selected by the steering committee and may include all related discipline representatives, for instance:
  - vice president or deans
  - chairman of the department or program leader
  - teachers related to the course
  - representatives of related industries

Identify the summative evaluation goals and measures:
- the goals must be based on how well instruction has been conducted
- the measures will be used for evaluating the instructional effectiveness

Conduct the summative evaluation:
- use formal and informal sources to establish a summary performance for teachers
- use formal and informal sources to evaluate the course content

Complete a postevaluation conference:
- discuss the results of evaluation with the teacher

Create a professional growth plan:
- based on the results of evaluation, collaborate with teacher and supervisor to set up a professional growth plan to continuously improve the quality of instruction

Conduct the formative evaluation for the above processes:
- monitor each stage and correct when necessary

Figure 8. The evaluation step for instructional supervision in a V-T program
do it.

8. Assume students can learn well by helping them to understand what to do and how to do to reach the standards of learning.

9. In order to remove the fear from the teachers and encourage peers to work together, this model did not emphasis the merit pay system that is based on the supervision results.

In order to continue to improve the model, validating steps included: the Delphi study and attitude survey.

**Delphi Study**

**Participants**

Thirteen TQM experts and fourteen instructional supervision experts agreed to participate in this study (Appendix A and B). The experts were selected based on their experience as consultants and teachers of TQM or instructional supervision. In addition, they authored articles or professional books on TQM or instructional supervision. Each participant agreed to participate before the first round questions were sent.

**The Steps of Delphi Process**

The Delphi study included the following steps:

1. Select the panel of experts.

2. Obtain a commitment to participate from the experts.
3. Generate the Delphi instrument and conduct the first round study.

4. Analyze the first round data. The mean and standard deviation for each question was calculated and the opinions derived from each open-ended question were analyzed.

5. Based on the results of first round, the model was refined and this generate the second round questions.

6. Conduct the second round process. The results of the first round were shared with all participants.

7. Based on the results of the second round, the mean and standard deviation of each item were calculated and the opinions derived from each open ended question were analyzed. After this, the comparisons between the results from the first and second rounds were conducted to obtain a degree of consensus from the experts.

8. Refine the model and generate the attitude survey instrument.

The Instrument of the Delphi Study

Two rounds of questions were used in this Delphi process to obtain the experts' opinions. The first round questions (Appendix E) focused on determining the basic components of the model and collecting the overall attitudes regarding the initial model. Two-part questions were used. The first part questions concerned the degree of importance for each TQM and
Instructional supervision component. The second part questions included 14 questions in order to obtain attitudes regarding the initial model from all experts. A Likert-type scale was used in each question to measure the attitude of the panel regarding each component in the initial model; an open-ended question was accompanied to obtain the indeed answer.

The second round questions (Appendix H) were the revisions from the first round Delphi. The initial model was modified and seven questions were added.

Data Analysis

In order to obtain critical information to revise the implementation model, the mean and standard deviation for each question were calculated. When the degree of importance for each component was above the midpoint of the Likert scale, the component was confirmed or added to the model. The answers from the open-ended questions were analyzed, and consensus opinions that evolved from the experts were used to revise the initial model. For hypotheses one, a t test for two dependent samples (Hinkle, Wiersma, & Jurs, 1988) was utilized to compare the variance in the first and second round questions to examine the degree of consensus. For hypothesis two, a t test for two dependent sample means was used to determine the difference between round one and round two.
Attitude Study

The purpose of the attitude study was to obtain perceptions regarding the proposed model from the administrators, and teachers in the V-T programs.

Population and Sampling

The accessible population of the survey consisted of:
1. The administrators of vocational technical programs in Iowa community colleges.
2. The teachers of vocational technical programs in Iowa community colleges.

The population contained about 1068 professionals. Since the number of teachers and administrators was large, a stratified sampling method was used and 150 professionals were selected from six community colleges: Des Moines Area Community College, Hawkeye Community College, Iowa Western Community College, Kirkwood Community College, Northwest Iowa Community College, and North Iowa Community college. The twenty-five participants included fifteen vocational-technical teachers and ten administrators from each community college. Following this, the attitude instrument was sent to these subjects to obtain the attitudes toward this model.

Instrument of the Attitude Study

One attitude measuring instrument (Appendix N) was developed in order to obtain the attitudes regarding the TQM
This instrument was approved by the Iowa State University Human Subjects Committee before the survey conducted. Based on the literature review, this instrument was generated by applying the following procedures and principles:

1. Modify the questions in the Delphi study to reflect the components and the procedures in the refined model.
2. Content validity of this instrument was verified by the Delphi process.
3. Conducted a pilot study to determine the possible communication problems in the instrument (Appendix J, K, and L).
4. Modified the questions when necessary.
5. Randomly arranged the questions selected.
6. Finalized the instrument.

Method of Data Collection

The following steps were used to obtain the attitudes regarding the model from the V-T professionals:

1. The model and the instrument were mailed to the selected subjects.
2. One cover letter (Appendix M) that introduced the purpose of the study and assured confidentiality of data was enclosed with each instrument.
3. Each participant was asked to read the model and then complete the instrument.
4. One administrator at each community college collected the completed instruments.

**Method of Data Analysis**

The data obtained from each subject was analyzed by the Statistical Analysis System (SAS). Means and standard deviations were generated and the following tests were conducted.

For hypothesis three, an F test for two independent samples was utilized to determine whether there were any significant differences in attitude toward each question between teachers and administrators. For hypothesis four, an ANOVA technique was used to determine whether a significant difference existed among the groups that were divided by working period. For hypothesis five, a bivariate correlational procedure were used to obtain the magnitude of the correlational coefficient between the attitude and the training experiences. For hypothesis six, one way ANOVA test was conducted to determine whether any differences existed in attitude scores among the teachers in different vocational groups. For hypothesis seven, an ANOVA was utilized to determine the differences in attitude scores among the community colleges selected. For hypothesis eight, a general linear model method was used to determine whether any interaction existed between the independent variables:
position, program, work experience in years, school and TQM training hours.

Summary

A literature review and a field interview were used to generate the initial model that was based on TQM and instructional supervision principles. A Delphi study was used to revise the model and increase the ease of implementation, and an attitude measurement was utilized to obtain the attitudes regarding the model from the V-T professionals and experts. A final model was proposed which can effectively be used to improve the quality of instruction in Iowa community college V-T programs.
A Delphi study and an attitude survey were the major approaches used in this research. The purpose of this chapter is to present the results of these two efforts. The organization is based on the order in which the data were collected. The results of the two rounds of the Delphi study are presented first then the results of the attitude study.

Results of Delphi Study

The Delphi study was started by requesting experts to participate in the process in September of 1993. Twenty seven experts in TQM and instructional supervision agreed to participate in this study (Appendix A and B). The first round instrument was sent on October 4, 1993. Twenty five experts responded to the first round questions after a follow-up letter was sent on November 23, 1993. The return rate for the first round was 93%. Means and standard deviations were calculated for each first round item.

Using the results of the first round, the initial model was refined. Seven questions were added to the second round survey. The second round questions (including the results of first round and the refined model) were distributed to the twenty-five first round participants on December 12 and completed on January 15, 1994. Twenty experts representing an 80% return rate responded to the questions in the second round.
After the round two Delphi was completed, as in round one, means and standard deviations were calculated and two t tests for paired dependent samples were conducted so that the degree of consensus and degree of attitude change could be tested. A detailed description of both rounds of the Delphi study and the hypothesis testing is provided below.

Round One Delphi

Two sections were used to form the first round Delphi instrument. Section one had two different questions used to solicit the perceived degree of importance for each TQM and instructional supervision component. Fifteen TQM and thirteen (one expert answered both sets of questions) instructional supervision experts were asked to answer the questions regarding the TQM and instructional supervision components respectively. Section two consisted of fourteen questions that were designed to measure the panel’s attitude regarding the model.

Section One  A seven-point Likert-type scale was used for the questions. One represented "not important" and seven represented "very important". Six important TQM components were confirmed by the TQM experts in Section one. All six components received high ratings (Table 5) on the importance scale (means ranged from 5.13 to 6.80). These components were:
Table 5

Descriptive Statistics for The Important Score of Each TOM Component in The Round One Delphi

<table>
<thead>
<tr>
<th>Component</th>
<th>N</th>
<th>Mean</th>
<th>Std Dev</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer driven quality</td>
<td>15</td>
<td>6.80</td>
<td>0.41</td>
</tr>
<tr>
<td>Teamwork</td>
<td>15</td>
<td>6.60</td>
<td>0.63</td>
</tr>
<tr>
<td>Top management commitment</td>
<td>15</td>
<td>6.80</td>
<td>0.78</td>
</tr>
<tr>
<td>TQM training</td>
<td>15</td>
<td>6.07</td>
<td>1.10</td>
</tr>
<tr>
<td>The utilization of statistical methods</td>
<td>15</td>
<td>5.13</td>
<td>1.64</td>
</tr>
<tr>
<td>Continuous improvement</td>
<td>15</td>
<td>6.80</td>
<td>0.56</td>
</tr>
</tbody>
</table>

1. Customer driven quality,
2. Teamwork,
3. Top management commitment,
4. TQM training,
5. The utilization of statistical methods, and
6. Continuous improvement.

Seven instructional supervision components were also confirmed based on the suggestions by the instructional supervision experts. The means for each component ranged from 4.69 to 6.83 (Table 6). These seven components included:
1. Teamwork,
2. Customer driven quality,
3. Peer coaching,
4. Student feedback,
5. Supervisor observation,
6. Continuous improvement, and
Table 6

Descriptive Statistics of Each Instructional Supervision Component in The Round One Delphi

<table>
<thead>
<tr>
<th>Component</th>
<th>N</th>
<th>Mean</th>
<th>Std Dev</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teamwork</td>
<td>12</td>
<td>6.83</td>
<td>0.39</td>
</tr>
<tr>
<td>Customer driven quality</td>
<td>13</td>
<td>6.54</td>
<td>0.78</td>
</tr>
<tr>
<td>Peer coaching</td>
<td>13</td>
<td>5.69</td>
<td>0.95</td>
</tr>
<tr>
<td>Student feedback</td>
<td>13</td>
<td>6.23</td>
<td>0.83</td>
</tr>
<tr>
<td>Supervisor observation</td>
<td>13</td>
<td>4.69</td>
<td>1.25</td>
</tr>
<tr>
<td>Continuous improvement</td>
<td>13</td>
<td>6.62</td>
<td>0.77</td>
</tr>
<tr>
<td>The utilization of statistical methods</td>
<td>12</td>
<td>4.92</td>
<td>1.17</td>
</tr>
</tbody>
</table>

7. The utilization of statistical methods.

Since these TQM and instructional supervision components exceeded 4.00 in the Likert-type scale, they were confirmed and included in the model used for the second round Delphi.

Section two This section included fourteen items. Each item contained a seven-point Likert-type scale and space for comments about improvement. Results from the Likert-type scale questions are presented in Table 7.

The answers from the open-ended questions were also analyzed and listed in Appendix F. The major suggestions included:

1. Need more details of the model.
2. Identify the customers of instruction.
3. Use the Quality Deployment Function to determine the customers' needs.
Table 7
Descriptive Statistics of Attitude Items in The Round One Delphi

<table>
<thead>
<tr>
<th>Question</th>
<th>N</th>
<th>Mean</th>
<th>Std Dev</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. This model clearly incorporates the TQM component of &quot;customer driven quality.&quot;</td>
<td>21</td>
<td>5.10</td>
<td>1.30</td>
</tr>
<tr>
<td>2. This model clearly incorporates the TQM component of &quot;top management commitment.&quot;</td>
<td>21</td>
<td>4.62</td>
<td>1.60</td>
</tr>
<tr>
<td>3. This model clearly incorporates the TQM component of &quot;teamwork.&quot;</td>
<td>21</td>
<td>5.33</td>
<td>1.59</td>
</tr>
<tr>
<td>4. This model clearly incorporates the TQM component of &quot;utilization of statistical methods.&quot;</td>
<td>22</td>
<td>4.23</td>
<td>1.51</td>
</tr>
<tr>
<td>5. This model clearly incorporates the TQM component of &quot;continuous improvement.&quot;</td>
<td>22</td>
<td>5.14</td>
<td>1.32</td>
</tr>
<tr>
<td>6. This model clearly incorporates the TQM component of &quot;enough TQM training.&quot;</td>
<td>22</td>
<td>5.00</td>
<td>1.54</td>
</tr>
<tr>
<td>7. This model contain an appropriate number of component that can be used to identify the instructional problems which may lead to improving the quality of instruction.</td>
<td>23</td>
<td>4.65</td>
<td>1.75</td>
</tr>
<tr>
<td>8. This model consists of workable procedures that can be used in the community college vocational program.</td>
<td>22</td>
<td>5.14</td>
<td>1.67</td>
</tr>
<tr>
<td>9. The model can be fully accepted by the teacher and the supervisor.</td>
<td>21</td>
<td>4.71</td>
<td>1.93</td>
</tr>
<tr>
<td>10. The step of analysis, design, development, and evaluation are appropriate procedures for use in this model.</td>
<td>23</td>
<td>5.30</td>
<td>1.84</td>
</tr>
</tbody>
</table>
Table 7 (Continued)

<table>
<thead>
<tr>
<th></th>
<th>The elements of the analysis step are appropriate.</th>
<th></th>
<th>The elements of the design step are appropriate.</th>
<th></th>
<th>The elements of the development step are appropriate.</th>
<th></th>
<th>The elements of the evaluation step are appropriate.</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>22.523</td>
<td>1.60</td>
<td>21.548</td>
<td>1.17</td>
<td>21.538</td>
<td>1.36</td>
<td>21.529</td>
</tr>
</tbody>
</table>

4. Need customers involvement in the teams.

5. The use of statistical methods was not addressed well in the model.

6. Use "data collection and analysis" instead of "utilization of statistical methods."

7. Change the direction of importance in the Likert scale. i.e., use 7 to indicate "strongly agree" and 1 to indicate "strongly disagree."

After reviewing the suggestions from the experts in the first round, the following revisions were made:

1. Provided four other flowcharts to explain the analysis, design, development, and evaluation steps.

2. Used two subtitles: Basic assumptions and guidelines for application to describe the general model. In addition, several assumptions and guidelines were added to better explain the model.

3. Reversed the Likert-type scale.
The first model modification and the instrument are presented as Appendix H.

**Round Two Delphi**

Twenty-one questions were included in the Round two Delphi. Descriptive statistics for each question were calculated and presented in Table 8.

Suggestions regarding the general model were also analyzed (Appendix I). The major suggestions made by the experts were:

1. Adding a specific "Delivery" or "Implementation" step.
2. Identify the concepts/conceptual/main steps first, then go into further detail.
3. Use an example of application may be useful to clarify concepts.
4. Use control charts to show the students how they are doing.
5. This model clearly incorporates the component of "involvement", not "commitment."
6. Need a "process improvement team" component.
7. Need to explain "Students are the raw material in the instructional process." and define "TQM training."
8. Include students on the evaluation team.
9. Customers are equally students and business.
10. The model "appear" to be customer driven, but "quality" is not defined.
Table 8.

Descriptive Statistics of Round Two

<table>
<thead>
<tr>
<th>Question</th>
<th>N</th>
<th>Mean</th>
<th>Std Dev</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. This model clearly incorporates the component of &quot;customer driven quality.&quot;</td>
<td>20</td>
<td>5.80</td>
<td>0.89</td>
</tr>
<tr>
<td>2. This model clearly incorporates the component of &quot;top management commitment.&quot;</td>
<td>20</td>
<td>5.00</td>
<td>1.41</td>
</tr>
<tr>
<td>3. This model clearly incorporates the component of &quot;teamwork.&quot;</td>
<td>20</td>
<td>5.95</td>
<td>1.32</td>
</tr>
<tr>
<td>4. This model clearly incorporates the component of &quot;utilization of statistical methods.&quot;</td>
<td>20</td>
<td>5.10</td>
<td>1.59</td>
</tr>
<tr>
<td>5. This model clearly incorporates the component of &quot;continuous improvement.&quot;</td>
<td>20</td>
<td>5.45</td>
<td>1.28</td>
</tr>
<tr>
<td>6. This model clearly incorporates the component of &quot;TQM training.&quot;</td>
<td>19</td>
<td>5.32</td>
<td>1.25</td>
</tr>
<tr>
<td>7. This model contains an appropriate number of components that can be used to improve the quality of instruction.</td>
<td>20</td>
<td>5.10</td>
<td>1.33</td>
</tr>
<tr>
<td>8. This model consists of workable procedures that can be used in community college vocational technical programs.</td>
<td>20</td>
<td>5.10</td>
<td>1.37</td>
</tr>
<tr>
<td>9. This model will be accepted by the teacher and supervisor.</td>
<td>20</td>
<td>4.65</td>
<td>1.23</td>
</tr>
<tr>
<td>10. The steps of analysis, design, development, and evaluation are appropriate procedures for use in this model.</td>
<td>20</td>
<td>5.30</td>
<td>1.38</td>
</tr>
<tr>
<td>11. The elements of the analysis step are appropriate.</td>
<td>20</td>
<td>5.20</td>
<td>1.11</td>
</tr>
<tr>
<td></td>
<td>Statement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>--------------------------------------------------------------------------</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>12</td>
<td>The elements of the design step are appropriate.</td>
<td>20</td>
<td>5.30</td>
</tr>
<tr>
<td>13</td>
<td>The elements of the development step are appropriate.</td>
<td>20</td>
<td>5.10</td>
</tr>
<tr>
<td>14</td>
<td>The elements of the evaluation step are appropriate.</td>
<td>20</td>
<td>5.15</td>
</tr>
<tr>
<td>15</td>
<td>This model should not emphasize a merit pay system.</td>
<td>20</td>
<td>5.95</td>
</tr>
<tr>
<td>16</td>
<td>The supervisor should focus on helping the teacher improve during the instructional process, not just check the instruction quality at the end of the process.</td>
<td>20</td>
<td>6.65</td>
</tr>
<tr>
<td>17</td>
<td>A professional growth plan that is created by the supervisor and teacher can be used for the continuous improvement of the quality of instruction.</td>
<td>20</td>
<td>6.10</td>
</tr>
<tr>
<td>18</td>
<td>Students are the main customers in the instruction process.</td>
<td>20</td>
<td>5.85</td>
</tr>
<tr>
<td>19</td>
<td>Students are the raw material in the instructional process.</td>
<td>19</td>
<td>5.00</td>
</tr>
<tr>
<td>20</td>
<td>Students must be involved on all teams (analysis, design, development, and evaluation) for the purposes of this model.</td>
<td>20</td>
<td>5.30</td>
</tr>
<tr>
<td>21</td>
<td>Four teams for each course may be too cumbersome. These teams should be combined.</td>
<td>20</td>
<td>5.50</td>
</tr>
</tbody>
</table>
11. Four teams for each course or related course will be too cumbersome.

12. Students are as much a product as a customers. Need more emphasis on product specifications and measures of goals.

13. Need to emphasize continuous "real time" feedback from students.

14. Summative evaluation should focus on "post instruction feedback from students and employers on mission; i.e. employee/employer productivity gains.

15. "Merit" pay is okay if team based and directly related to gains-gain sharing.

16. Future employers are "main" customer-students" are as much products as customers.

17. emphasize this statement "This model clearly incorporates the component of customer driven quality." in the basic assumptions and make a special point of it.

18. The model is too centered on courses. It should focus on the entire program to be offered to a student.

Hypothesis Testing for the Delphi Study

In order to examine the amount of change and the degree of agreement regarding attitudes, comparisons of two dependent sample means and variances from the first round and second
round were conducted. The following two hypotheses were tested.

**Research hypothesis one:** The variances of attitude scores in each second round question will be significantly smaller than the variance calculated for the first round questions.

A t test for two dependent sample variances was used to test this hypothesis. The corresponding statistical hypothesis was:

\[ H_0: \sigma_1^2 = \sigma_2^2 \]
\[ H_a: \sigma_1^2 \neq \sigma_2^2 \]

Where \( \sigma_1^2 \) = The variance of Round one attitude scores.

\( \sigma_2^2 \) = The variance of Round two attitude scores.

To verify this hypothesis, the variances of round one and round two were calculated and a t value is presented in Table 9. The results failed to reject the null hypothesis. The overall variance of the fourteen questions did not show a significant reduction. The variance values did, however, drop from 0.415 to 0.324.

Table 9

| n  | r   | S₁  | S₂  | t   | Prob > |t| |
|----|-----|-----|-----|-----|--------|---|
| 14 | 0.45| 0.42| 0.32| 0.97 | 0.21   |   |
Research hypothesis two: The attitude of experts regarding the model in the second round is more positive than the first round. In other words, the mean of each question in the second round will be higher than the first round mean for the same item.

A t test for dependent sample means was used to test this hypothesis. The corresponding statistical hypothesis was:

\[ H_0: \delta = 0 \]
\[ H_a: \delta \neq 0 \]

Where \( \delta \) = The mean of difference scores across round one and round two.

The overall means for question one to question fourteen in round one and round two were calculated and a t value is presented in Table 10. The result (\( t = 2.28 \)) showed that the null hypothesis was rejected at the 0.05 significance level. Round two items had a higher overall mean than round one items. A further examination of the means indicated that the first seven items in round two did increase. However, the items 8 through 14 in round two were lower than round one.

Table 10

<table>
<thead>
<tr>
<th>t Test for Two Dependent Sample Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td>14</td>
</tr>
</tbody>
</table>
Results of Attitude Survey

An attitude instrument was developed based on a literature review, Delphi panel suggestions and the results of a pilot test. The instrument used to measure attitudes was analyzed for reliability using the Cronbach alpha coefficient. The overall alpha coefficient of the instrument on the final survey (N = 102) was 0.92, indicating a high degree of internal consistency.

The survey instruments were distributed to 150 V-T professionals in January of 1994. After several telephone calls were made, 102 completed instruments were return by March 3, 1994. The total return rate was 68% (Table 11).

Table 11
Return Rate for the Attitude Survey

<table>
<thead>
<tr>
<th>Community College</th>
<th>Distributed Number</th>
<th>Return Number</th>
<th>Total Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Des Moines Area Community College</td>
<td>25</td>
<td>11</td>
<td>7.33</td>
</tr>
<tr>
<td>Hawkeye Community College</td>
<td>25</td>
<td>24</td>
<td>16.00</td>
</tr>
<tr>
<td>Iowa Western Community College</td>
<td>25</td>
<td>21</td>
<td>14.00</td>
</tr>
<tr>
<td>Kirkwood Community College</td>
<td>25</td>
<td>17</td>
<td>11.33</td>
</tr>
<tr>
<td>Northwest Iowa Community College</td>
<td>25</td>
<td>18</td>
<td>12.00</td>
</tr>
<tr>
<td>North Iowa Community College</td>
<td>25</td>
<td>11</td>
<td>7.33</td>
</tr>
</tbody>
</table>
Demographic Information

This survey instrument contained five demographic variables. Means and standard deviations are shown in Table 12 to Table 16. Each category was also used as an independent variable for testing the related hypotheses.

Table 12
Composite Mean for Each Community College of School

<table>
<thead>
<tr>
<th>School</th>
<th>Frequency</th>
<th>Cumulative Frequency</th>
<th>Mean</th>
<th>Std Dev</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hawkeye Community College</td>
<td>24</td>
<td>24</td>
<td>5.41</td>
<td>0.65</td>
</tr>
<tr>
<td>Northwest Iowa Community College</td>
<td>18</td>
<td>42</td>
<td>5.28</td>
<td>0.61</td>
</tr>
<tr>
<td>Des Moines Area Community College</td>
<td>11</td>
<td>53</td>
<td>5.22</td>
<td>0.66</td>
</tr>
<tr>
<td>Kirkwood Community College</td>
<td>17</td>
<td>70</td>
<td>5.59</td>
<td>0.52</td>
</tr>
<tr>
<td>North Iowa Community College</td>
<td>11</td>
<td>81</td>
<td>5.34</td>
<td>0.68</td>
</tr>
<tr>
<td>Iowa Western Community College</td>
<td>21</td>
<td>102</td>
<td>5.02</td>
<td>0.88</td>
</tr>
</tbody>
</table>

Table 13
Composite Mean for Each Position

<table>
<thead>
<tr>
<th>Position</th>
<th>Frequency</th>
<th>Cumulative Frequency</th>
<th>Mean</th>
<th>Std Dev</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administrators</td>
<td>32</td>
<td>32</td>
<td>5.58</td>
<td>0.65</td>
</tr>
<tr>
<td>Teachers</td>
<td>61</td>
<td>93</td>
<td>5.12</td>
<td>0.65</td>
</tr>
</tbody>
</table>

Frequency Missing = 9
Table 14

**Composite Mean For Each Program**

<table>
<thead>
<tr>
<th>Program</th>
<th>Frequency</th>
<th>Cumulative Frequency</th>
<th>Mean</th>
<th>Std Dev</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industry</td>
<td>44</td>
<td>44</td>
<td>5.14</td>
<td>0.75</td>
</tr>
<tr>
<td>Commercial</td>
<td>20</td>
<td>64</td>
<td>5.23</td>
<td>0.65</td>
</tr>
<tr>
<td>Health Care</td>
<td>12</td>
<td>76</td>
<td>5.69</td>
<td>0.59</td>
</tr>
<tr>
<td>Other</td>
<td>18</td>
<td>94</td>
<td>5.50</td>
<td>0.55</td>
</tr>
</tbody>
</table>

Frequency Missing = 8

Table 15

**Composite Mean for Each Group of Work Experience in Years**

<table>
<thead>
<tr>
<th>Year</th>
<th>Frequency</th>
<th>Cumulative Frequency</th>
<th>Mean</th>
<th>Std Dev</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-4 Year</td>
<td>14</td>
<td>14</td>
<td>5.06</td>
<td>0.64</td>
</tr>
<tr>
<td>5-9 Year</td>
<td>20</td>
<td>34</td>
<td>5.12</td>
<td>0.67</td>
</tr>
<tr>
<td>10-14 Year</td>
<td>17</td>
<td>51</td>
<td>5.41</td>
<td>0.58</td>
</tr>
<tr>
<td>15-24 Year</td>
<td>18</td>
<td>69</td>
<td>5.30</td>
<td>0.89</td>
</tr>
<tr>
<td>20-24 Year</td>
<td>15</td>
<td>84</td>
<td>5.44</td>
<td>0.54</td>
</tr>
<tr>
<td>Above 25 Year</td>
<td>10</td>
<td>94</td>
<td>5.62</td>
<td>0.66</td>
</tr>
</tbody>
</table>

Frequency Missing = 8

Table 16

**Composite Mean for Each Group in TQM Training Hours**

<table>
<thead>
<tr>
<th>TQM Training Hours</th>
<th>Frequency</th>
<th>Cumulative Frequency</th>
<th>Mean</th>
<th>Std Dev</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 Hour</td>
<td>27</td>
<td>27</td>
<td>5.12</td>
<td>0.77</td>
</tr>
<tr>
<td>0-9 Hours</td>
<td>20</td>
<td>47</td>
<td>5.09</td>
<td>0.52</td>
</tr>
<tr>
<td>10-19 Hours</td>
<td>15</td>
<td>62</td>
<td>5.32</td>
<td>0.58</td>
</tr>
<tr>
<td>20-29 Hours</td>
<td>13</td>
<td>75</td>
<td>5.69</td>
<td>0.59</td>
</tr>
<tr>
<td>30-39 Hours</td>
<td>4</td>
<td>79</td>
<td>6.08</td>
<td>0.33</td>
</tr>
<tr>
<td>Above 40 Hours</td>
<td>17</td>
<td>96</td>
<td>5.31</td>
<td>0.74</td>
</tr>
</tbody>
</table>

Frequency Missing = 6
Descriptive Statistics

After conducting the attitude survey, the mean and standard deviations for each question were calculated and presented in Table 17. Means ranged from 4.46 to 6.50 on the

Table 17
Descriptive Statistics of Attitude Survey

<table>
<thead>
<tr>
<th>Question</th>
<th>N</th>
<th>Mean</th>
<th>Std Dev</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Customers' needs should be used to determine the content and standards for instruction.</td>
<td>102</td>
<td>5.86</td>
<td>1.23</td>
</tr>
<tr>
<td>2. This model clearly incorporates the component of &quot;customer driven quality.&quot;</td>
<td>102</td>
<td>5.24</td>
<td>1.37</td>
</tr>
<tr>
<td>3. Top management commitment is necessary for supporting the improvement of instructional quality.</td>
<td>102</td>
<td>6.50</td>
<td>0.85</td>
</tr>
<tr>
<td>4. This model clearly incorporates the component of &quot;top management commitment.&quot;</td>
<td>102</td>
<td>5.28</td>
<td>1.41</td>
</tr>
<tr>
<td>5. Teamwork with peers, supervisors, students and business representatives is important in accomplishing the mission of improving instructional quality to match customers' needs.</td>
<td>102</td>
<td>6.17</td>
<td>0.98</td>
</tr>
<tr>
<td>6. This model clearly incorporates the component of &quot;teamwork.&quot;</td>
<td>102</td>
<td>5.51</td>
<td>1.30</td>
</tr>
<tr>
<td>7. Utilization of data collection and analysis methods can help teachers identify problems and make decisions to improve the quality of instruction.</td>
<td>102</td>
<td>5.58</td>
<td>1.30</td>
</tr>
</tbody>
</table>
8. This model clearly incorporates the component of "utilization of data collection and analysis methods."  

9. Continuous improvement is important for maintaining the quality of instruction.  

10. This model clearly incorporates the component of "continuous improvement."  

11. Quality instruction training is necessary for every professional to improve the quality of instruction.  

12. This model clearly incorporates the component of "quality instruction training."  

13. Communication and feedback is necessary for improving the quality of instruction.  

14. This model clearly incorporates the component of "communication and feedback."  

15. This model contains an appropriate number of components that can be used to improve the quality of instruction.  

16. This model consists of workable procedures that can be used in community college vocational technical programs.  

17. This model can be accepted by the vocational technical faculty in community colleges.  

18. The steps of analysis, design/development, implementation and evaluation are appropriate procedures for use in this model.  

19. The elements of the analysis step are appropriate.
20. The elements of the design/development step are appropriate. 102 5.22 1.06
21. The elements of the implementation step are appropriate. 102 5.06 1.08
22. The elements of the evaluation step are appropriate. 102 5.13 1.11
23. This model should not emphasize a merit pay (based on performance) system. 100 4.95 1.83
24. The instructional supervisor should focus on helping the teacher improve during the instructional process, not just check the instruction quality at the end of the process. 101 5.86 1.32
25. A professional improvement plan that is created by the instructional supervisor and teacher can be used to continuously improve the quality of instruction. 101 5.44 1.33
26. Students are the main customers in the vocational technical (V-T) instructional process. 101 5.53 1.59
27. When compared to a production system, students are the raw material in the instructional process. They are not the main customers. 101 3.46 1.93
28. Students must be involved in all steps (analysis, design/development, implementation and evaluation) for the purposes of this model. 102 4.36 1.55
29. Employers are the main customers of V-T programs. 102 4.55 1.55
seven-point Likert-type scale. Standard deviations ranged from 0.81 to 1.93. The results showed that item one to item twenty-nine were perceived positively by the participants.

Table 18 indicates the frequency of internal and external customers which were selected by the participants.

Table 18
Frequency Selected for Internal and External Customer

<table>
<thead>
<tr>
<th>Variable</th>
<th>Frequency</th>
<th>Percent</th>
<th>Cumulative Frequency</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal Customers:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student in the Class</td>
<td>93</td>
<td>25.34</td>
<td>93</td>
<td>25.34</td>
</tr>
<tr>
<td>Administrators</td>
<td>21</td>
<td>5.72</td>
<td>114</td>
<td>31.06</td>
</tr>
<tr>
<td>Teachers in the Next Grade</td>
<td>30</td>
<td>8.17</td>
<td>144</td>
<td>39.24</td>
</tr>
<tr>
<td>Others</td>
<td>11</td>
<td>3.00</td>
<td>155</td>
<td>42.23</td>
</tr>
<tr>
<td>External Customers:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employers</td>
<td>90</td>
<td>24.52</td>
<td>245</td>
<td>66.76</td>
</tr>
<tr>
<td>Government</td>
<td>29</td>
<td>7.90</td>
<td>274</td>
<td>74.66</td>
</tr>
<tr>
<td>Parents</td>
<td>35</td>
<td>9.54</td>
<td>309</td>
<td>84.19</td>
</tr>
<tr>
<td>Students</td>
<td>46</td>
<td>12.53</td>
<td>355</td>
<td>96.73</td>
</tr>
<tr>
<td>Others</td>
<td>12</td>
<td>3.27</td>
<td>367</td>
<td>100.00</td>
</tr>
</tbody>
</table>

In order to verify the attitude of the V-T professionals in different demographic categories, the following hypotheses were generated. Several statistical methods were utilized to test these hypotheses.
Hypotheses Testing for the Attitude Survey

Research hypothesis three: Those in administration will demonstrate more positive attitudes regarding the TQM implementation model than those teachers not in an administrative position.

An ANOVA method was utilized to test this hypothesis. The corresponding statistical hypothesis was:

$H_0: \mu_1 = \mu_2$

$H_a: \mu_1 \neq \mu_2$

Where $\mu_1 =$ Attitude mean score of administrators

$\mu_2 =$ Attitude mean score of teachers

Table 19 shows that the null hypothesis was rejected at the 0.05 significance level. The attitudes regarding the model were not the same for administrators and teachers. The administrators' attitudes were significantly higher than those of teachers.

Table 19

Analysis of Variance of Perception by Job Title

<table>
<thead>
<tr>
<th>Source</th>
<th>DF</th>
<th>Sum of Squares</th>
<th>Mean Square</th>
<th>F Value</th>
<th>Pr &gt; F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Job Title</td>
<td>1</td>
<td>4.42</td>
<td>4.42</td>
<td>10.45</td>
<td>0.01</td>
</tr>
<tr>
<td>Error</td>
<td>91</td>
<td>38.47</td>
<td>0.42</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>92</td>
<td>42.89</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Research hypothesis four: V-T professionals with more work experience in years will have more positive perceptions toward the TQM implementation model than those V-T professionals with fewer years.

In order to examine whether attitude differences exist among the different groups, the data were categorized into six subgroups based on the work experience V-T professionals have in their present positions. An ANOVA was used to test this hypothesis. The corresponding statistical hypothesis was:

\[ H_0: \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6 \]

\[ H_a: \text{at least one difference among the means} \]

Where \( \mu_1 \) = Attitude mean score of the group have 0-4 years of work experience.

\( \mu_2 \) = Attitude mean score of the group have 5-9 years of work experience.

\( \mu_3 \) = Attitude mean score of the group have 10-14 years of work experience.

\( \mu_4 \) = Attitude mean score of the group have 15-19 years of work experience.

\( \mu_5 \) = Attitude mean score of the group have 20-24 years of work experience.

\( \mu_6 \) = Attitude mean score of the group have 25 or more years of work experience.

The null hypothesis was not rejected (Table 20). There
were no differences regarding the attitude toward the model among the groups who had different lengths of work experience. However, an analysis using the Pearson product-moment correlation (Table 21) indicated that there was a significant relationship between the variables attitude scores and different lengths of work experience.

Table 20
Analysis of Variance Summary for Testing Group Means of Different Work Experience in Years

<table>
<thead>
<tr>
<th>Source</th>
<th>DF</th>
<th>Sum of Squares</th>
<th>Mean Square</th>
<th>F Value</th>
<th>Pr &gt; F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work experience</td>
<td>5</td>
<td>3.00</td>
<td>0.60</td>
<td>1.29</td>
<td>0.28</td>
</tr>
<tr>
<td>Error</td>
<td>88</td>
<td>41.01</td>
<td>0.47</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>93</td>
<td>44.01</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 21
Pearson Product-Moment Correlation Coefficient between Work Experience in Years and Attitude Scores

| Dependent Variable | Independent Variable     | N   | R    | Prob | |R| |
|--------------------|--------------------------|-----|------|------|---|---|
| Attitude           | Work experience          | 94  | 0.37 | 0.01 |
Research hypothesis five: The more TQM training V-T professionals have, the more positive attitudes they perceive regarding the model.

The TQM training hours were categorized into six groups so that the following statistical hypothesis could be tested.

\[ \text{Ho: } \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6 \]
\[ \text{Ha: at least one difference among the means} \]

Where \( \mu_1 \) = Attitude mean score of the group with 0 hour of TQM training.
\( \mu_2 \) = Attitude mean score of the group with 0-9 TQM training hours.
\( \mu_3 \) = Attitude mean score of the group with 10-19 TQM training hours.
\( \mu_4 \) = Attitude mean score of the group with 20-29 TQM training hours.
\( \mu_5 \) = Attitude mean score of the group with 30-39 TQM training hours.
\( \mu_6 \) = Attitude mean score of the group with above 40 TQM training hours.

The analysis rejected the null hypothesis at the 0.05 significance level (Table 22). There were differences in attitudes regarding the model among the groups which have different TQM training experience levels. The post hoc t test (LSD) shows that there were significant differences between
Table 22

**Analysis of Variance Summary for Testing Different TQM Training Group**

<table>
<thead>
<tr>
<th>Source</th>
<th>DF</th>
<th>Sum of Squares</th>
<th>Mean Square</th>
<th>F Value</th>
<th>Pr &gt; F</th>
</tr>
</thead>
<tbody>
<tr>
<td>TQM training hours</td>
<td>5</td>
<td>6.19</td>
<td>1.24</td>
<td>2.88</td>
<td>0.02</td>
</tr>
<tr>
<td>Error</td>
<td>90</td>
<td>38.61</td>
<td>0.43</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>95</td>
<td>44.80</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The following paired groups: group five and three, five and six, five and one, five and two, four and two, and four and one.

Although differences were found between the groups, a Pearson product-moment correlation (Table 23) was calculated and there was not a significant correlation between TQM training hours and attitude scores as perceived by V-T.

Table 23

**Pearson Product-Moment Correlation Coefficient between TQM Training Hours and Attitude Scores**

| Dependent Variable | Independent Variable | N  | R     | Prob | |R| |
|--------------------|----------------------|----|-------|------|---|---|
| Attitude scores    | TQM training hours   | 96 | -.09  | 0.37 |
professionals. When examining the scatterplot of attitude score as a function of training hours (Figure 9), the results show that the distribution was positively skewed. The group with less than 40 hours of TQM training showed a positive relationship with attitude scores, and the group that had training above 40 hours did not continue this tendency. In order to determine the relationship, a Spearman correlation was utilized and the result is presented in Table 24. There

Attitude

Legend: A = 1 obs, B = 2 obs, etc.

Figure 9. Scatterplot of attitude scores as a function of training hours

Table 24

Spearman's Correlation Coefficient between TQM Training Hours and Attitude Scores

| Dependent Variable | Independent Variable | N  | R   | Prob | |R| |
|--------------------|----------------------|----|-----|------|---|
| Attitude mean scores for training hours | TQM training hours | 96 | 0.51 | 0.01 |   |
was a significant relationship between the ranked attitude scores and TQM training in hours.

**Research hypothesis six:** The V-T professionals belonging to different vocational groups will perceive different attitudes regarding the model.

Four vocational categories were used to test this hypothesis. The statistical hypothesis was:

- **H₀:** $\mu_1 = \mu_2 = \mu_3 = \mu_4$
- **Hₐ:** at least one difference among the means

Where $\mu_1$ = Attitude mean score of the V-T professionals in industry program.

$\mu_2$ = Attitude mean score of the V-T professionals in business program.

$\mu_3$ = Attitude mean score of the V-T professionals in health care program.

$\mu_4$ = Attitude mean score of the V-T professionals in other program.

The null hypothesis was rejected at a 0.05 significance level (Table 25). The attitude demonstrated by the different V-T program professionals were not the same. After conducting the T tests (LSD), the results showed that professionals in health care programs have more positive attitudes than those in industrial programs.
### Table 25

**Analysis of Variance Summary for Testing Different Vocation Groups**

<table>
<thead>
<tr>
<th>Source</th>
<th>DF</th>
<th>Sum of Squares</th>
<th>Mean Square</th>
<th>F Value</th>
<th>Pr &gt; F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Programs</td>
<td>3</td>
<td>3.76</td>
<td>1.25</td>
<td>2.73</td>
<td>0.048</td>
</tr>
<tr>
<td>Error</td>
<td>90</td>
<td>41.22</td>
<td>0.46</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>93</td>
<td>44.98</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Research hypothesis seven:** V-T professionals belonging to different community colleges will perceive different attitudes regarding the model.

For the purpose of testing whether there was a significant difference among the community colleges selected, the following hypothesis was established:

\[ H_0: \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6 \]

\[ H_A: \text{at least one difference among the means} \]

Where \( \mu_1 \) = Attitude mean score of the V-T professionals in Hawkeye Community College.

\( \mu_2 \) = Attitude mean score of the V-T professionals in Northwest Iowa Community College.

\( \mu_3 \) = Attitude mean score of the V-T professionals in Des Moines Area Community College.

\( \mu_4 \) = Attitude mean score of the V-T professionals in Kirkwood Community College.
105

\( \mu_5 \) = Attitude mean score of the V-T professionals in North Iowa Community College.

\( \mu_6 \) = Attitude mean score of the V-T professionals in Iowa Western Community College.

The results of an ANOVA failed to reject the null hypothesis (Table 26). There appeared to be no differences in attitudes among the professionals at the six community colleges.

Table 26

**Analysis of Variance Summary for Testing Different Community College**

<table>
<thead>
<tr>
<th>Source</th>
<th>DF</th>
<th>Sum of Squares</th>
<th>Mean Square</th>
<th>F Value</th>
<th>Pr &gt; F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schools</td>
<td>5</td>
<td>3.43</td>
<td>0.69</td>
<td>1.47</td>
<td>0.21</td>
</tr>
<tr>
<td>Error</td>
<td>96</td>
<td>44.90</td>
<td>0.47</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>101</td>
<td>48.33</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Research hypothesis eight: There is no interaction between the following independent variables when taken two at a time: schools, position, program, working experience in years, and TQM training hours that affect the attitudes regarding the model.

In order to test this hypothesis, a general linear model method was utilized. Table 27 shows that there was
significant interaction between the variable of schools and TQM training hours at the 0.05 level. The effect of TQM training hours on attitude scores was not the same among the six community colleges.

Table 28 summarizes the results of the hypothesis testing.

Table 27

General Linear Model Summary for Testing Interaction Among the Independent Variables

<table>
<thead>
<tr>
<th>Source</th>
<th>DF</th>
<th>SS</th>
<th>Mean Square</th>
<th>F Value</th>
<th>Pr &gt; F</th>
</tr>
</thead>
<tbody>
<tr>
<td>School * Title</td>
<td>5</td>
<td>0.44</td>
<td>0.09</td>
<td>0.21</td>
<td>0.96</td>
</tr>
<tr>
<td>School * Year</td>
<td>22</td>
<td>7.57</td>
<td>0.34</td>
<td>0.71</td>
<td>0.81</td>
</tr>
<tr>
<td>School * Hour</td>
<td>21</td>
<td>17.60</td>
<td>0.84</td>
<td>2.92</td>
<td>0.01</td>
</tr>
<tr>
<td>School * Program</td>
<td>13</td>
<td>5.62</td>
<td>0.43</td>
<td>0.96</td>
<td>0.50</td>
</tr>
<tr>
<td>Title * Year</td>
<td>5</td>
<td>3.37</td>
<td>0.67</td>
<td>1.61</td>
<td>0.17</td>
</tr>
<tr>
<td>Title * Program</td>
<td>3</td>
<td>2.82</td>
<td>0.94</td>
<td>2.33</td>
<td>0.08</td>
</tr>
<tr>
<td>Title * Hour</td>
<td>5</td>
<td>2.11</td>
<td>0.42</td>
<td>1.04</td>
<td>0.40</td>
</tr>
<tr>
<td>Year * Program</td>
<td>14</td>
<td>5.60</td>
<td>0.40</td>
<td>0.84</td>
<td>0.62</td>
</tr>
<tr>
<td>Year * Hour</td>
<td>19</td>
<td>10.70</td>
<td>0.56</td>
<td>1.38</td>
<td>0.17</td>
</tr>
<tr>
<td>Program * Hour</td>
<td>14</td>
<td>4.25</td>
<td>0.30</td>
<td>0.69</td>
<td>0.78</td>
</tr>
</tbody>
</table>

Table 28

Summary of Hypothesis Testing

1. There were no differences in the overall variance of scores between Round two and Round one.
2. The overall mean in Round two was higher than Round one.
3. The administrators have more positive attitudes than teachers.
4. There were no different attitudes among the groups with different work experience in years.
5. There were different attitudes among the groups with different TQM training hours.

6. There were different attitudes among the V-T professionals who belong to different vocational programs.

7. There were different attitudes among the V-T professionals who belong to different community colleges.

8. There was an interaction between schools and TQM training hours that affect the attitude regarding the model.

Summary

The results of the Delphi study and the attitude survey were reported in this chapter. The Delphi study contained round one and round two information regarding the model from the panel. Six TQM components and seven instructional supervision elements were confirmed by the panel after the first round Delphi. Two hypotheses were tested to determine the degree of consensus and the trend of attitude change after the second round Delphi. The results failed to reject the null hypothesis in assuming the reduced variance. However, the mean score of the second round did increased significantly.

Six hypotheses were also tested using data gathering by an attitude survey. There were significant differences in mean scores among the variables of position, program, and TQM training hours. The results failed to reject two null
hypotheses. The mean scores were not different for the variables of school, and work experience in years. In addition, there was a significant interaction between school and TQM training.
The purpose of this chapter is to present a brief summary of the study, discuss the findings, make the conclusions, and provide recommendations for implementing the model and provide suggestions for future research.

Summary of the Study

This research was conducted to generate and verify the Quality Instruction Model for vocational technical (V-T) programs. A literature review focusing on Total Quality Management (TQM), instructional supervision, Delphi techniques and attitude surveys was used to generate an initial model. A Delphi study utilizing TQM and instructional supervision experts was conducted and the model was modified. Once the model was modified by the Delphi panel, an attitude survey was conducted to determine the V-T professionals' attitude regarding the applicability of model.

Twenty-seven experts participated in the first Delphi round and twenty experts completed the second Delphi round. Two hypotheses were tested to determine the degree of consensus and the change of attitude scores on the same questions in round one and round two. Comparing the variances failed to yield differences between these two rounds. However, the attitude scores in the second round were higher
(more positive) than those in the first round. The initial model was modified based on the results of these two rounds.

In the final survey, 102 V-T professionals completed the attitude instrument that was generated by the researcher. Six hypotheses were tested to examine the differences in attitude scores based on the independent variables: school, program, job title, TQM training in hours, and work experience in years. There were differences in attitude scores between (among) the groups for each of the following independent variables: job title, program, and TQM training in hours. In addition, there was a significant interaction between school and TQM training in hours.

A Quality Instruction Model was proposed after the final survey was completed and the data were analyzed. This model received positive reactions from the V-T professionals and was recommended for application in Iowa community colleges. Continuous improvement of the model was addressed by the procedure. Another recommendation addressed the need to modify the Delphi process for this application.

Discussions

The methodology, descriptive statistics, and the results of the hypothesis testing are discussed in this section. These discussions contributed to the conclusion in the next section.
Methodology

This research focused on developing a quality instruction model for use in V-T programs. A literature review, Delphi study and an attitude survey were used in the development of this model.

Literature review Total Quality Management plans, instructional supervision models, Delphi studies, and attitude survey literature were reviewed. The results indicated that there were several reports supporting the use of TQM in education. However, little research has been done on the topic of developing a model for use with V-T instruction.

Delphi study The Delphi technique was used to structure a group communication process that allowed a group of individuals, to deal with a complex problem. Two rounds of the Delphi were planned for this research. Each round of the Delphi took about six weeks. The researcher received useful information from the panel during both rounds. However, some difficulties were found, such as combining the perception from experts represents two different areas (TQM and instructional supervision), analyzing the open-ended questions, and the time consuming nature of the process.

The attitude survey This survey was used as the final step to determine the attitude regarding the model of the V-T professionals. The model was confirmed and refined based on the survey results. A positive attitude did not necessarily mean that the V-T professionals would totally accepted the
model. The TQM and instructional supervision components of the model were confirmed through the literature review and the Delphi study. These components were also used in the development of the attitude instrument regarding the model. Therefore, the instrument was validated and the reliability was confirmed (the reliability of the instrument was also confirmed by the pilot test, see Appendix L).

Descriptive Statistics

Delphi study The TQM and instructional supervision components were identified by the panel in the first round. The attitudes regarding the initial model were measured and compared after the second round. The results were used for refining the model.

In the first round Delphi, six TQM components: Customer driven quality, Teamwork, Top management commitment, TQM training, The utilization of statistical methods, and Continuous improvement all received high rating on a seven point Likert-type importance scale. The utilization of statistical methods was rated lowest in importance. Customer driven quality, Top management commitment, and continuous improvement were rated as the most important components by the TQM panel.

Seven instructional supervision components: Teamwork, Customer driven quality, Peer coaching, Student feedback, Supervisor observation, Continuous improvement, and
The utilization of statistical methods were also confirmed based on the suggestions by the instructional supervision experts. Teamwork was the most important component ranked by the panel. "Supervisor observation" and "the utilization of statistical methods" received the lowest scores. The TQM and instructional supervision experts have the similar perceptions regarding the utilization of statistical methods in the instructional process.

**Attitude study** From the attitude survey, means and standard deviations for each question were calculated. These provided valuable information to confirm or refine the model.

Since the components: Customer driven quality, Teamwork, Top management commitment, TQM training, The utilization of statistical methods, Communication and feedback, and Continuous improvement were included in the model. The instrument used seven questions to ask whether these components were necessary. The results showed that these components were confirmed by the V-T participants. However, the questions that asked whether this model clearly incorporates these components did not produce the same ratings. This means that the components were important but the model did not perfectly address each component.

Since Instructional System Development procedures: analysis, design/development, implementation, and evaluation were used as the framework in this model, question 15-22 were designed to measure the attitude regarding the framework and
the degree of acceptance. The results indicated that these steps all received the scores ranging from 5.06 to 5.41. V-T professionals agreed that this model contains an appropriate number of components that can be used to improve the quality of instruction (mean score = 5.55). But the question: this model consists of workable procedures that can be used in community college V-T programs received lower score. A lower mean score was also received by the question: this model can be accepted by the V-T faculty. It appears that the V-T professionals recognized that the model was appropriate but it would not be accepted by all.

Question 23 to 29 were designed to confirmed some other key components that were used in the model. The important findings included:

1. The instructional supervisor should focus on helping the teacher improve during the instructional process, not just check the instruction quality at the end of the process.

2. Students are the main customers in the V-T programs, and they are more important than the employers.

3. V-T professionals recognized that the students are not the raw material in the instructional process. Students must be involved in the instructional process but the V-T professionals did no agree that students must be involved in all steps: analysis, design/development, implementation, and evaluation.
4. Professional improvement plans that are created by the instructional supervisors and teachers can be used to continuously improve the quality of instruction.

5. Merit pay (based on performance) systems should not be emphasized. Since the standard deviation was larger than that of other questions, it means that no strong consensus opinions was present.

Hypothesis Testing

**Hypothesis one**  During the Delphi study, hypothesis one assumed that the variance of round two would be lower than round one. This hypothesis was not rejected at 0.05 level. The reason may be because four flowcharts were added to explain the general model in the second round and this additional explanation provided for more diverse opinions. This may have caused the variance of the attitudes to not be affected.

**Hypothesis two**  This hypothesis was set up to test for differences in attitudes between the first and the second round. The results showed that the mean score in round two was significantly higher than that of round one. Although the panel could not achieve consensus in attitudes regarding the model, they did indicate that the second round model was better than the round one model.

**Hypothesis three**  Hypothesis three tested whether those in administration will demonstrate more positive attitudes
regarding the TQM implementation model than those teachers not in an administrative position. The results indicated that administrators have more positive attitudes than teachers. This may be due to more TQM training being received by administrators.

**Hypothesis four** This hypothesis assumed that there were different attitudes regarding the model among the groups of V-T professionals who have different work experience in years. The results did not support the hypothesis at the 0.05 significance level. The attitudes were not different attitudes among the groups with varying work experience. There was a significant correlation between the attitude score and the work experience in years. The more work experience in years V-T professionals have the more positive their attitudes regarding the model.

**Hypothesis five** It was assumed that there were different attitudes among the groups with different amounts of TQM training. The results showed that this hypothesis was supported. The TQM training hours impacted the attitude scores significantly at the 0.05 level. Groups receiving 20-29 and 30-39 hours of TQM training have more positive attitudes regarding the model than other groups. There was a significant linear correlation between the attitude scores and TQM training hours (0-40 hours). The more TQM training hours V-T professionals have will produce more positive attitude regarding the model. The hours between 20-39 was the optimum
for producing positive attitudes. The training above 40 hours did not show a linear trend in increasing the attitude scores.

**Hypothesis six**  This hypothesis assumed that V-T professionals belonging to different vocational groups will demonstrate different attitudes regarding the model. The hypothesis was supported by the results. V-T professionals in the health care programs showed more positive attitudes than those in industry programs. The reasons may be due to differences in educational levels.

**Hypothesis seven**  This hypothesis stated that V-T professionals belonging to different community colleges will demonstrate different attitudes regarding the model. This hypothesis was not supported by the results at the 0.05 significance level. There are no differences regarding the model among the community colleges.

**Hypothesis eight**  This hypothesis was used to test the interaction effect between the independent variables when taken two at a time. The results showed that there was an interaction between the variables of schools and TQM training hours. From the results of hypothesis five, TQM training hours affected the attitude scores significantly, but the effect depended on the individual community college. The individual community college may have different levels of emphasis on TQM training. Therefore, college was a factor with TQM training in impacting the attitude scores regarding the model.
Conclusions

Based on the findings and the discussion, the following conclusions are made:

The Generation of Quality Instruction Model

After conducting the literature review, Delphi study, and attitude survey, a quality instruction model was generated and improved. This modified model includes seven assumptions, ten guidelines, and an overall flowchart (Figure 10). Four flowcharts (Appendix 0) were also provided to explain the general model in a detail. This model promises to improve the quality of instruction in Iowa community college vocational technical programs.

Use of the Delphi Technique

This research used a Delphi technique to generate a quality instruction model. Two rounds were used and the initial model was confirmed and refined by the experts. Although there was no significant reduction in variability from round one to two, there were more positive attitudes regarding the model in the second round. This model also received higher positive attitude scores from the V-T professionals. Therefore, the Delphi is a useful technique for developing an educational model.
Quality Instruction Model

Basic assumptions:

1. Top management and supervisors (administrators) fully support this model and they must have basic total quality management and instructional supervision knowledge.

2. Customer driven quality, top management commitment, teamwork, utilization of data collection and analysis methods, continuous improvement, communication and feedback, and quality instruction training are the most important components in this model.

3. Participants (teachers and administrators) in the process must have an orientation to the basic model concepts and principles before addressing specific tasks.

4. Systematic Instructional System Development processes (analysis, design/development, implementation, and evaluation) are appropriate for use in the model.

5. A supervisor must collaborate with teachers at each stage.

6. Teachers will be more motivated if they know what is expected and what is to be measured.

7. Students can learn if they understand what is expected and what is to be measured.

Figure 10. Quality instruction model
Implementation guidelines:

1. Students' needs must be addressed in the model and they should be involved in the selected process.

2. The TQM training at the range of 20 to 40 hours will cause V-T professionals to show positive attitudes toward the model. The training should include:
   a. A problem solving model.
   b. Preparation for teamwork.
   c. Tools of decision-making.
   d. Data collection and analysis methods.

3. The effect of TQM training was not the same among the different community colleges. Different community colleges have different TQM training thrusts, the TQM training program is important when implementing.

4. Since teachers' attitudes were lower than administrators, more TQM training and communications for the teachers are important before implementing the model so that their attitudes regarding the model can be more positive and they can be more supportive.

5. The utilization of statistical methods must be limited so that the V-T professionals can apply the technique properly and without fears. Several data collection and analysis methods such as quality function deployment, statistical testing (mean, standard deviation, t test, and ANOVA) can be utilized in this model.

6. The members of the steering committee should include deans, department chairpersons (program leaders), teachers, peers and industry representatives.

7. The quality improvement team should include the department chairman (program leader), teachers, industry representatives, students and others.

8. The focus of the steering committee will be on a particular vocational technical (V-T) program.

9. The focus of the quality improvement team will be on a course or group of related courses.

10. The health care program in a community college can be the suitable area first to use this model.

Figure 10. (Continued)
Establish a steering committee to:

1. Identify an quality improvement team to conduct the analysis, design/development, implementation, evaluation stages
2. Use the following components to guide the process:
   A. Customer driven quality.
   B. Top management commitment at each stage.
   C. Teamwork (participation of all appropriate parties).
   D. Communication and feedback.
   E. Quality instruction training for every professional.
   F. Continuous improvement.
   G. Utilization of data collection and analysis methods.

<table>
<thead>
<tr>
<th>Quality improvement team activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANALYSIS</td>
</tr>
<tr>
<td>- A. Identify the customers of the program.</td>
</tr>
<tr>
<td>- B. Define the needs of customers.</td>
</tr>
<tr>
<td>- C. State the instructional goals of the program.</td>
</tr>
<tr>
<td>- D. Conduct a formative evaluation for the above processes.</td>
</tr>
<tr>
<td>DESIGN/DEVELOPMENT</td>
</tr>
<tr>
<td>- A. Identify the objectives of course (s).</td>
</tr>
<tr>
<td>- B. Identify the competencies (outcomes) for students.</td>
</tr>
<tr>
<td>- C. Prepare teaching materials and identify teaching techniques.</td>
</tr>
<tr>
<td>- D. Conduct a pre-evaluation conference.</td>
</tr>
<tr>
<td>- E. Conduct a formative evaluation for the above processes.</td>
</tr>
<tr>
<td>IMPLEMENTATION</td>
</tr>
<tr>
<td>- A. Communicate expected performance standards with students.</td>
</tr>
<tr>
<td>- B. Facilitate communication during the teaching process.</td>
</tr>
<tr>
<td>- C. Collect students' feedback.</td>
</tr>
<tr>
<td>- D. Initiate self evaluation.</td>
</tr>
<tr>
<td>- E. Establish peer coaching activities.</td>
</tr>
<tr>
<td>- F. Conduct formative evaluation by supervisor.</td>
</tr>
<tr>
<td>- G. Conduct a formative evaluation for the above processes.</td>
</tr>
<tr>
<td>EVALUATION</td>
</tr>
<tr>
<td>- A. Identify the summative evaluation goals and measures.</td>
</tr>
<tr>
<td>- B. Conduct the summative evaluation.</td>
</tr>
<tr>
<td>- C. Complete a post-evaluation conference.</td>
</tr>
<tr>
<td>- D. Create a professional improvement plan.</td>
</tr>
<tr>
<td>- E. Conduct a formative evaluation for the above processes.</td>
</tr>
</tbody>
</table>

Figure 10. (Continued)
Recommendations

Based on the findings and the discussion, the following recommendations are made to those interested in implementing a quality instruction model or conducting similar research.

Applying the Quality Instruction Model in a V-T Program in Iowa Community College

After conducting this research, this model was refined by the experts and the V-T professionals in Iowa. The experts and V-T professionals also perceived positive attitudes regarding the model. Due to the time limitations, field implementation was not planned in this research. It would be useful to conduct a study to implement this model in a selected V-T program so that the effectiveness of the model can be measured.

Continuous Improvement of the Quality Instruction Model

This model was designed for use in Iowa community colleges. It may not be applicable in community college V-T programs in other states. Before an implementation of the model begins, modifications may be needed so that local needs can be addressed. Moreover, the implementation should include a continuous improvement component so that the model can continue to improve the quality of instruction.
Continuous Improvement of the Delphi Technique for Use in Model Development

The Delphi technique is useful for collecting data to generate an educational model. However, trying to obtain consensus opinions from TQM and instructional supervision experts was difficult. Since these experts represent two areas, an improved means of communication should be addressed in future applications of the Delphi technique.
REFERENCES


Teigland, M. D. (1993). A study of the beliefs total quality management comparing superintendents, board members, and


ACKNOWLEDGMENTS

During the past three years, this research was fully supported by my family and many friends. I would like to express my sincere appreciation to my lovely wife Tzu-hsing Chiang, my mother Chen-sen Chao, and my son Ting-han Chao.

My advisor Dr. Dugger was the most important person who gave encouragement and directions to me. Without his support, this research could not have been completed. We shared a lot of enjoyable time in arguing and exploring the truth. The things I have learned exceed this research.

I also want to express my appreciation to the committee members: Dr. Huba, Dr. Netusil, Dr. Strahan, Dr. Hall, and Dr. Johnson. They provided much support for this research effort.

It was an enjoyable experience in learning. I will never forget my years at Iowa State University.
October 6, 1993

NAME
ADDRESS

Dear:

Based on your knowledge of Total Quality Management, we are asking your assistance in a study designed to create a TQM model for instructional supervision in vocational technical programs in community colleges. This model promises to improve the quality of instruction in these programs.

After the development of an initial model, a two step process will be utilized. First, a Delphi study will be used to obtain opinions regarding basic TQM components in an implementation model for instructional supervision. Second, an attitude measure will be used on community college personnel to revise the proposed model.

Please complete the enclosed form and return in the stamped, addressed envelop provided. As a Delphi participant, you will receive three questionnaires at three different times. Your responses will be kept confidential. If you desire, a copy of the results will be provided. Your assistance is critical if this model is to be useful. We hope that you will be willing to participate as a Delphi panelist.

If you have any questions or concerns regarding this study, please contact the principal investigator by mail or telephone. A fax number is also available for contacting us. Thank you for your help.

Sincerely,

chih-yang Chao
Principal Investigator
(h) 515-296-8251
(o) 515-294-8416

John C. Dugger, Ph. D.
Department Chair
(o) 515-294-1033
Fax: 515-294-1123
Participant Information

I agree to serve on an expert panel for the following study:

A proposed total quality management model for instructional supervision in vocational-technical programs

(Please provide any additions or corrections to the following)

Name:

Address:

Office Phone:

Home Phone:

Fax:

I desire a copy of the results
APPENDIX B: PANEL MEMBERS
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1. Dorsey J. Talley  
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(H): 206-376-5109  
Fax: 206-376-5109
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(H): 414-731-1670  
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Fax: 515-423-1711

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(H): 515-232-0202

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27. Fenwick English  
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University of Kentucky  
Lexington, Kentucky 40506  
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APPENDIX C: FIRST ROUND COVER LETTERS TO THE PANEL
October 4, 1993

NAME
ADDRESS

Dear:

Thank you for agreeing to become a Delphi panel member. Enclosed are the first round questions regarding the proposed instructional supervision model. These questions are divided into two sections. The first section addresses general total quality management concepts. The second addresses the model. A description of the model is contained on the three blue sheets enclosed.

Please complete both sections of the yellow instrument enclosed in this packet. Return the completed instrument in the stamped, self-addressed envelope provided.

If you have any questions or concerns regarding this study, please contact the principal investigator. Thank you for your continuing support.

Sincerely,

chih-yang Chao
Principal Investigator
(h) 515-296-8251
(o) 515-294-8416

John C. Dugger, Ph. D.
Department Chair
(o) 515-294-1033
Fax: 515-294-1123
November 23, 1993

NAME
ADDRESS

Dear:

We are writing to follow-up our October 4 first round Delphi process survey. Since only 28 experts in the field of TQM and instructional supervision we have requested, every expert's opinion is so critical to this research. Without your support, this study cannot be completed. We are looking forward to seeing your response soon.

In order to reach the research schedule, we are asking the response can be received before November 30, so that we can on time process these information and prepare it for the second round. Thank you for your continued cooperation.

Sincerely,

Chao Chih-yang
Principal Investigator
515-296-8251

John C. Dugger, Ph.D
Department Head
515-294-1033
APPENDIX E: INITIAL MODEL AND QUESTIONS FOR THE FIRST ROUND DELPHI
The TOM Based Instructional Supervision Model

After examining the literature, one general model (Figure 1) was developed to guide the implementation of Total Quality Management in community colleges. The general model was designed to be used in a Vocational-Technical program. A supervisor may apply this model and collaborate with teachers to improve the quality of instruction.

In general, the model is based on the following:

1. The participants (teachers, administrators) in the process must have an orientation to TQM concepts and principles before addressing specific tasks.

2. The quality standards of the institution are defined by the customers.

3. The supervisor focuses on helping the teacher do the right thing during the instructional process, not at the end of the process.

4. Systematic Instructional System Development processes: analysis, design, development, and evaluation will be used in the model.

5. Teamwork is an integral part of the process. Teams will be formed for each stage.

6. Feedback from students, supervisors and peers will be frequently provided to the individual teacher.

7. The evaluation stage will focus on continuous improvement. A professional growth plan will be established by the supervisor and teacher.

8. Teachers can work well if they know what to do and how to teach effectively.

9. Students can learn if they understand what to do and how to achieve the standards.

10. In order to remove the fear from the teachers and encourage peers to work together, this model does not emphasize a merit pay system.

11. The focus of the steering committee will be on a particular V-T program.

12. The focus of each team (analysis, design, development, and evaluation) will be on a course or group of related courses.
Establish a steering committee to:
1. Identify the analysis, design/development, implementation, and evaluation team
2. Use the following components to guide the process:
   A. Customer driven quality
   B. Top management commitment at each stage
   C. Teamwork
   D. Participation of all appropriate parties
   E. TQM training for every professional
   F. Continuous improvement
   G. Utilization of scientific decision making techniques

1. Establish the analysis team
2. have the analysis team complete the following:
   A. identify the customers of instruction
   B. define the needs of customers
   C. state the mission of the instruction
   D. conduct a formative evaluation for the above processes

1. Establish the design/development team
2. have the design team complete the following:
   A. identify the objectives of instruction
   B. generate the competencies (outcomes) for students
   C. prepare teaching materials
   D. conduct a preevaluation conference
   E. conduct a formative evaluation for the above processes

1. Establish the implementation team
2. have the development team complete the following:
   A. help teacher present the outcomes to the students
   B. help teacher present course materials
   C. collect students feedback
   D. initiate self evaluation
   E. establish peer coaching activities
   F. conduct formative evaluation by supervisor
   G. conduct a formative evaluation for the above processes

1. Establish the evaluation team
2. have the evaluation team complete the following:
   A. identify the summative evaluation goals
   B. conduct the summative evaluation
   C. complete a postevaluation conference
   D. create a professional growth plan
   E. conduct a formative evaluation for the above processes
A. Section One

For TQM Experts

Based on a literature review, the researcher has included several basic TQM components for an implementation model. Please react to these components by rating each component on a 1-7 Likert-type scale. A "1" means not important and a "7" means very important. In addition, please add any components that may be missing.

<table>
<thead>
<tr>
<th>Basic components of TQM</th>
<th>Degree of importance of each component</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>not important</td>
</tr>
<tr>
<td>Customer driven quality</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>Teamwork</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>Top management commitment</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>TQM training</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>The utilization of statistical method</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>Continuous improvement</td>
<td>1 2 3 4 5 6 7</td>
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<td>1 2 3 4 5 6 7</td>
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<td>1 2 3 4 5 6 7</td>
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<tr>
<td></td>
<td>1 2 3 4 5 6 7</td>
</tr>
</tbody>
</table>
Based on a literature review, the researcher has included several basic instructional supervision components for an implementation model. Please react to these components by rating each component on a 1-7 Likert-type scale. A "1" means not important and a "7" means very important. In addition, please add any components that may be missing.

<table>
<thead>
<tr>
<th>Basic components of instructional supervision</th>
<th>Degree of importance of each component</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tr>
<tr>
<td>Teamwork</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>Customer driven quality (instructional objectives)</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>Peer coaching</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>Student feedback</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>Supervisor observation</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>Continuous improvement (professional growth plan)</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>The utilization of statistical method</td>
<td>1 2 3 4 5 6 7</td>
</tr>
</tbody>
</table>

150

For instructional supervision experts
B. Section Two

Please read each statement and indicate the extent to which you agree or disagree. Then indicate your decision by circling the number that corresponds to the appropriate level of agreement.

Please list any suggestions that may improve the model.

1(a). This model clearly incorporates the TQM component of "customer driven quality."

<table>
<thead>
<tr>
<th>Strongly Agree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
</table>
| 1   2   3   4   5   6   7

1(b). How could this model better incorporate "customer driven quality?"

________________________________________________________________________

2(a). This model clearly incorporates the TQM component of "top management commitment."

<table>
<thead>
<tr>
<th>Strongly Agree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
</table>
| 1   2   3   4   5   6   7

2(b). How could this model better incorporate "top management commitment?"

________________________________________________________________________

3(a). This model clearly incorporates the TQM component of "teamwork."

<table>
<thead>
<tr>
<th>Strongly Agree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
</table>
| 1   2   3   4   5   6   7

3(b). How could this model better incorporate "teamwork?"

________________________________________________________________________

4(a). This model clearly incorporates the TQM component of "utilization of statistical methods."

<table>
<thead>
<tr>
<th>Strongly Agree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
</table>
| 1   2   3   4   5   6   7

________________________________________________________________________
4(b). How could this model better incorporate "utilization of statistical methods?"

5(a). This model clearly incorporates the TQM component of "continuous improvement."

Strongly Agree

Strongly Disagree

5(b). How could this model better incorporate "continuous improvement?"

6(a). This model clearly incorporates the TQM component of "enough TQM training."

Strongly Agree

Strongly Disagree

6(b). How could this model better incorporate "enough TQM training?"

7(a). This model contain an appropriate number of component that can be used to identify the instructional problems which may lead to improving the quality of instruction.

Strongly Agree

Strongly Disagree

7(b). What other methods may be used to detect the problems of instruction?
8(a). This model consists of workable procedures that can be used in the community college vocational program.  
Strongly Agree  Strongly Disagree

1  2  3  4  5  6  7

8(b). How could the procedures be improved?


9(a). The model can be fully accepted by the teacher and the supervisor.  
Strongly Agree  Strongly Disagree

1  2  3  4  5  6  7

9(b). How could the acceptability of this model be improved?


10(a). The step of analysis, design, development, and evaluation are appropriate procedures for use in this model.  
Strongly Agree  Strongly Disagree

1  2  3  4  5  6  7

10(b). How could the steps of analysis, design, development, and evaluation in this model be improved?


11(a). The elements of the analysis step are appropriate.  
Strongly Agree  Strongly Disagree

1  2  3  4  5  6  7

11(b). How could the elements in the analysis step be improved?
12(a). The elements of the design step are appropriate.  
   Strongly Agree  Strongly Disagree
   1  2  3  4  5  6  7
12(b). How could the elements in the design step be improved?

13(a). The elements of the development step are appropriate.  
   Strongly Agree  Strongly Disagree
   1  2  3  4  5  6  7
13(b). How could the elements in the development step be improved?

14(a). The elements of the evaluation step are appropriate.  
   Strongly Agree  Strongly Disagree
   1  2  3  4  5  6  7
14(b). How could the elements in the evaluation step be improved?
APPENDIX F: RESULTS OF THE FIRST ROUND DELPHI
The results of the first round are presented below. In section one, the degree of importance of each component is presented by a frequency distribution. Some components were suggested by the panel. In section two, the degree of agreement for each question also was presented in the same way, and comments follow the table. Some responses were illegible and are labeled by "(?)."

Section one:
TQM components

<table>
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<tr>
<th>Basic components</th>
<th>Frequency distribution</th>
<th>Ave.</th>
<th>S.D.</th>
<th>N</th>
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<td>Teamwork</td>
<td></td>
<td>1</td>
<td>5</td>
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<td>Top management commitment</td>
<td></td>
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<td>The utilization of statistical methods</td>
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<td>Continuous improvement</td>
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Section one:
Instructional supervision components

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</table>
Section two:

1. This model clearly incorporates the TQM component of "customer driven quality."

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</table>

Comments:
- a. Apply concepts of QFD in meeting customers' needs.
- b. Customers should be (1) university (2) students (3) society (4) business.
- c. You do not clearly define "customer driven quality", must include student/parent survey, feedback on a regular basis.
- d. Depends on how you define CDQ.
- e. Need customers on teams (students).
- f. Who is the customer? students, business, tax payers, parents?
- g. Who is the customer?
- h. Insufficient information to judge.
- i. Need better define customers. Customer might be internal/external, students, employer.
- j. Quality enhanced by instructor receiving student, peer, administrator feedback. Need to define customer--students or potential employer.
- k. Include customers on development and evaluation teams.
- l. May have a better idea with a pilot run.
- m. Dislike the word customer as for profit type organizations its applicable to schools.
- n. Can't tell. It's easy to say but very difficult to operate. I 'd be more confident if the evaluation stage made some reference to customer standards/requirements.
- o. Clearly define the "customer." Internal vs external (students? teachers? community? employers?)

Note: The model utilizes an analysis team to identify the customer for each course.

2. This model clearly incorporate the TQM component of "top management commitment."

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</table>

Comments:
- a. May have a better idea with a pilot run.
b. Put money into training.
c. Ask for statement of commitment in catalog, syllabus/verbally at presidents' day have top management on steering committee.
d. The description of the model does not clearly incorporate "top management commitment."
e. Inefficient information to judge.
f. No specific "top management commitment" mentioned in the model.
g. Unclear what role of steering committee beyond selection team(s); unclear who is steering committee; unclear where organizational barriers are dealt with.
h. Vision, mission, objectives statement, research can improve.
i. Clearly indicate the role of the president of the community college in the process.
j. Top management appears to have the strongest emphasis at the analysis team level.
k. Depends on how you define CDQ.
l. Management commitment means building a supportive culture of trust, committing to training and equipment, communications. Leadership is not addressed. Plans, goals, communication and rewards. If not merit pay then what kind of pay?
m. Top management should instruct also.
n. Unless you mean by "top management", the involvement of the supervisor. What if customer feedback requires major changes, it's not clear if there is suggest from the "top."
o. Top management must: solve "system" problems which teams cannot solve. Stop the process when it is "out of control."

3. This model clearly incorporate the TQM component of "teamwork."

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</table>

Comments:

a. Is top management on a team(s)?
b. The model lacks definition. Are students part of the team?
c. Depends on how you define CDQ.
d. Are the customers in team?
e. It is unclear how teamwork/team dynamics are developed; unclear whether team is functional or cross functional; unclear whether team is rewarded as team or individual.
f. Clarifying how teams are constituted, composition of team.
g. Are customers (students, etc.) the team members?
h. Stress peer evaluation / Master teacher assigned to new instructor-involving all faculty in the specific program.
i. The model incorporates teamwork in all stages: analysis, design, development, and evaluation.
j. Is it necessary to create from separate teams? It seems to create artificial & competitively? item of the process. The steering committee is responsible then for ensuing? "teamwork" among the teams.
k. One team through all process.

4. This model clearly incorporate the TQM component of "utilization of statistical methods."

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<th>Strongly disagree</th>
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Comments:

a. I'm not sure "statistical methods" transfer logically from TQM to teacher evaluation.
b. Specify the methods to be used in the model.
c. Give examples.
d. Unclear how statistical methods could be used.
e. The model explanation does not describe the use of statistical methods - how are you going to measure?
f. Unable to judge.
g. No detail on where, how this is done.
h. Use control charts.
i. Indicate which methods will be taught to the team & then be used by them.
j. Need statistical methods in process definition & management.
k. Depends on how you define CDQ.
l. Are statistical methods used to analyze customer feedback?
m. Should have an external measure(statistic) of students' learning.
n. I would suggest you down play your emphasis on "statistical" methods. I'll think you'll find little use for control charts and other SPC related techniques given the data you'll be analyzing. Yes, you'll be using simple statistics like mean. We simply refer to "data collection and analysis."
o. Application is unclear.
5. This model clearly incorporates the TQM component of "continuous improvement."

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<th>Frequency distribution</th>
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<td>5.14</td>
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Comments:

a. What is time frame of new or? in courses—short or 3-5 years that's norm now.
b. This model falls short in two areas—(1) It presents an approach but does not provide for stratification of issues in the analysis stage. (2) What happens after the check (evaluation).
c. Depends on how you define CDQ.
d. Indicate how improvement will be made in each team.
e. Here is no explicit mention of Pareto principle; only component "professional growth plan", "formative evaluation".
f. "Repeat the above step" or phase if check action does not exist?
g. Shown by self evaluation, student evaluation, peer and supervisor.
h. I would like to see more emphasis on self supervision based on teacher initiated feedback leading to teacher initiated improvements under taken in-process, i.e. during a course.
i. More than "feedback" is required. Intentional change is required.

6. This model clearly incorporate the TQM component of "TQM training."

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</table>

Comments:

a. States "TQM training for every professional"
b. Describe types, amount, sequence, methods, and timing of training.
c. You have no learning objectives for your TQM training! No mention of whether training is Jit?, experiential, cooperative, etc.
d. This is part of employee involvement.
e. Depends on how you define CDQ.
f. No definition of how much & what type. How much "commitment" is management giving to make?
g. Is TQM training critiqued by outsiders?
h. Our experiences with teachers suggest you have better off not calling it "TQM" training. Our teachers readily accept the notion of classroom research which incorporate all the essential TQM concepts.

i. Training as part of doing—not separate—, and training evaluated as to effect of implementation.

7. This model contains an appropriate number of components that can be used to identify the instructional problems which may lead to improving the quality of instruction.

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<th>Frequency distribution</th>
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</table>

**Average**: 4.65  **S.D.**: 1.75  **Total number**: 23

Comments:

a. The model does not provide for isolation & stratification of issues (components).

b. Expand on how student feedback is & be achieved. Again, QFD techniques may be useful here.

c. Use control charts.

d. Not sure how your lay out is different from conventional instructional design models?

e. Roles of students seems ?nimal? classroom assessment techniques.

f. Long term impact of instruction—reports from students 5 years after instruction.

g. After a pilot run, feedback may have a better idea.

h. Not sophisticated enough.

i. Again, more emphasis on teacher-initiated classroom research (formative and summative) on the teaching/learning process.

8. This model consists of workable procedures that can be used in the community college vocational program.

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**Average**: 5.14  **S.D.**: 1.67  **Total number**: 22

Comments:

a. Could fit any.

b. Review/pilot with community college vocational program faculty/ students.

c. Workload an issue for both peer evaluation & supervisor—time to do it all.

d. Needs much better definition.

e. Model without staff development will be of little use!
f. Insufficient detail to judge.
g. Need much more detail behind model ?pre-guiding? principles.
h. Need to define "education/training". Course related not organization related.
i. Add the 3 elements: communication, MgMt network, reward & recognition.
j. The procedures are not yet defined.
k. What procedures?
l. Better (cleaver) definition of some terms.

9. The model can be fully accepted by the teacher and the supervisor.

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<th>Frequency distribution</th>
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</table>

Comments:

a. The model needs to be filled out with more detail & procedures. Teachers must see how they will benefit from applying it, not just student benefit.
b. All is not clean.
c. No way to give attitudes of vocational education supervisors.
d. Depends on existing climate, e.g. is there precedent for innovation, collegiality?
e. Staff development.
f. Needs much better definitions, Faculty unions?
g. Faculty involvement through initial training of TQM concepts ?thru eval? documents by students, peers, supervisor.
h. Teachers are not sure TQM makes sense!
i. Clarify what aspects of teaching will be evaluated and what aspects are out of bounds.
j. I'm not sure what you mean by fully accepted.
k. Note suggestions above regarding use of "TQM" jargon.
l. Remove ?egos? from brains by washing in warm ndisy water.

10. The steps of analysis, design, development, and evaluation are appropriate procedures for use in this model.

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Comments:
a. There should be more simultaneity (QFD).
b. Vary appropriate usage, again, feedback will be helpful here.
c. Evaluation is part of the other steps.
d. Add the next step after evaluation.
e. CQI is much more than this, it's a culture change!
f. Why not PDCA?
g. Analysis should be expanded to achieve focus on specific issues—USA—understand issues/customers.
h. Use outside help—business & parents.
i. The steps are okay but I still might quarrel with the complexity added by all the teams.
j. Clear up the "team" concepts.

11. The elements of the analysis step are appropriate.

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Comments:

a. Output is for individual, society, and business.
b. You need to prioritize needs and evaluate with conflicting needs.
c. Clarify composition of team, the mission should come first; are customers actively consulted regarding their requirements?
d. Does mission equal goals?
e. Where are the elements of the analysis step?
f. Who is on this team? students?, employers?, union?, DOE?
g. Identify the customers.
h. Some definitions of intended application of teams.

12. The elements of the design step are appropriate.

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</table>

Comments:

a. Who is on the team? students?, employers?, union?, DOE?
b. Where are the elements?
c. How do you distinguish competencies for students from objectives of instruction?
d. You need to explicitly match customer needs with instructional objectives, then cascade down to methods and materials.
e. PDCA cycle, problem solving process.
f. Can't tell.
g. Plan for contingencies? Your approach looks like a once through process. After "design" we must confirm and plan for changes to improve.
h. Who is on the design team is most important.
i. I would be more explicit in the design regarding the relationship of the "needs of customers" and instructional "objectives" and "competencies"
j. Integrate better with other steps and involve clearly in continuous improvement.

13. The elements of the development step are appropriate.

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Comments:
- Formative evaluation by whom? What are the measures?
- Some have "development" is the iterative process of "doing"/implementing changes.
- Can't tell.
- Need emphasis on how feedback from students will be achieved.
- Is the teacher an active participant? Is he or she a member of the team?
- If this is a team effort, why "supervisor"?
- Where are the elements?
- The self evaluation should incorporate student feedback and part of this feedback should be related to the teacher's use of student feedback to improve his/her teaching effectiveness.

14. The elements of the evaluation step are appropriate.

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<td>6</td>
<td>5.29</td>
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Comments:
- Give examples.
- Who is on this team? students?, employers?, union?, DOE?
- Where are the elements?
- Summative evaluation will clash with TQM's formative approach.
- Repeat the CI process.
- Show how continuous improvement will be made after each evaluation (PDSA cycle).
g. Can't tell.
h. Not clear what is to be evaluated and how. What happens after evaluation? act? adopt?
i. Evaluation 2-4 years later, very important.

Overall opinions:

1. Model is typical sequential design rather than simultaneous/concurrent design

2. The model needs better explanation of what the model is trying to achieve? How does the model operate? Is this a linear model?

3. It appears that you are trying to develop a cook-book approach to CQI. A considerable amount of staff development will be required for this approach to have value and effect outcomes.

4. The strongly agree and strongly disagree must be exchanged.

5. The model appears to be limited to instructional activities. Too narrow, needs to be organizational.

6. Limits application in teaching except as it pertains to the raw materials (students). Better input, better output.

7. "Quality" seems to focus on outcomes, raw material..... where is focus on process? Seems like model should emphasize classroom process (teaching methods) much more than it does now. Also, you should steal some ideas from QFD literature to add more structure, simultaneity to your model.

8. * The three blue sheets mixed with assumptions, principles, and description.
   * Number 2 refers to customers. Are these community college students? If so, I would have a problem with standards being defined just by the students.
   * Where does the expertise of the teacher come in?
   * On the third page the term employee is used. Does this refer to the community college teacher or is the model looking ahead to the use of the model by supervisors in business and industry?
   * I believe teamwork is essential but I cannot tell who constitutes the TOM team. If there are four separate teams as I perceive the model ("Teams will be formed for each stage"), I would want to know
what provision there is for continuity between stages.

* I have no way of knowing whether the model "clearly" incorporates the components except that the model calls for seven components.

* To what does the term "workable procedures" refer in question 8? Does it refer to the principles, etc. on the first two blue pages or to the steps on the third blue page?

* What I feel is needed is a capsule description of the model with more specifics. If future questionnaires require a prior knowledge of the TOM model, then I would like to request more detail.

9. I don't have enough information at my disposal about the "model" being analyzed here to make ratings and suggestions.

10. On the past two years many of our faculty have share intention applying TQ related techniques in the classroom. There are about 50-60 full-time faculty (125 total) who are experimenting with some form of classroom assessment to improve the teaching/learning process.

11. The model is way too generic to answer with any precision.
Dear:

Thank you for participating in the first round of my study. Enclosed are the second round questions and the results of the first round. Several revisions in the model were made based on your input. In order to explain this model in more detail, four blue sheets were added, each sheet addresses either analysis, design, development, or evaluation of the model.

Your instructions for completing the second round include:

1. Read the blue sheets that describe the modified model.
2. Complete the white sheets.
3. Return the completed sheets in the stamped, addressed envelop or Fax to (515) 294-1123 by December 31.

Your continuing support for the second round process is critical to this research. Two dollars are included as a small token of my gratitude. I appreciate your help and look forward to your responses.

Sincerely,

Chao Chih-yang
Principal investigator
(H): 515-296-8251
(O): 515-294-8416
APPENDIX H: REVISED MODEL AND QUESTIONS FOR THE SECOND ROUND DELPHI
The Quality Instruction Model

This model is designed to guide the quality improvement of technical instruction in community colleges.

Basic assumptions

1. The participants (teachers, administrators) in the process must have an orientation to the basic model concepts and principles before addressing specific tasks.

2. Systematic Instructional System Development processes (analysis, design, development, and evaluation) are appropriate for use in the model.

3. Teachers will be more motivated if they know what to do and how to teach effectively.

4. Students can learn if they understand what to do and how to achieve the standards.

Guidelines for application

1. Obtain the support of top management.

2. Conduct quality instruction training that includes:
   a. A problem solving model
   b. Preparation for teamwork
   c. Tools of decision-making
   d. Basic statistical methods
   e. Control charts

3. The members of the steering committee should include deans, departments chairpersons, teachers and industry representatives.

4. A supervisor must collaborate with teachers at each stage.

5. The focus of the steering committee will be on a particular V-T program.

6. The focus of each team (analysis, design, development, and evaluation) will be on a course or group of related courses.

7. Several quality management methods such as quality function deployment, statistical testing (t test, ANOVA) and SPC control charting can be utilized in this model to determine the customer's needs and to make other decisions.
Establish a steering committee to:
1. Identify the analysis, design/development, implementation, and evaluation team
2. Use the following components to guide the process:
   A. Customer driven quality
   B. Top management commitment at each stage
   C. Teamwork
   D. Participation of all appropriate parties
   E. TQM training for every professional
   F. Continuous improvement
   G. Utilization of scientific decision making techniques

1. Establish the analysis team
   2. have the analysis team complete the following:
      A. Identify the customers of instruction
      B. Define the needs of customers
      C. State the mission of the instruction
      D. Conduct a formative evaluation for the above processes

1. Establish the design/development team
   2. have the design team complete the following:
      A. Identify the objectives of instruction
      B. Generate the competencies (outcomes) for students
      C. Prepare teaching materials
      D. Conduct a pre-evaluation conference
      E. Conduct a formative evaluation for the above processes

1. Establish the implementation team
   2. have the development team complete the following:
      A. Help teacher present the outcomes to the students
      B. Help teacher present course materials
      C. Collect students feedback
      D. Initiate self evaluation
      E. Establish peer coaching activities
      F. Conduct formative evaluation by supervisor
      G. Conduct a formative evaluation for the above processes

1. Establish the evaluation team
   2. have the evaluation team complete the following:
      A. Identify the summative evaluation goals
      B. Conduct the summative evaluation
      C. Complete a post-evaluation conference
      D. Create a professional growth plan
      E. Conduct a formative evaluation for the above processes
Conduct the formative evaluation of the above processes: evaluate each stage and modify if necessary

Identify the customers of instruction:
- internal customers might be:
  - students involved in the course
  - administrators of the program
  - teachers in the next course or group of courses
- external customers might be:
  - employers from related industries
  - representatives from the community

Define the needs of customers:
- ascertain the needs of the customers by the data collected from survey, interview, nominal group, Delphi processes
- utilize quality function deployment method to determine the quality of instruction

Modify course purpose if necessary:
- the purpose of the course might be: to help students gain the necessary skills and knowledge to adapt to the customers needs

Establish the analysis team:
- team members will be selected by the steering committee and may include:
  - chairman of the department or program leader
  - teachers of the course or content area
  - teachers from related programs
  - representatives of related industries
  - students
Establish the design/development team:
- team members will be selected by the steering committee
  and may include all related discipline representatives, for instance:
  - chairman of the department, or program leader
  - teachers related to the course
  - representatives of related industries
  - students

Identify the student performances for the course
- based on the customers' needs and use decision making techniques
  to establish the expected students performances for the instruction

Prepare teaching materials:
- the materials must be performance and self-learning oriented
  so that students can continue improve themselves

Conduct a preinstruction conference:
- discuss the instruction improvement activities in a conference
  involving the evaluation team, supervisor, and teacher of the course

Conduct the formative evaluation for the above processes:
- evaluate each stage and modify if necessary
Establish the implementation team:
- team members will be selected by the steering committee and may include all related discipline representatives, for instance: chairman of the department, or program leader
- teachers related to the course
- students from the course

Communicate expected performance standards with students:
- the students must know the expected performances before they start learning

Facilitate communication during the teaching process:
- interactive communication between teacher and students

Collect student feedback:
- use survey questions or individual contacts to collect feedback
- use statistical and decision-making techniques to detect the instructional problems

Initiate self evaluation:
- teacher evaluate the instruction performed by him/her self

Establish peer coaching activities:
- observed and advised by peers

Conduct an informal evaluation:
- observed and advised by supervisors

Conduct the formative evaluation for the above processes:
- monitor each stage and correct when necessary
Establish the evaluation team:
team members will be selected by the steering committee and may include all related discipline representatives, for instance: chairman of the department or program leader, teachers related to the course, representatives of related industries.

Identify the summative evaluation goals and measures:
the goals must be based on how well instruction has been conducted, the measures will be used to evaluate instructional effectiveness.

Conduct the summative evaluation:
use formal and informal sources to establish a summary performance for teachers, use formal and informal sources to evaluate the course content.

Complete a postevaluation conference:
discuss the results of evaluation with the teacher.

Create a professional growth plan:
based on the results of evaluation, collaborate with teacher and supervisor to set up a professional growth plan to continuously improve the quality of instruction.

Conduct the formative evaluation for the above processes:
monitor each stage and correct when necessary.
Please read each statement and determine the extent to which you agree or disagree. Then indicate your decision by circling the number that corresponds to the appropriate level of agreement.

1. This model clearly incorporates the component of "customer driven quality."
   **Strongly Disagree**       **Strongly Agree**
   1  2  3  4  5  6  7

2. This model clearly incorporates the component of "top management commitment"
   **Strongly Disagree**       **Strongly Agree**
   1  2  3  4  5  6  7

3. This model clearly incorporates the component of "teamwork"
   **Strongly Disagree**       **Strongly Agree**
   1  2  3  4  5  6  7

4. This model clearly incorporates the component of "utilization of statistical methods"
   **Strongly Disagree**       **Strongly Agree**
   1  2  3  4  5  6  7

5. This model clearly incorporates the component of "continuous improvement"
   **Strongly Disagree**       **Strongly Agree**
   1  2  3  4  5  6  7

6. This model clearly incorporates the component of "TQM training"
   **Strongly Disagree**       **Strongly Agree**
   1  2  3  4  5  6  7

7. This model contains an appropriate number of components that can be used to improve the quality of instruction
   **Strongly Disagree**       **Strongly Agree**
   1  2  3  4  5  6  7
8. This model consists of workable procedures that can be used in community college vocational technical programs.  
   Strongly disagree  Strongly Agree
   1  2  3  4  5  6  7

9. This model will be accepted by the teacher and supervisor.  
   Strongly Disagree  Strongly Agree
   1  2  3  4  5  6  7

10. The steps of analysis, design, development, and evaluation are appropriate procedures for use in this model.  
    Strongly Disagree  Strongly Agree
    1  2  3  4  5  6  7

11. The elements of the analysis step are appropriate.  
    Strongly Disagree  Strongly Agree
    1  2  3  4  5  6  7

12. The elements of the design step are appropriate.  
    Strongly Disagree  Strongly Agree
    1  2  3  4  5  6  7

13. The elements of the development step are appropriate.  
    Strongly Disagree  Strongly Agree
    1  2  3  4  5  6  7

14. The elements of the evaluation step are appropriate.  
    Strongly Disagree  Strongly Agree
    1  2  3  4  5  6  7

15. This model should not emphasize a merit pay system.  
    Strongly Disagree  Strongly Agree
    1  2  3  4  5  6  7

16. The supervisor should focus on helping the teacher improve during the instructional process, not just check the instruction quality at the end of the process.  
    Strongly Disagree  Strongly Agree
    1  2  3  4  5  6  7
17. A professional growth plan that is created by the supervisor and teacher can be used for the continuous improvement of the quality of instruction.

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
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18. Students are the main customers in the instruction process.

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19. Students are the raw material in the instructional process.

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20. Students must be involved on all teams (analysis, design, development, and evaluation) for the purposes of this model.

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21. Four teams for each course may be too cumbersome. These teams should be combined.

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Other comments about the model:

___________________________________________________________________________
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APPENDIX I: RESULTS OF SECOND ROUND DELPHI
Round Two Results:

1. This model clearly incorporates the TQM component of "customer driven quality."

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<td>5.80</td>
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2. This model clearly incorporate the TQM component of "top management commitment."

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3. This model clearly incorporate the TQM component of "teamwork."

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4. This model clearly incorporate the TQM component of "utilization of statistical methods."

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<td>5.10</td>
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5. This model clearly incorporates the TQM component of "continuous improvement."

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<td>5.45</td>
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6. This model clearly incorporate the TQM component of "TQM training."

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<td>5.32</td>
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7. This model contains an appropriate number of components that can be used to identify the instructional problems which may lead to improving the quality of instruction.

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8. This model consists of workable procedures that can be used in the community college vocational program.

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9. The model can be fully accepted by the teacher and the supervisor.

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10. The steps of analysis, design, development, and evaluation are appropriate procedures for use in this model.

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11. The elements of the analysis step are appropriate.

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12. The elements of the design step are appropriate.

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13. The elements of the development step are appropriate.

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14. The elements of the evaluation step are appropriate.

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<td>5.15</td>
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15. The model should not emphasize a merit pay system.

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16. The supervisor should focus on helping the teacher improve during the instructional process, not just check the instruction quality at the end of the process.

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17. A professional growth plan that is created by the supervisor and teacher can be used for the continuous improvement of the quality of instruction.

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18. Students are the main customers in the instruction process.

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19. Students are the raw material in the instructional process.

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20. Students must be involved on all teams (analysis, design, development, and evaluation) for the purposes of this model.

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21. Four teams for each course may be too cumbersome. These teams should be combined.

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<th>S.D.</th>
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</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

Overall opinions:

1. I'm still concerned with the use of only four steps in your model. I'd recommended adding a specific "Delivery" or "Implementation" step.

2. a. May be too many components this model contained. The multitude of steps may be confusing. Perhaps identify the concepts/conceptual/main steps first, then go into further detail.
   b. An example of application may be useful to clarify concepts.

3. a. The teams should have intended customers and what?
   b. Use control charts to show the students how they are doing.

4. a. This model clearly incorporates the component of "involvement", not "commitment."
   b. The model will describe the existing curriculum however I do not see it improving processes within the curriculum/community college program.
   c. Need a "process improvement team" component.

5. a. What does this mean: "Students are the raw material in the instructional process."?
   b. Need define "TQM training."

6. a. Include students on evaluation team. The "raw material" may be perceived as what comes from the instructional process. If the raw material is improperly processed. Customer (students) will be unhappy, etc.
   b. Statistical procedures could be used to determine process control [adherence of instruction and instructors to students, not post process inspection (test) of student knowledge].
   c. The model is starting to look like "teacher" types are the primary respondents to your inquires and
they appear to be tapped in outdated thinking about "quality" as applied to education (confused?)

7. The model should be weighted just as ?? towards supervisor/instructors as to the students. Customers are equally students and business.

8. a. It is still not clear if summative evaluation includes "on the job" performance feedback from employees.
   b. The model "appear" to be customer driven, but "quality" is not defined.
   c. Four teams for each course or related course was be too cumbersome.
   d. Teachers/suppliers need to see how this will improve: results, quality of work, not add to work load.
   e. The mission should focus on benefit to customers, i.e.??
   f. Students are as much a "product." as a customers. Need more emphasis on product specifications and measures of goals.
   g. Need to emphasize continuous "real time" feedback from students. Students are also products of process- think about internal ?diznastics? of computers.
   h. Summative evaluation should focus on "post instruction "feedback from students and employers on mission; i.e. employee/employer productivity gains.
   i. "Merit" pay is ok if team based and directly related to gains-gain sharing.
   j. Future employers are "main" customer-students" are as much products as customers. If I can replace a student with a computer and get a gain, I will!
   k. Yes, some good, some bad. The instrument in process adds value to the material to make it a "product"
   l. The four steps are a linear process. The same team could do all.
   m. Students are customers in that they don't want to be replaced by computers and thus must improve their productivity through education.
   n. The focus of this model should be:
      * Improve productivity of future employers-good for economy.
      * Improve productivity of students-employers-more employable.
      * Improve productivity of educational system-lower COQ.

9. a. Does the "analysis team" do an evaluation of the current instructional efforts? (or do all efforts at improvement perform all steps)
b. What happens when conflict becomes apparent? Example: teacher/instructor VS administrators, industry VS administrators/teachers. Teachers that are unable to teach with up-date technology.
c. Who controls the curriculum in a college? (faculty? administration? state rules? industry?)

10. a. I would emphasize this statement "This model clearly incorporates the component of customer driven quality." in the basic assumptions and make a special point of it.
b. I would give some options here: "This model should not emphasis a merit pay system." I believe a merit system to be important but, if it was made a requirement, it would ?jeopardize? the use of the model.

11. I believe your model is too centered on courses. It should focus on the entire program to be offered to a student. You should use a "strands" element that weaves several learning themes together over several courses in sequence. It on can you have continuous improvement if the learning process is envisioned as several desecrate "course."

12. For small school we may not have a chance to use four teams in the model.
APPENDIX J: COVER LETTER FOR PILOT TEST
January 20, 1994

Dear Sir/Madam:

Thank you for agreeing to participate in this research. As a stakeholder in vocational technical (V-T) education, I hope you agree that continually improving the quality of instruction is our major mission. This research attempts to find an efficient way to utilize total quality management (TQM) in V-T instruction.

Enclosed please find a quality instruction model and an attitude measure regarding this model. Since this is a pilot test, the main purpose for this survey is to identify possible communication difficulties so that the model and instrument can be refined before the final survey. Please read the model first then answer the questions and give suggestions regarding the model and instrument. You may write suggestions directly on the models and the instrument.

Your participation is entirely voluntary. The responses you provide will be kept confidential. After the data analysis, all the questionnaires will be destroyed to further preserve anonymity. We estimate that you will need approximately 20 minutes to complete the instrument.

If you have any questions or concerns regarding this study, please contact the principal investigator. Thank you for your support and professional contribution.

Sincerely,

Chih-yang Chao
Principal Investigator
(H) 515-296-8251
(O) 515-294-8416

John C. Dugger, Ph. D.
Department Chair
(O) 515-294-1033
Fax: 515-294-1123
APPENDIX K: REVISED MODEL AND THE QUESTIONS FOR THE PILOT TEST
The Quality Instruction Model

This model is designed to guide the quality improvement of technical instruction in community colleges. Two sheets (basic assumptions and guideline) and five flowcharts are included in this model. The first flowchart is the general model that consists of four steps: analysis, design/development, implementation, and evaluation so that the improvement process can be completed. The other four charts are dedicated to provide further information regarding the each step.

Basic assumptions

1. The top management and supervisors (administrators) involved in this model must have basic total quality management and instructional supervision knowledge.

2. After advising by expert panel, customer driven quality, top management commitment, teamwork, utilization of statistical methods, continuous improvement, quality instruction training are recognized to the most important elements in this model.

3. The participants (teachers, administrators) in the process must have an orientation to the basic model concepts and principles before addressing specific tasks.

4. Systematic Instructional System Development processes (analysis, design/development, implementation, and evaluation) are appropriate for use in the model (Figure 1).

5. Teachers will be more motivated if they know what to do and how to teach effectively.

6. Students can learn if they understand what to do and how to achieve the standards.

Guidelines for application

1. Obtain the support of top management.

2. Conduct quality instruction training that includes:
   a. A problem solving model
   b. Preparation for teamwork
   c. Tools of decision-making
   d. Basic statistical methods
   e. Control charts
3. The members of the steering committee should include deans, departments chairpersons, teachers and industry representatives.

4. The executive team should include chairman, teachers, representatives, students.

5. A supervisor must collaborate with teachers at each stage.

6. The focus of the steering committee will be on a particular V-T program.

7. The focus of the executive team will be on a course or group of related courses.

8. Several quality management methods such as quality function deployment, statistical testing (t test, ANOVA) and SPC control charting can be utilized in this model to determine the customer's needs and to make other decisions.
Establish a steering committee to:
1. **Identify** an executive team to conduct the analysis, design/development, implementation, evaluation stages
2. **Use the following components to guide the process:**
   A. Customer driven quality
   B. Top management commitment at each stage
   C. Teamwork
   D. Participation of all appropriate parties
   E. TQM training for every professional
   F. Continuous improvement
   G. Utilization of scientific decision making techniques

**ANALYSIS**
A. identify the customers of instruction
B. define the needs of customers
C. state the mission of the instruction
D. conduct a formative evaluation for the above processes

**DESIGN/DEVELOPMENT**
A. identify the objectives of instruction
B. generate the competencies (outcomes) for students
C. prepare teaching materials
D. conduct a preevaluation conference
E. conduct a formative evaluation for the above processes

**IMPLEMENTATION**
A. communicate expected performance standards with students
B. facilitate communication during the teaching process
C. collect students feedback
D. initiate self evaluation
E. establish peer coaching activities
F. conduct formative evaluation by supervisor
G. conduct a formative evaluation for the above processes

**EVALUATION**
A. identify the summative evaluation goals and measures
B. conduct the summative evaluation
C. complete a postevaluation conference
D. create a professional growth plan
E. conduct a formative evaluation for the above processes
ANALYSIS:

A. Identify the customers of instruction:
   - internal customers might be:
     - students involved in the course
     - administrators of the program
     - teachers in the next course or group of courses
   - external customers might be:
     - employers from related industries
     - representatives from the community

B. Define the needs of customers:
   - ascertain the needs of the customers by the data collected from survey, interview processes
   - utilize quality function deployment method to determine the quality of instruction

C. Modify course purpose if necessary:
   - the purpose of the course might be: to help students gain the necessary skills and knowledge to adapt to the customers needs

D. Conduct the formative evaluation of the above processes:
   - evaluate each stage and modify if necessary
DESIGN / DEVELOPMENT:

A. Identify the objectives of instruction based on the customers' needs and use decision making techniques to determine the objectives of instruction.

B. Generate the competencies (outcomes) for students based on the objectives of instruction to establish the expected performances for the instruction.

C. Prepare teaching materials: the materials must be performance and self-learning oriented so that students can continue improve themselves.

D. Conduct a preinstruction conference: discuss the instruction improvement activities in a conference involving the evaluation team, supervisor, and teacher of the course.

E. Conduct the formative evaluation for the above processes: evaluate each stage and modify if necessary.
IMPLEMENTATION:

A. Communicate expected performance standards with students: the students must know the expected performances before they start learning

B. Facilitate communication during the teaching process: interactive communication between teacher and students

C. Collect student feedback: use survey questions or individual contacts to collect feedback use statistical and decision-making techniques to detect the instructional problems

D. Initiate self evaluation: teacher evaluate the instruction performed by him/her self

E. Establish peer coaching activities: observed and advised by peers

F. Conduct formative evaluation: observed and advised by supervisors

G. Conduct a formative evaluation for the above processes: monitor each stage and correct when necessary
EVALUATION:

A. Identify the summative evaluation goals and measures:
   the goals must be based on how well instruction has been conducted
   the measures will be used to evaluate instructional effectiveness

B. Conduct the summative evaluation:
   use formal and informal sources to establish a summary performance for teachers
   use formal and informal sources to evaluate the course content

C. Complete a post-evaluation conference:
   discuss the results of evaluation with the teacher

D. Create a professional growth plan:
   based on the results of evaluation, collaborate with teacher and supervisor to set up a professional growth plan to continuously improve the quality of instruction

E. Conduct the formative evaluation for the above processes:
   monitor each stage and correct when necessary
The TQM survey for the instructional supervision

Please read each statement and determine the extent to which you agree or disagree. Then indicate your decision by circling the number that corresponds to the appropriate level of agreement.

1. Customers' needs should be used to determine the content and standards for the instruction.
   Strongly Disagree                     Strongly Agree
   1  2  3  4  5  6  7

2. This model clearly incorporates the component of "customer driven quality."
   Strongly Disagree                     Strongly Agree
   1  2  3  4  5  6  7

3. Top management commitment is not necessary for supporting the improvement of instructional quality.
   Strongly Disagree                     Strongly Agree
   1  2  3  4  5  6  7

4. This model clearly incorporates the component of "top management commitment."
   Strongly Disagree                     Strongly Agree
   1  2  3  4  5  6  7

5. Teamwork is not important in accomplishing the mission of improving instructional quality to match customers' needs.
   Strongly Disagree                     Strongly Agree
   1  2  3  4  5  6  7

6. This model clearly incorporates the component of "teamwork."
   Strongly Disagree                     Strongly Agree
   1  2  3  4  5  6  7

7. Utilization's of statistical methods can help teachers to the problems and make decisions to improve the quality of instruction.
   Strongly Disagree                     Strongly Agree
   1  2  3  4  5  6  7
8. This model clearly incorporates the component of "utilization of statistical methods."

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Strongly Agree</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>2 3 4 5 6 7</td>
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</table>

9. Continuous improvement is not important for maintaining the quality of instruction.

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Strongly Agree</th>
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<td>1</td>
<td>2 3 4 5 6 7</td>
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</table>

10. This model clearly incorporates the component of "continuous improvement."

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Strongly Agree</th>
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<tbody>
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<td>1</td>
<td>2 3 4 5 6 7</td>
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</tbody>
</table>

11. The training of TQM and instructional techniques are necessary for improving the quality of instruction.

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2 3 4 5 6 7</td>
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</table>

12. This model clearly incorporates the component of "TQM training."

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Strongly Agree</th>
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</thead>
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<tr>
<td>1</td>
<td>2 3 4 5 6 7</td>
</tr>
</tbody>
</table>

13. This model contains an appropriate number of components that can be used to improve the quality of instruction.

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2 3 4 5 6 7</td>
</tr>
</tbody>
</table>

14. This model consists of workable procedures that can be used in community college vocational technical programs.

<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>Strongly Agree</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>2 3 4 5 6 7</td>
</tr>
</tbody>
</table>

15. This model can be accepted by the vocational technical faculty in community colleges.

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2 3 4 5 6 7</td>
</tr>
</tbody>
</table>
16. The steps of analysis, design, development, and evaluation are appropriate procedures for use in this model.

**Strongly Disagree**    **Strongly Agree**

1  2  3  4  5  6  7

17. The elements of the analysis step are appropriate.

**Strongly Disagree**    **Strongly Agree**

1  2  3  4  5  6  7

18. The elements of the design step are appropriate.

**Strongly Disagree**    **Strongly Agree**

1  2  3  4  5  6  7

19. The elements of the development step are appropriate.

**Strongly Disagree**    **Strongly Agree**

1  2  3  4  5  6  7

20. The elements of the evaluation step are appropriate.

**Strongly Disagree**    **Strongly Agree**

1  2  3  4  5  6  7

21. This model should not emphasize a merit pay system.

**Strongly Disagree**    **Strongly Agree**

1  2  3  4  5  6  7

22. The supervisor should focus on helping the teacher improve during the instructional process, not just check the instruction quality at the end of the process.

**Strongly Disagree**    **Strongly Agree**

1  2  3  4  5  6  7

23. A professional growth plan that is created by the supervisor and teacher can be used for the continuous improvement of the quality of instruction.

**Strongly Disagree**    **Strongly Agree**

1  2  3  4  5  6  7

24. Students are the main customers in the instruction process.

**Strongly Disagree**    **Strongly Agree**

1  2  3  4  5  6  7
25. Students are the raw material similar in the production system not the major customers in the instructional process.

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>7</td>
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<tr>
<td>6</td>
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</tbody>
</table>

26. Students must be involved on all teams (analysis, design, development, and evaluation) for the purposes of this model.

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Strongly Agree</th>
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<tr>
<td>1</td>
<td>7</td>
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<td>2</td>
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<td>5</td>
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<td>6</td>
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</table>

Other comments about the model:

____________________________________________________________________

____________________________________________________________________

____________________________________________________________________

General Information

1. Your title:
   - [ ] vice president
   - [ ] dean
   - [ ] department chair, or program leader
   - [ ] teacher

2. How many total years do you have for working at the post-secondary level.
   - [ ] years

3. The program that you serve belong to:
   - [ ] Industry
   - [ ] Commercial (business)
   - [ ] Health care technology
   - [ ] Others

4. How much time have you spent in TQM workshops or training (include lecture)?
   - [ ] none
   - [ ] hours
APPENDIX L: RESULTS FOR THE PILOT TEST
The Results of pilot test were presented by followings:

**Descriptive Statistics for Each Question**

<table>
<thead>
<tr>
<th>Question</th>
<th>N</th>
<th>Mean</th>
<th>Std Dev</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Customers' needs should be used to determine the content and standards for the instruction.</td>
<td>8</td>
<td>6.25</td>
<td>0.71</td>
</tr>
<tr>
<td>2. This model clearly incorporates the component of &quot;customer driven quality.&quot;</td>
<td>8</td>
<td>4.75</td>
<td>1.04</td>
</tr>
<tr>
<td>3. Top management commitment is not necessary for supporting the improvement of instructional quality.</td>
<td>8</td>
<td>6.13</td>
<td>1.36</td>
</tr>
<tr>
<td>4. This model clearly incorporates the component of &quot;top management commitment.&quot;</td>
<td>8</td>
<td>4.00</td>
<td>1.31</td>
</tr>
<tr>
<td>5. Teamwork is not important in accomplishing the mission of improving instructional quality to match customers' needs.</td>
<td>8</td>
<td>5.75</td>
<td>2.05</td>
</tr>
<tr>
<td>6. This model clearly incorporates the component of &quot;teamwork.&quot;</td>
<td>8</td>
<td>3.75</td>
<td>1.67</td>
</tr>
<tr>
<td>7. Utilization of statistical methods can help teachers to the problems and make decisions to improve the quality of instruction.</td>
<td>8</td>
<td>5.38</td>
<td>1.06</td>
</tr>
<tr>
<td>8. This model clearly incorporates the component of &quot;utilization of statistical methods.&quot;</td>
<td>8</td>
<td>3.88</td>
<td>1.64</td>
</tr>
<tr>
<td>9. Continuous improvement is not important for maintaining the quality of instruction.</td>
<td>8</td>
<td>5.50</td>
<td>2.51</td>
</tr>
<tr>
<td>10. This model clearly incorporates the component of &quot;continuous improvement.&quot;</td>
<td>8</td>
<td>4.66</td>
<td>1.51</td>
</tr>
<tr>
<td>11. The training of TQM and instructional techniques are necessary for improving the quality of instruction.</td>
<td>8</td>
<td>5.13</td>
<td>1.96</td>
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</tr>
<tr>
<td>12.</td>
<td>This model clearly incorporates the component of &quot;TQM training.&quot;</td>
<td>8 4.75 1.28</td>
<td></td>
</tr>
<tr>
<td>13.</td>
<td>This model contains an appropriate number of components that can be used to improve the quality of instruction.</td>
<td>8 4.75 0.89</td>
<td></td>
</tr>
<tr>
<td>14.</td>
<td>This model consists of workable procedures that can be used in community college vocational technical programs.</td>
<td>8 4.50 1.07</td>
<td></td>
</tr>
<tr>
<td>15.</td>
<td>This model can be accepted by the vocational technical faculty in community colleges.</td>
<td>8 4.00 1.20</td>
<td></td>
</tr>
<tr>
<td>16.</td>
<td>The steps of analysis, design, development, and evaluation are appropriate procedures for use in this model.</td>
<td>8 5.25 1.58</td>
<td></td>
</tr>
<tr>
<td>17.</td>
<td>The elements of the analysis step are appropriate.</td>
<td>8 4.63 1.51</td>
<td></td>
</tr>
<tr>
<td>18.</td>
<td>The elements of the design step are appropriate.</td>
<td>8 4.88 0.99</td>
<td></td>
</tr>
<tr>
<td>19.</td>
<td>The elements of the development step are appropriate.</td>
<td>8 4.88 0.99</td>
<td></td>
</tr>
<tr>
<td>20.</td>
<td>The elements of the evaluation step are appropriate.</td>
<td>8 5.13 0.83</td>
<td></td>
</tr>
<tr>
<td>21.</td>
<td>This model should not emphasize a merit pay system.</td>
<td>7 4.86 1.77</td>
<td></td>
</tr>
<tr>
<td>22.</td>
<td>The supervisor should focus on helping the teacher improve during the instructional process, not just check the instruction quality at the end of the process.</td>
<td>7 6.71 0.49</td>
<td></td>
</tr>
<tr>
<td>23.</td>
<td>A professional growth plan that is created by the supervisor and teacher can be used for the continuous improvement of the quality of instruction.</td>
<td>7 6.00 1.00</td>
<td></td>
</tr>
</tbody>
</table>
Continued

24. **Students are the main customers in the instruction process.**
   
25. **Students are the raw material similar in the production system not the major customers in the instructional process.**
   
26. **Students must be involved on all teams (analysis, design, development, and evaluation) for the purposes of this model.**

---

**Cronbach Coefficient Alpha for The Instrument**

<table>
<thead>
<tr>
<th>For</th>
<th>Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAW variables</td>
<td>0.86</td>
</tr>
<tr>
<td>STANDARDIZED variables</td>
<td>0.87</td>
</tr>
</tbody>
</table>

APPENDIX M: COVER LETTER FOR THE ATTITUDE SURVEY
A. The letter to the person who distributed instrument in each community college:

February 7, 1994

Dear:

Thank you for agreeing to help me to conduct this survey. As a stakeholder in vocational technical (V-T) education, I hope you agree that continually improving the quality of instruction is our major mission. This research is based on the goal and attempts to find an efficient way to utilize total quality management (TQM) in V-T instruction.

Enclosed please find thirty copies of yellow sheets and blue sheets. Each yellow sheet describes a quality instruction model that is based on TQM concepts; The blue sheets is the attitude measure regarding this model. Please "randomly" select at least twenty vocational technical instructors and five administrators, distribute yellow copies and blue copies to each participant to complete the questions.

After collecting the completed attitude instruments, please return it in the envelop provided. Ten dollars was enclosed for the postage fee, thank for your supports. The responses they provide will be kept confidential. After the data analysis, all the questionnaires will be destroyed to further preserve anonymity. We estimate that one will need approximately 20 minutes to complete the instrument.

If you have any questions or concerns regarding this study, please contact the principal investigator. Thank you for your support and professional contribution.

Sincerely,

Chih-yang Chao
Principal Investigator
(H) 515-296-8251
(O) 515-294-8416

John C. Dugger, Ph. D.
Department Chair
(O) 515-294-1033
Fax: 515-294-1123
B. The letter to the survey participants:

February 8, 1994

Dear Sir/Madam:

Thank you for agreeing to participate in this research. As a stakeholder in vocational technical (V-T) education, I hope you agree that continually improving the quality of instruction is our major mission. This research attempts to find an efficient way to utilize total quality management (TQM) in V-T instruction.

Enclosed please find a quality instruction model that is based on TQM concepts and an attitude measure regarding this model. Please read the model first then answer the questions. Any other suggestions are welcome.

Your participation is entirely voluntary. The responses you provide will be kept confidential. After the data analysis, all the questionnaires will be destroyed to further preserve anonymity.

After examining the model, please complete the enclosed instrument and return it in the envelope provided. We estimate that you will need approximately 20 minutes to complete the instrument.

If you have any questions or concerns regarding this study, please contact the principal investigator. Thank you for your support and professional contribution.

Sincerely,

Chih-yang Chao
Principal Investigator
(H) 515-296-8251
(O) 515-294-8416

John C. Dugger, Ph. D.
Department Chair
(O) 515-294-1033
Fax: 515-294-1123
APPENDIX N: REVISED MODEL AND QUESTIONS FOR THE ATTITUDE SURVEY
The people who help to distribute the instruments:

Dr. Michael C. Morrison, Vice President
North Iowa Area Community College
500 College Drive
Mason City 50401

Dr. Glen Pedersen, Dean
Hawkeye Institute of Technology
Box 8015
1501 East Orange Road
Waterloo 50704

Mr. Rich Lake, Dean
Kirkwood Community College
Box 2068
6301 Kirkwood Blvd. 6W
Cedar Rapids

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2006 S. Ankeny Blvd.
Ankeny 50021
February 11, 1994

Dear :

Thank you for agreeing to participate in this research study. As a stakeholder in vocational technical (V-T) education, I hope you agree that continually improving the quality of instruction is our major mission. This study attempts to find an efficient way to utilize total quality management (TQM) in V-T instruction.

Enclosed please find a model description (yellow sheets) and a survey instrument (blue sheets). Please "randomly" select at least twenty vocational technical instructors and five administrators (supervisors), distribute yellow and blue copies to each participant and request that they complete the blue sheet in three days.

After collecting the completed attitude instruments, please return them in the envelope provided. Ten dollars was enclosed to cover postage. The responses will be kept confidential. After the data analysis, all the questionnaires will be destroyed to further preserve anonymity. We estimate that the respondent will need approximately 20 minutes to complete the instrument.

If you have any questions or concerns regarding this study, please contact the principal investigator. Thank you for your support and professional contribution.

Sincerely,

Chih-yang Chao
Principal Investigator
(H) 515-296-8251
(O) 515-294-8416

John C. Dugger, Ph. D.
Department Chair
(O) 515-294-1033
Fax: 515-294-1123
The letter to the survey participants:

February 11, 1994

Dear Sir/Madam:

Thank you for agreeing to participate in this research study. As a stakeholder in vocational technical (V-T) education, I hope you agree that continually improving the quality of instruction is our major mission. This study attempts to find an efficient way to utilize total quality management (TQM) in V-T instruction.

Enclosed please find a quality instruction model that is based on TQM concepts and an attitude measure regarding this model.

After examining the model, please complete the enclosed instrument and return it to the person who distributed the model and survey. We estimate that you will need approximately 20 minutes to complete the instrument.

Your participation is entirely voluntary. The responses you provide will be kept confidential. After the data is analyzed, all the questionnaires will be destroyed to further preserve anonymity.

If you have any questions or concerns regarding this study, please contact the principal investigator. Thank you for your support and professional contribution.

Sincerely,

Chih-yang Chao
Principal Investigator
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The Quality Instruction Model

This model is designed to guide the quality improvement of technical instruction in community colleges. Two sheets (basic assumptions and guidelines) and one flowchart (Figure 2) are included in this model. The flowchart is the general model that consists of four steps: analysis, design/development, implementation, and evaluation so that the improvement process can be completed.

Basic assumptions

1. Top management and supervisors (administrators) involved in this model must have basic total quality management and instructional supervision knowledge.

2. Customer driven quality, top management commitment, teamwork, utilization of data collection and analysis methods, continuous improvement, communication and feedback, and quality instruction training are the most important elements in this model.

3. Participants (teachers and administrators) in the process must have an orientation to the basic model concepts and principles before addressing specific tasks.

4. Systematic Instructional System Development processes (analysis, design/development, implementation, and evaluation) are appropriate for use in the model (Figure 1).

5. Teachers will be more motivated if they know what is expected and what is to be measured.

6. Students can learn if they understand what is expected and what is to be measured.

Guidelines for application

1. Obtain the support of top management.

2. Conduct quality instruction training that includes:
   a. A problem solving model.
   b. Preparation for teamwork.
   c. Tools of decision-making.
   d. Data collection and analysis methods.

3. Several data collection and analysis methods such as quality function deployment, statistical testing (mean, standard deviation, t test, and ANOVA) and statistical process control (SPC) charting can be utilized in this
model to determine the customer's needs and to make other decisions.

4. The members of the steering committee should include deans, department chairpersons (program leaders), teachers, peers and industry representatives.

5. The executive team should include the department chairman (program leader), teachers, industry representatives, students and others.

6. A supervisor must collaborate with teachers at each stage.

7. The focus of the steering committee will be on a particular vocational technical (V-T) program.

8. The focus of the executive team will be on a course or group of related courses.

Figure 1. Instructional system
Establish a steering committee to:

1. Identify an executive team to conduct the analysis, design/development, implementation, evaluation stages

2. Use the following components to guide the process:
   A. Customer driven quality.
   B. Top management commitment at each stage.
   C. Teamwork (participation of all appropriate parties).
   D. Communication and feedback.
   E. Quality instruction training for every professional.
   F. Continuous improvement.
   G. Utilization of data collection and analysis methods.

**Executive team activities**

**ANALYSIS**
A. Identify the customers of the program.
B. Define the needs of customers.
C. State the instructional goals of the program.
D. Conduct a formative evaluation for the above processes.

**DESIGN/DEVELOPMENT**
A. Identify the objectives of course(s).
B. Identify the competencies (outcomes) for students.
C. Prepare teaching materials and identify teaching techniques.
D. Conduct a pre-evaluation conference.
E. Conduct a formative evaluation for the above processes.

**IMPLEMENTATION**
A. Communicate expected performance standards with students.
B. Facilitate communication during the teaching process.
C. Collect students' feedback.
D. Initiate self evaluation.
E. Establish peer coaching activities.
F. Conduct formative evaluation by supervisor.
G. Conduct a formative evaluation for the above processes.

**EVALUATION**
A. Identify the summative evaluation goals and measures.
B. Conduct the summative evaluation.
C. Complete a post-evaluation conference.
D. Create a professional improvement plan.
E. Conduct a formative evaluation for the above processes.

**Figure 2. Quality instruction model**
The survey of quality instruction model

Please read each statement and determine the extent to which you agree or disagree. Then indicate your decision by circling the number that corresponds to the appropriate level of agreement/disagreement.

1. Customers' needs should be used to determine the content and standards for instruction.
   Strongly Disagree                       Strongly Agree
   1  2  3  4  5  6  7

2. This model clearly incorporates the component of "customer driven quality."
   Strongly Disagree                       Strongly Agree
   1  2  3  4  5  6  7

3. Top management commitment is necessary for supporting the improvement of instructional quality.
   Strongly Disagree                       Strongly Agree
   1  2  3  4  5  6  7

4. This model clearly incorporates the component of "top management commitment."
   Strongly Disagree                       Strongly Agree
   1  2  3  4  5  6  7

5. Teamwork with peers, supervisors, students and business representatives is important in accomplishing the mission of improving instructional quality to match customers' needs.
   Strongly Disagree                       Strongly Agree
   1  2  3  4  5  6  7

6. This model clearly incorporates the component of "teamwork."
   Strongly Disagree                       Strongly Agree
   1  2  3  4  5  6  7

7. Utilization of data collection and analysis methods can help teachers identify problems and make decisions to improve the quality of instruction.
   Strongly Disagree                       Strongly Agree
   1  2  3  4  5  6  7

8. This model clearly incorporates the component of "utilization of data collection and analysis methods."
   Strongly Disagree                       Strongly Agree
   1  2  3  4  5  6  7
9. Continuous improvement is important for maintaining the quality of instruction.  
   Strongly Disagree  Strongly Agree
   1  2  3  4  5  6  7

10. This model clearly incorporates the component of "continuous improvement."  
   Strongly Disagree  Strongly Agree
   1  2  3  4  5  6  7

11. Quality instruction training is necessary for every professional to improve the quality of instruction.  
   Strongly Disagree  Strongly Agree
   1  2  3  4  5  6  7

12. This model clearly incorporates the component of "quality instruction training."  
   Strongly Disagree  Strongly Agree
   1  2  3  4  5  6  7

13. Communication and feedback is necessary for improving the quality of instruction.  
   Strongly Disagree  Strongly Agree
   1  2  3  4  5  6  7

14. This model clearly incorporates the component of "communication and feedback."  
   Strongly Disagree  Strongly Agree
   1  2  3  4  5  6  7

15. This model contains an appropriate number of components that can be used to improve the quality of instruction.  
   Strongly Disagree  Strongly Agree
   1  2  3  4  5  6  7

16. This model consists of workable procedures that can be used in community college vocational technical programs.  
   Strongly Disagree  Strongly Agree
   1  2  3  4  5  6  7

17. This model can be accepted by the vocational technical faculty in community colleges.  
   Strongly Disagree  Strongly Agree
   1  2  3  4  5  6  7

18. The steps of analysis, design/development, implementation and evaluation are appropriate procedures for use in this model.  
   Strongly Disagree  Strongly Agree
   1  2  3  4  5  6  7
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19. The elements of the analysis step are appropriate.  
   Strongly Disagree  Strongly Agree  
   1  2  3  4  5  6  7

20. The elements of the design/development step are appropriate.  
   Strongly Disagree  Strongly Agree  
   1  2  3  4  5  6  7

21. The elements of the implementation step are appropriate.  
   Strongly Disagree  Strongly Agree  
   1  2  3  4  5  6  7

22. The elements of the evaluation step are appropriate.  
   Strongly Disagree  Strongly Agree  
   1  2  3  4  5  6  7

23. This model should not emphasize a merit pay (based on performance) system.  
   Strongly Disagree  Strongly Agree  
   1  2  3  4  5  6  7

24. The instructional supervisor should focus on helping the teacher improve during the instructional process, not just check the instruction quality at the end of the process.  
   Strongly Disagree  Strongly Agree  
   1  2  3  4  5  6  7

25. A professional improvement plan that is created by the instructional supervisor and teacher can be used to continuously improve the quality of instruction.  
   Strongly Disagree  Strongly Agree  
   1  2  3  4  5  6  7

26. Students are the main customers in the vocational technical (V-T) instructional process.  
   Strongly Disagree  Strongly Agree  
   1  2  3  4  5  6  7

27. When compared to a production system, students are the raw material in the instructional process. They are not the main customers.  
   Strongly Disagree  Strongly Agree  
   1  2  3  4  5  6  7

28. Students must be involved in all steps (analysis, design/development, implementation and evaluation) for the purposes of this model.  
   Strongly Disagree  Strongly Agree  
   1  2  3  4  5  6  7
29. Employers are the main customers of V-T programs.

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 2 3 4 5 6 7</td>
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</table>

30. Please place a check by the customers of your V-T programs, (you may select more than one).

Internal customers:
- Students in the class.
- Administrators.
- Teachers in the next grade (next upgrade courses).
- Others, please indicate: ______________________

External customers:
- Employers.
- Government.
- Parents.
- Students.
- Others, please indicate: ______________________

Other comments about the model:
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

General Information

1. Your title:
   - Vice President
   - Dean
   - Department Chair, or Program Leader.
   - Teacher.
   - Others, please indicate the title: ______________________

2. How many years have you worked at the post-secondary level?
   — Years.

3. The program that you serve belongs to:
   — Industry.
   — Commercial (business).
   — Health Care.
   — Others, please indicate: ______________________
4. How much time (in hours) have you spent in total quality management (TQM) workshops or TQM training (include lectures) within the past 5 years?
   ___ Hours.
APPENDIX O DESCRIPTIVE FLOWCHARTS FOR THE STEPS OF ANALYSIS, DESIGN/DEVELOPMENT, IMPLEMENTATION, AND EVALUATION
ANALYSIS STEP:

A. Identify the customers of instruction:
   internal customers might be:
   students involved in the course
   administrators of the program
   teachers in the next course or group of courses
   external customers might be:
   employers from related industries
   representatives from the community

B. Define the needs of customers:
   ascertain the needs of the customers by the data collected from
   survey, interview processes
   utilize quality function deployment method to determine the quality
   of instruction

C. Modify course purpose if necessary:
   the purpose of the course might be:
   to help students gain the necessary skills and knowledge to adapt to the customers needs

D. Conduct the formative evaluation of the above processes:
   evaluate each stage and modify if necessary
DESIGN / DEVELOPMENT STEP:

A. Identify the objectives of instruction based on the customers' needs and use decision making techniques to determine the objectives of instruction.

B. Generate the competencies (outcomes) for students based on the objectives of instruction to establish the expected performances for the instruction.

C. Prepare teaching materials: the material must be performance and self-learning oriented so that students can continue improve themselves.

D. Conduct a preinstruction conference: discuss the instruction improvement activities in a conference involving the evaluation team, supervisor, and teacher of the course.

E. Conduct the formative evaluation for the above processes: evaluate each stage and modify if necessary.
IMPLEMENTATION STEP:

A. Communicate expected performance standards with students: the students must know the expected performances before they start learning

B. Facilitate communication during the teaching process: interactive communication between teacher and students

C. Collect student feedback: use survey questions or individual contacts to collect feedback use statistical and decision-making techniques to detect the instructional problems

D. Initiate self evaluation: teacher evaluate the instruction performed by him/her self

E. Establish peer coaching activities: observed and advised by peers

F. Conduct formative evaluation: observed and advised by supervisors

G. Conduct a formative evaluation for the above processes: monitor each stage and correct when necessary
EVALUATION STEP:

A. Identify the summative evaluation goals and measures:
   the goals must be based on how well instruction has been conducted
   the measures will be used to evaluate instructional effectiveness

B. Conduct the summative evaluation:
   use formal and informal sources to establish a summary performance for teachers
   use formal and informal sources to evaluate the course content

C. Complete a postevaluation conference:
   discuss the results of evaluation with the teacher

D. Create a professional growth plan:
   based on the results of evaluation, collaborate with teacher and supervisor to set up a professional growth plan to continuously improve the quality of instruction

E. Conduct the formative evaluation for the above processes:
   monitor each stage and correct when necessary