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Comparison of Approaches to Total Quality Management

Including an Examination of the Department of Energy's Position on Quality Management

C. Thomas Bennett

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U.S. Department of Energy

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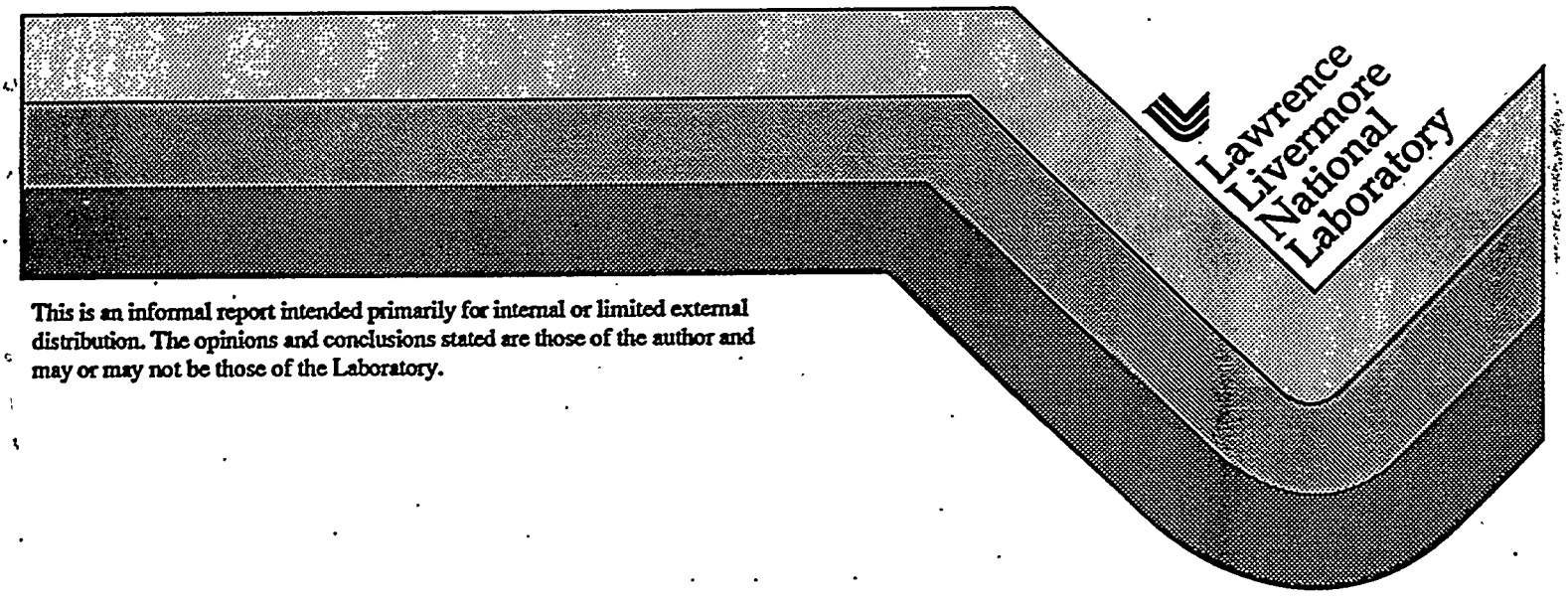

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COMPARISON OF APPROACHES TO TOTAL QUALITY MANAGEMENT

INCLUDING AN EXAMINATION OF THE DEPARTMENT OF ENERGY'S POSITION ON QUALITY MANAGEMENT

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for:

U. S. DEPARTMENT OF ENERGY

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FESSP
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TABLE OF CONTENTS

Executive Summary ii

I. A Comparison of Total Quality Management (TQM) Approaches 1
- Introduction 1
- Total Quality Management 2
- Textual Comparisons of the Different TQM Approaches 5
- Tabular Comparisons of TQM Methods 6
- Summary 8

II. Lists of Selected TQM Criteria, Principles & Tenets 12
- ISO 9000 13
- Malcolm Baldrige National Quality Award 16
- Senge's The Learning Organization 18
- Sculpting the Learning Organization 20
- Deming's Fourteen Points for Management 22
- Seven Habits of Highly-Effective People 24
- DOE Order 5480.19 *Conduct of Operations Requirements for DOE Facilities* 25
- DOE Order 5700.6C *Quality Assurance* 26
- DOD Directive 5000.51G *Total Quality Management: A Guide for Implementation* 29
- Re-Inventing Government ThroughQuality Management 31

III. Tables Showing Comparisons Between Different TQM Approaches 32
- Table 1. ISO 9000 Criteria vs. Deming's 14 Points 33
- Table 2. Malcolm Baldrige Award Criteria vs. Deming's 14 Points 34
- Table 3. Senge's Learning Organization vs. Deming's 14 Points 35
- Table 4. Senge's The Learning Organization Criteria vs. Malcolm Baldrige National Quality Award 36
- Table 5. Senge's The Learning Organization Criteria vs. Covey's Seven Habits of Successful People 37
- Table 6. DOE Quality Assurance vs. Deming's 14 Points 38
- Table 7. DOE Conduct of Operations vs. Deming 39
- Table 8. ISO 9000 vs. DOE Quality Assurance 40
- Table 9. ISO 9000 Criteria vs. DOE Conduct of Operations 41

References 42

EXECUTIVE SUMMARY

This paper presents a comparison of several qualitatively different approaches to Total Quality Management (TQM). The continuum ranges from management approaches that are primarily standards — with specific guidelines, but few theoretical concepts — to approaches that are primarily philosophical, with few specific guidelines. The approaches to TQM discussed in this paper include the International Organization for Standardization (ISO) 9000 Standard, the Malcolm Baldrige National Quality Award, Senge's The Learning Organization, Watkins and Marsick's approach to organizational learning, Covey's Seven Habits of Highly Successful People, and Deming's Fourteen Points for Management.

Some of these approaches (Deming and ISO 9000) are then compared to the DOE's official position on quality management and conduct of operations (DOE Orders 5700.6C and 5480.19). Using a tabular format, it is shown that while 5700.6C (Quality Assurance) maps well to many of the current approaches to TQM, DOE's principle guide to management Order 5419.80 (Conduct of Operations) has many significant conflicts with some of the modern approaches to continuous quality improvement.

This paper is organized into three distinct sections:

- Section I provides a brief textual description of the various approaches.
- Section II includes lists of the criteria established for each approach.
- Section III illustrates selected two-way comparisons of various TQM approaches in a tabular format.

In addition, the References section offers an abbreviated list of some of the current academic and popular literature on TQM.

I. A COMPARISON OF TOTAL QUALITY MANAGEMENT (TQM) APPROACHES

White Paper
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INTRODUCTION

The purpose of this paper is to identify and compare the major principles of several different approaches to Total Quality Management (TQM). The approaches I will discuss include: (a) the International Organization for Standardization (ISO) 9000 Standard, (b) the Malcolm Baldrige National Quality Award, (c) Senge's The Learning Organization, (d) Watkins and Marsick's organizational learning theory, (e) Covey's Seven Habits of Highly Successful People, and (f) Deming's Fourteen Points for Management.

The term TQM was coined in 1985 by the Naval Air Systems Command to describe their newly adopted approach to conducting business (Bemowski, 1992). The USAF's approach to TQM was based very explicitly on Japanese-style management practices — similar to those espoused by Deming, Juran, and others. Since that time, TQM has come to refer to any set of management practices — developed before or after 1985 — which advocates systems analytic management practices, and emphasizes that customer and employee satisfaction, not profits, should be the primary motivation for doing business.

Bennett (1994) emphasized that TQM is more a philosophy of doing business as opposed to a specific organizational effectiveness technique. Inherent in TQM is the belief, "If an organization chooses to retain any form of competition as a predator relationship with other organizations, then that organization will ultimately choose profit over quality (Dorsey, 1993)." Profit should not be the defining characteristic of an organization's culture. Profit should provide a source of funds for continuous improvement of the organization's products or services.

The approaches to management that I will discuss have all been grouped under the rubric of Total Quality Management (TQM). Each — to one degree or another — has in common a focus on *achieving success* by *improving business processes.*

However, it is important to keep in mind that these TQM methods represent two ends of a continuum. On one end lies ISO 9000 and the Baldrige Award, and on the other end, Deming and Senge. The continuum ranges from pure standards on the far left (ISO 9000) to the philosophy of management at the far right (Senge). The Baldrige Award and Deming fall somewhere in between.

It is beyond the scope of this paper to go into any depth concerning each of these approaches to business management. The Reference Section contains specific citations directing interested readers to some of the primary sources.

TOTAL QUALITY MANAGEMENT

Overview

TQM has been advocated actively by the Federal Government, primarily through the Office of Management and Budget (Burstein, 1989; Lewis, 1991; and, Swiss 1992). The approach that any given Federal Agency might choose is left to the discretion of that Agency. The Government has accomplished this by defining TQM in such a way that any technique might be used, as long as it adheres to certain basic principles:

- Demonstrating personal leadership of TQM by top management;
- Strategically planning the short and long-term implementation of TQM throughout the organization;
- Assuring that everyone focuses on customers' needs and expectations;
- Developing clearly defined measures for tracking progress and identifying improvement opportunities;
- Providing adequate resources for training and recognition to enable workers to carry the mission forward and reinforce positive behavior;
- Empowering workers to make decisions and fostering teamwork, and;
- Developing systems to assure that quality is built in at the beginning and throughout the operations.

The elaboration of these principles provides the grist of an individual quality management program.

What is ISO 9000?

The International Standards Organization (ISO) was founded in 1946 to promote the development of international standards. In 1987, the ISO published a series of five international standards to guide quality management compliance (ISO 9000, 9001, 9002, 9003, and 9004). Corporations, particularly in the European Economic Community, regularly require companies with which they do business to register with the ISO.

The ISO 9000 series has been adopted in the United States as the American National Standards Institute (ANSI) and American Society for Quality Control (ASQC) Q 90 series (Arter, 1992; Golis and Kist, 1993). The ISO 9000 document is summarized in List 1.

Both ISO 9000 and Q 90 are highly structured, but generic in content, as a standard should be. Interestingly for us, they use most of the same requirements found in 10CFR50 Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," and ASME NQA-1, "Quality Assurance Program Requirements for Nuclear Power Plants."

There is nothing particularly earth shaking in these documents, in that they outline basic, systems-analytic methods that ensure customers get what they order. As such, these documents are not TQM programs in and of themselves. A true program would additionally provide for implementation and other management details. However, these standards do provide a framework and set of guidelines for quantifying a quality organization.

The Malcolm Baldrige Award

Some detail on the Malcolm Baldrige National Quality Award was provided in an earlier White Paper (Bennett, 1994). List 2 presents the basic criteria used in the Award. Since its enactment, the Baldrige Award has emerged as one of the primary focuses of the U.S. business approach to TQM (Easton, 1993).

The Award has not been without its critics (Sunday and Liberty, 1992). Yet, what is clear about the Award is that it has provided some common ground for analyzing quality improvement. It has allowed assessment of the shortcomings of a company's TQM program (Easton, 1993). Some of the demonstrated shortcomings in TQM programs identified include:

- Lack of emphasis on planning;
- Lack of effective systems to implement the plans;
- Focusing on results to the exclusion of processes or methods;
- Failure to apply the principle of management-by-fact;
- Focusing on financial measures to the exclusion of direction operational measures; and,
- Inadequate understanding of customer expectations.

Easton (1993) identified these shortcomings through interviews and surveys of companies that had instituted TQM by following guidelines established for the Malcolm Baldrige Award. Of course, what is important here is not the fact that the companies involved in the study did not achieve all the goals created when they began. What is important is that is that they instituted clear, measurable metrics that could form the basis of a quality management improvement program. At least now they know what is wrong.

As with ISO 9000, the Malcolm Baldrige National Quality Award is not a program in the truest sense. That is, all of the management controls that normally characterize a program are not present. But, as with ISO 9000, the Baldrige Award provides the guidelines critical to a quality improvement program.

Senge's The Learning Organization

The general relationship of Senge's organizational learning approach to the other TQM methods was discussed in Bennett (1994). The five basic principles, or disciplines, of The Learning Organization (TLO) are outlined in List 3.

Again, space and time do not permit an in-depth discussion of TLO's basic tenets.

A careful search of the popular and academic literature has failed to provide any empirical support whether TLO has been successful in producing long-term changes in a corporate culture. Senge even avoids providing any metrics which would allow such an assessment.

None the less, TLO has received a significant amount of positive reviews (Bennett, 1994) and that popularity should be addressed.

Senge explicitly acknowledges that he founded TLO, in part, on Eastern transcendentalism. As might be expected, the basic concepts of TLO are subjective and holistic (general) in content. As with most doctrines based on abstract generalizations, any success or failure can be accounted for without "violating" the basic tenets.

This approach to theory-generation is often taken while a doctrine is in its infancy. Although generic doctrinalism may be useful to the framers of a new theoretical system, those who are faced with implementation are doomed to failure — because without any metrics, the implementers will never know if they achieved the doctrine's goals.

Watkins and Marsick's Approach to Organizational Learning

Watkins and Marsick's work (List 4) is a very systematic, metric-based approach to organizational learning which is counterpoint to the Zen-like, holistic approach of Senge. Comparing the two provides an interesting perspective of how differently organizational dynamics and processes can be conceptualized.

Deming's Fourteen Points for Management

List 5 presents the basic postulates of Deming's approach to TQM. As Bennett (1994) indicated, there are several approaches similar to Deming's TQM (e.g., Juran and Crosby) . References to those approaches are presented in that paper, as well as in this one.

Covey's Seven Habits of Highly Successful People

Covey's approach to management is presented in List 6. In one sense, Covey's work is qualitatively different from the other TQM methods. Some may even say that his approach does not even address group or organizational management issues. Covey very explicitly focuses on individual or personal management issues. Only peripherally does he discuss organizational concerns. However, the tools he discusses could be applied both to individual or organizational problems. It is merely a matter if you consider the guideline to be relevant to psychological or sociological phenomena. The parallelisms are extremely compelling.

Government's TQM Guidelines

Lists 7 and 8 present the DOE Orders concerning Quality Assurance (5700.6C) and Conduct of Operations (5480.19). These Orders represent DOE's official position concerning quality management issues.

The principal TQM implementation guide for the Department of Defense is presented in List 9 (DOD Directive 5000.51G).

The Federal Quality Institute (FQI) was formed in the late 1980s in part to provide support to those organizations interested in competing for the Malcolm Baldrige Award. But, primarily, the FQI was formed to provide guidance to government agencies concerning implementation of TQM. The FQI does provide some training, but mainly support in terms of monthly TQM publications, an electronic bulletin board, General Services Administration's list of TQM providers, and lessons-learned documents from other government agencies.

The FQI guidelines presented in List 10 are representative of a Deming-Juran approach to TQM.

No systematic comparison to other TQM approaches will be presented because of the high degree of correspondence among them. That is, there are many basic principles that are common to all systems-analytic-based disciplines concerned with organizational effectiveness.

Decision-Support Systems

There is another emerging area in the fields of organizational effectiveness and TQM. This involves the use of Decision-Support Systems (DSSs) as systematic aids to the continuous improvement process (Franz and Foster, 1992).

What a DSS provides is an expert system-like tool to walk an organization through the TQM process. Such DSSs can be, at one extreme, very expensive computer-based systems. On the other hand, they may be paper-and-pencil analytic trees that are developed in an *ad hoc* fashion during the TQM design-phase.

The value that DSSs provide, even if they are developed in-house, are that they ensure a systematic and individual look at organization's problems, and offer guidelines on how to tailor a TQM program to it.

TEXTUAL COMPARISONS OF THE DIFFERENT TQM APPROACHES

In this section, I will present a general, high-level comparison of the basic differences among the different TQM methodologies. At the end, each of the approaches will be compared specifically to Deming's Fourteen Points for Management.

ISO 9000 vs. the Baldrige Award

Both the ISO 9000 and the Baldrige Award provide very concrete metrics to be used in obtaining quality improvement. Both are standards used to benchmark an organization. Neither of them contain much theoretical baggage — which might sidetrack an organization's efforts to achieve continuing quality improvement.

For some organizations, this lack of organizational ideology may be a detractor. For some institutions, and the people that guide them, a solid philosophical grounding for what they do is important. This need for "philosophical truth," as opposed to "ground truth," may drive individuals toward Senge or Deming.

One of the primary differences between these two benchmarks is how they are used by a company. ISO 9000 is highly prized in the international community. In some countries, it is virtually a requirement for a U.S. company to register with the ISO (and pay for the required evaluation). On the other hand, the Baldrige Award is still primarily a U.S.-oriented prize.

Senge vs. Baldrige and ISO 9000

The reader should notice the clear differences between ISO 9000 and the Baldrige Award on one hand, and Senge's TLO approach on the other. The primary difference is a lack of specific focus in Senge's method on measurable means for assessing an organization's program.

While certain aspects of Senge's approach can be tracked to specific quantitative TQM techniques, a deductive leap must be made from his general principles to any given metric. For the sake of parsimony, an organization needs to question whether such a deductive leap is necessary for a successful TQM program.

List 3 presents Senge's parsing of his five disciplines. To understand the relationship of TLO to the other TQM philosophies, you must consider that each of Senge's disciplines are broken down into three levels:

- Practices — what people do.
- Principles — guiding ideas and insights.

- Essences — the state of being of those with high levels of mastery in the discipline.

Senge believes that *practices* are the activities on "which practitioners of the discipline focus their time and energy." They are the actions that describe the discipline. For example, a manager uses system archetypes (part of the Systems Thinking Discipline) to perceive underlying structures in complex situations.

Principles represent the theory behind the practices. For example, the notion that societal structure influences behavior is a key to the Systems Thinking Discipline.

The third level, *essences*, is the most ephemeral, even for Senge. He writes, "There is no point in focusing one's attention and effort on these essences in learning a discipline, any more than it would make sense to make an effort to experience love or joy or tranquillity." Senge believes that essences are experienced naturally as a *state of being*. For example, as managers practice systems thinking more and more, they will come to experience a sense of "interconnectedness" with the world.

Senge vs. Deming

As can be seen from a brief visual comparison of Senge and Deming, *neither* identify any specific metrics. I suspect the primary reason is that they believe anything specific is, in essence, proprietary. After all, both are consultants.

However, Deming's approach has been around since the 1950s. Much has been written about what is done specifically and the metrics involved (Walton, 1986; Hill, 1991). So, in the case of Deming, there have been specific attempts to map his principles to TQM benchmarking tools.

The irony that arises in comparing Senge and Deming comes from their fundamental philosophies and who is attracted to them. Deming's TQM philosophy is embedded with American and European social thought. While Deming's philosophy focuses on improving a company's processes, it does not stray far from the puritanical, hard-work ethics of capitalism. In addition, there are elements of Marxism, in so much that it advocates stronger worker control of the processes (Kronenberg and Loeffler, 1991). *However, the first to endorse Deming's approach were those from the Orient.*

Senge's approach is mystical and Zen-like. He very explicitly ties his philosophy to several East coast transcendental schools. *Yet, those who are his advocates* (so far) *are primarily from Western Cultures.*

Deming & Senge vs. ISO 9000 & Baldrige Award

On the surface, Deming and Senge represent proprietary-like, philosophical and theoretically oriented approaches to TQM. Neither of them — in their public writings — address specifically how to achieve total quality improvement. In contrast, both ISO 9000 and the Baldrige are non-proprietary, TQM benchmark tools. That is, the metrics associated with ISO 9000 and the Baldrige Award are publicly documented.

Deming's work has been around long enough that concrete examples of the implementation of his philosophy exists. This is not true for Senge's doctrine. It remains to be seen whether quantitative metrics that can track from Senge's various Disciplines to conventional management benchmarks will be developed.

TABULAR COMPARISONS OF TQM METHODS

Tables 1-9 present selected tabular comparisons of different TQM techniques. Filled-circles (●) indicate that there is significant correspondence between the published descriptions of a given principle, tenet, or metric. Open-circles (O) indicate

that there is some correspondence — if a little imagination is employed. A cross (✖) indicates that there is potential conflict between categories.

A correspondence (●) was established if I could identify explicit phraseology that described a principle or metric, or if I could identify a reference to a concrete business or management example. Partial correspondence (O) was determined if slight rewording of concept did not appear to corrupt the concept's basic intent. Conflict (✖) was considered to exist unless some basic re-interpretation of the tenets or metrics was permitted.

Because of time constraints, textual comparisons will be presented at a fairly high level. In addition, not a great deal of detail will be presented about individual concepts and tenets. I encourage readers to refer to the original references for developing their own definition of specific principles.

Mapping of Deming to ISO 9000, Baldrige Award, and Senge's TLO

Tables 1-3 provide specific mappings from each of Deming's fourteen management directives to the metrics or tenets of the other TQM approaches.

Remember that these four TQM schools (Deming, ISO 9000, Baldrige, and Senge) represent two ends of a continuum. ISO 9000 and the Baldrige Award are more representative as a standard than a philosophy of management and, conversely, Deming and Senge represent more the philosophical approach than a standard.

Despite the differences in approaches to TQM, there are a number of similarities in terms of the types of issues raised. One focus is on a systems-analytic approach to business. Another concept represented in all four methods is the notion of leadership and developing a unified view of the goals and mission of the company. A third concept common to all is the issue of training (or in Senge's case, learning).

Senge vs. Malcolm Baldrige Award

Table 4 presents a comparison of Senge's five disciplines and the major categories of the Malcolm Baldrige National Quality Award. As indicated earlier, Senge's disciplines are extremely broad, and in many ways very nonspecific. As a result, when making a specific comparison of Senge to any of the standard-type TQM processes, an analyst must make some extremely arbitrary decisions.
Because of the nonspecificity of many of the disciplines, you could almost map any given one to any other category. In some sense then, readers could easily arrive at their own unique and arbitrary tables. But, what is important in making these comparisons is not really the final table, but the process itself. It is through the process of analysis that readers will come to a clearer understanding of the nature of the two TQM processes.

Senge vs. Covey

Table 5 presents a comparison of Senge's and Covey's philosophies. As indicated earlier, Covey's approach is not really a corporate management tool so much as a personal approach to organizing one's own life.

From a psychological and sociological perspective, analyzing the different approaches is one of conceptual scaling. That is, many of the concepts that are of value on a personal level are also important at a group level. For example, both Senge and Covey advocate developing a vision and setting goals at the heart of being successful. Certainly Covey talks about applying some of his concepts to one's business life, but he focuses on the individual, not the group.

DOE Quality Assurance and Conduct of Operations vs. Deming

Tables 6 and 7 present comparisons of the DOE's Orders on Quality Assurance and Conduct of Operations.

There is a significant amount of concordance between the Order outlining Quality Assurance and Deming's Fourteen Points for Management. However, there is potential conflict concerning how a company should go about inspections and evaluations. Deming believes that emphasis in these areas should be minimized, and not used as a primary management tool.

DOE's Order concerning Conduct of Operations appears to significantly vary from Deming's approach (and many standard approaches to TQM). The Conduct of Operations advocates a classical pre-TQM management philosophy that emphasizes fear intimidation by focusing on workers' errors. The Conduct of Operations focuses on errors through the use of frequent inspections and evaluations. Little, if any, emphasis is placed on developing a shared corporate vision and examination of the influence of systems on worker performance. To be quite frank, the DOE Order on the Conduct of Operations shows a striking lack of modern management principles.

DOE Quality Assurance and Conduct of Operations vs. ISO 9000

Tables 8 and 9 present comparisons of ISO 9000 with DOE's Quality Assurance and Conduct of Operations Orders. As can be seen from inspecting the tables, there is a great deal of concordance between ISO 9000 and the DOE orders, mainly because all three "approaches" to TQM place heavy emphasis on inspection and testing of the final product of an organization.

In contrast, the human-centered, systems approaches to TQM (e.g., Deming) place emphasis on how systems can influence the performance of a worker. The systems-output-based approach to management (e.g., DOE Order 5480.19, Conduct of Operations) places emphasis on the final product of the process, and whether that product meets the criteria. In the latter case, the output of the system was derived by management's concept of what the customer wanted. In this type of organization, workers' motivation is to please management, whereas in a human-centered, systems approach, workers are motivated to please the customer. If they achieve customer satisfaction, then they obtain approval from management.

SUMMARY

This paper presented a high-level comparison and discussion of four different TQM approaches that vary qualitatively in how they approach quality improvement. The basic criteria, principles, or tenets of the different approaches were briefly discussed, outlined, and compared. Lists of the various criteria and tables of comparisons highlighted the differences among the different TQM approaches.

This paper can provide only a basic understanding of the essential differences among the various approaches to continuous quality improvement. Because of time constraints, any in-depth analysis of individual concepts was precluded. However, the high-level comparisons that were presented can be a guide to further analysis by the reader.

I presented a full spectrum of TQM techniques, ranging from those that are essentially standards, to those that are basically personal management guides. In addition, tabular comparisons of the various approaches were presented. I discussed the concordance among some of the techniques; however, the concordance may be more apparent than real because some terminology used by the adherents is extremely vague and general. As a result, I had to be very arbitrary in some of the distinctions I made.

I presented a comparison of the official DOE position on quality assurance and conduct of operations with some of the TQM methods. It appeared that there was a certain amount of agreement with the Order on quality assurance and many current TQM methods. On the other hand, there were some major conflicts between the Order on Conduct of Operations and most of the modern approaches to quality management.

II. LISTS OF SELECTED TQM CRITERIA, PRINCIPLES & TENETS

List 1. ISO 9000 Criteria Identified.

ISO 9000

1. **Management Responsibility**
   - a. The quality policy shall be defined, documented and understood.
   - b. Responsibilities and authorities shall be defined.
2. **Quality System**
   - a. Procedures shall be prepared.
   - b. Procedures shall be implemented.
3. **Contract Review**
   - a. Determine if contracts meet requirements.
4. **Design Control**
   - a. The design project shall be planned.
   - b. Design input parameters shall be defined.
   - c. Design output shall be documented.
   - d. Design output shall be verified.
   - e. Design changes shall be controlled.
5. **Document Control**
   - a. Generation of documents shall be controlled.
   - b. Distribution of documents shall be controlled.
   - c. Changes to documents shall be controlled.
6. **Purchasing**
   - a. Potential suppliers shall be evaluated.
   - b. Requirements shall be clearly defined.
   - c. Effectiveness of suppliers quality assurance system shall be evaluated.
7. **Customer Supplied Product**
   - a. Customer-supplied material shall be protected against loss or damage.
8. **Product Identification & Traceability**
   - a. The product shall be identified and traceable by item, batch, or lot.
9. **Process Control**
   - a. Production process shall be defined and planned.
   - b. Production shall be carried out under controlled conditions.
   - c. Special processes that cannot be verified after the fact shall be monitored and controlled throughout the process.
10. **Inspection and Testing**
    - a. Incoming materials shall be inspected and verified.
    - b. In-process inspection and testing shall be performed.

c. Final inspection and testing shall be performed prior to release of finished product.

d. Records of inspection and test shall be kept.

11. Inspection, Measuring & Test Equipment

a. Equipment used to demonstrate conformance shall be controlled, calibrated, and maintained.

b. Measurement uncertainty and equipment capability shall be known.

c. Where test hardware or software is used it shall be checked before use and rechecked during use.

12. Inspection & Test Status

a. Status of inspections and test shall be maintained for items as they progress through the process.

b. Records shall show who released conforming product.

13. Control of Nonconforming Product

a. Nonconforming product shall be controlled to prevent inadvertent use or installation.

b. Review and disposition of nonconforming product shall be accomplished in a formal manner.

14. Corrective Action

a. Problem causes shall be identified.

b. Specific problems and their causes shall be corrected.

c. Effectiveness of corrective actions shall be assessed.

15. Handling, Storage, Packaging & Delivery

a. Procedures for handling, storage, packaging, and delivery shall be developed.

b. Handling controls shall prevent damage and deterioration.

c. Secure storage shall be provided.

d. Packing preservation and marking process shall be controlled.

e. Quality of product after final inspection shall be maintained.

16. Quality Records

a. Quality records shall be identified, collected, indexed, filed, stored, maintained, and dispositioned.

17. Internal Quality Audits

a. Audits shall be planned and performed.

b. Result of audits shall be communicated to management.

c. Any deficiencies found shall be corrected.

18. Training

a. Training needs shall be identified.

b. Training shall be provided.

c. Selected tasks might require qualified individuals.

d. Records of training shall be maintained.

19. Servicing

a. Servicing activities shall be performed to written procedures.

b. Servicing activities shall meet requirements.

20. Statistical Techniques

a. Statistical techniques shall be identified.

b. Statistical techniques shall be used to verify acceptability of process capability and product characteristics.

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Adopted after:

Arter, D.R. "Demystifying the ISO 9000/Q90 Series Standards." *Quality Progress*, V25, N11:65-67, 1992.

Golis, M.J. and Kist, N.C2. "ISO 9000, Total Quality Management, and Implications for NDT." *Materials Evaluation*, V51, N4:462-467, 1993.

List 2. Malcolm Baldrige Award Criteria Identified.
(Notations of listings are consistent with original articles for clarity.)

MALCOLM BALDRIGE NATIONAL QUALITY AWARD

1. Leadership

- 1.1. Senior Executive Leadership.
- 1.2. Management for Quality.
- 1.3. Public Responsibility.

2. Information and Analysis

- 2.1. Scope and Management of Quality and Performance Data and Information.
- 2.2. Competitive Comparisons and Benchmarks.
- 2.3. Analysis and uses of Company-Level Data.
- 3. Strategic Quality Planning
- 3.1. Strategic Quality and Company Performance Planning Process.
- 3.2. Quality and Performance Plans.

4. Human Resource Development and Management

- 4.1. Human Resource Management.
- 4.2. Employee Involvement.
- 4.3. Employee Education and Training.
- 4.4. Employee Performance and Recognition.
- 4.5. Employee Well-Being and Morale.

5. Management of Process Quality

- 5.1. Design and Introduction of Quality Products and Services.
- 5.2. Process Management—Product and Service Production and Delivery Processes.
- 5.3. Process Management—Business Process and Support Services.
- 5.4. Supplier Quality.
- 5.5. Quality Assessment.

6. Quality and Operational Results

- 6.1. Product and Service Quality Results.
- 6.2. Company Operational Results.
- 6.3. Business Process and Support Service Results.
- 6.4. Supplier Quality Results.

7. Customer Focus and Satisfaction

- 7.1. Customer Relationship Management.
- 7.2. Commitment to Customers.
- 7.3. Customer Satisfaction Determination.
- 7.4. Customer Satisfaction Results.
- 7.5. Customer Satisfaction Comparison.
- 7.6. Future Requirements and Expectation of Customers.

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Adopted after:

Bemowski, K. "Inside the Baldrige Award Guidelines." *Quality Progress*, V25, N6:24-28, 1992.
Easton, G.S. "The 1993 State of U.S. Total Quality Management: A Baldrige Examiner's Perspective." *California Management Review*, V35, N3:32-54, 1993.

List 3. Senge's The Learning Organization Criteria Identified.
(Notations of listings are consistent with original articles for clarity.)

SENGE'S THE LEARNING ORGANIZATION

I. Systems Thinking

A. Practices.
1. System Archetypes.
2. Simulation.

B. Principles.
1. Structure Influences Behavior.
2. Policy Resistance.
3. Leverage.

C. Essences.
1. Holism.
2. Interconnectedness.

II. Personal Mastery

A. Practices.
1. Clarifying Personal Vision.
2. "Holding" Creative Tension.
3. Making Choices.

B. Principles.
1. Vision.
2. Creative Tension vs. Emotional Tension.
3. Subconscious.

C. Essences.
1. Being.
2. Generativeness.
3. Connectedness.

III. Mental Models

A. Practices.
1. Distinguishing "Data" from Abstractions Based on Data.
2. Testing Assumptions.
3. "Left-Hand" Column.

B. Principles.
1. Espoused Theory vs. Theory-In-Use.
2. Ladder of Inferences.
3. Balance Inquiry and Advocacy.

C. Essences.
1. Love of Truth.
2. Openness.

IV. Building Shared Vision

A. Practices.
1. Visioning Process.
   a. Sharing personal visions.
   b. Listening to others.
   c. Allowing freedom of choice.
2. Acknowledging Current Reality.

B. Principles.
1. Shared Vision as "Hologram."
2. Commitment vs. Compliance.

C. Essences.
1. Commonality of Purpose.
2. Partnership.

V. Team Learning

A. Practices.
1. Suspending Assumptions.
2. Acting as Colleagues.
3. Surfacing Own Defensiveness.
4. "Practicing."

B. Principles.

1. Dialogos.
2. Integrate Dialogue and Discussion.
3. Defensive Routines.

C. Essences.
   1. Collective Intelligence.
   2. Alignment.

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Adopted after:

Senge, P.M. *The Fifth Discipline: The Art and Practice of the Learning Organization.* New York: Doubleday, 1990.

List 4. Watkins and Marsick Version of the Learning Organization Identified.
(Notations of listings are consistent with original articles for clarity.)

SCULPTING THE LEARNING ORGANIZATION

Definition of the Learning Organization

1. The learning organization is one that learns continuously and transforms itself.
2. Learning takes place in individuals, teams, the organization, and even society.
3. Learning is a continuous, strategically used process—integrated with, and running parallel to, work.
4. Learning also enhances organizational capacity for innovation and growth.
5. The learning organization has embedded systems to capture and share learning.

The Learning Organization Action Imperatives

1. Individual learning.
   - Create continuous learning opportunities.
   - Promote inquiry and dialogue.
2. Team learning.
   - Encourage collaboration and team learning.
3. Organization learning.
   - Establish systems to capture and share learning.
   - Empower people toward a collective vision.
4. Societal Learning.
   - Connect the organization to its environment.

Auditing Capacity: The Seven C's of a Learning Organization

1. Continuous Learning.
   - Learning must be ongoing
   - It must be available just-in-time.
2. Collaborative Learning.
   - Cooperative participation in meaningful tasks.
3. Connected Learning.
   - Connected structures are community-centered.
   - Connected learning creates a sense that people are working toward a longer-term goal, rather than immediate profits.
4. Collective Learning.
   - Aggregated learning that is brought together through the shared learning of individuals or teams.
   - It involves inquiry across boundaries and mutual forging of common understanding.
5. Creative Learning.
   - Creativity moves the organization beyond its apparent limitations.
   - It results in alternative future for the company.

6. Capture and Codified Learning.
   - Systems need to be motivating and accessible.
   - Establish a policy that ensures that learning itself takes place.
7. Capacity Building.
   - Organizational development is planned organization change.
   - Organizational learning is an increase in the organization's capacity to make changes.

Measures for Auditing the Learning Organization

1. Individual
   - Collect baseline data describing employee skills.
   - Create development plans to build future skills.
   - Develop literacy programs to upgrade the overall skill threshold.
   - Capacity to challenge prevailing wisdom should be fostered.
   - Establish Action Learning programs that tie learning to work.
   - Ensure there is money for development.
2. Team
   - Develop problem solving skill.
   - Develop collaborative skill.
   - Ensure diversity is embraced.
   - Blame, fear, and reprisals for mistakes should be reduced.
   - Begin partnering with customers: internal, external, societal.
   - Control number, fluency, and uniqueness of team inventions, ideas, products, processes.
3. Organization.
   - Develop total employee involvement and a culture of empowerment.
   - Create systems to capture and share learning.
   - Foster increases in percentage of knowledge workers.
   - Reduce costs per worker to upgrade knowledge level.
   - Reduced cost per patent, reduced time to market per patent.
   - Increase percentage of organizational assets dedicated to the new economy.
4. Society.
   - Forge a global awareness and responsibility.
   - Control environmental indices: public monitoring of accident rates, safety violations, EPA violations.
   - Control indices of corporate social responsibility: increased quality-of-work-like policies, long-term mutual commitments, wellness programs..

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Adopted after:

Watkins, K.E. and Marsick, V.J. *Sculpting the Learning Organization*. San Francisco: Jossey-Bass, 1993.

List 5. Deming's Fourteen Points Identified.
(Notations of listings are consistent with original articles for clarity.)

DEMING'S FOURTEEN POINTS FOR MANAGEMENT

1. **Create Constancy of Purpose for Improvement of Product and Service.**
   - a. Define the aim of the company.
     - i. Mission statement.
     - ii. Guiding principles.
   - b. Innovate, allocate resources for education and research, conduct long -range planning.
   - c. Constantly improve products and services.

2. **Adopt the New Philosophy.**
   - a. Seek the active support of the "movers and shakers."
   - b. Select improvement efforts within your span of control.

3. **Cease Dependence on Inspection to Achieve Quality.**
   - a. Identify the processes in the system.
   - b. Focus on improving the process to satisfy the customer.

4. **End the Practice of Awarding Business on the Basis of Price.**
   - a. Evaluate the quality programs of the supplier.
   - b. Make the supplier part of the team.
   - c. Let the supplier help design the process.

5. **Improve Constantly and Forever Every Process for Planning, Production, and Service.**
   - a. Quality must be built in at the design stage.
   - b. Teamwork in design is fundamental.
   - c. Test methods must be continuously improved.
   - d. Constant improvement will result in constantly decreasing costs.

6. **Institute Training on the Job.**
   - a. Management needs training on company processes.
   - b. Central problem is need to understand variation.
   - c. Provide foundations of training for management and new employees.

7. **Adopt and Institute Leadership.**
   - a. Management's job is not supervision, but leadership.
   - b. Work on sources of improvements.

8. **Drive Out Fear.**
   a. Communicate the goals and results.
   b. Allow employees to participate in setting goals for their processes.

9. **Break Down Barriers Between Staff Areas.**
   a. Encourage teaming across divisions.
   b. Identify and disseminate goals of each group in the system.

10. **Eliminate Slogans, Exhortations, and Targets for the Work Force.**
    a. Employees should specify objectives.
    b. Goals should not be dictated from above.

11. **Eliminate Numerical Quotas for the Work Force and Numerical Goals for Management.**
    a. Focus on the process—not the product.
    b. Quality, not quantity.
    c. Customer satisfaction should drive production rates.

12. **Remove Barriers that Rob People of Pride of Workmanship, eliminate the Annual Rating or Merit System.**
    a. Shift responsibilities of supervisors from numbers to quality.
    b. Abolish annual or merit rating and management by objective.

13. **Institute a Vigorous Program of Education and Self-improvement for Everyone.**
    a. Productivity improvement must not cost jobs—re-train.

14. **Put Everybody in the Company to Work to Accomplish the Transformation.**
    a. The transformation is everyone's responsibility.

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Adopted after:

Deming, W.E. *Out of the Crisis.* Cambridge: M.I.T. Press, 1982.

List 6. Covey's Habits Identified.
(Notations of listings are consistent with original articles for clarity.)

SEVEN HABITS OF HIGHLY-EFFECTIVE PEOPLE

Habit One—Be Proactive: **The Habit of Personal Vision**

1. Proactivity vs. Reactivity
2. Proactivity vs. Determinism.
3. Proactive Language and the Inner Circle of Influence.
4. Proactivity and the Thirty-Day Test.

Habit Two—Begin with the End in Mind**: The Habit of Personal Leadership**

1. Values and Rescripting.
2. Discovering a Personal Mission Statement.
3. Personal Leadership for Others.

Habit Three—Put Fist Things First**: The Habit of Personal Management**

1. The Time-Management Matrix and High-Leverage Activities
2. Organization through Scheduling.
3. Organization through Delegation.
4. The Five Levels of Initiative.

Habit Four—Think Win-Win: **The Habit of Interpersonal Leadership**

1. Creating Win-Win Relationships.
2. Win-Win or No Deal.
3. Win-Win and Character.
4. Win-Win and Systems.

Habit Five—Seek First to Understand, Then to be Understand**: The Habit of Communication**

1. Diagnose Before You Prescribe.
2. Listening with the Eyes for Feeling.
3. The Attitude and the Skill of Empathy.

Habit Six—Synergize: **The Habit of Creative Cooperation**

1. Value the Differences.
2. We See the World as We Are.

Habit Seven—Sharpen the Saw**: The Habit of Self-Renewal**

1. The Physical Dimension.
2. The Mental Dimension.
3. The Emotional/Social and Spiritual Dimensions.

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Adopted after:

Covey, S.R. *Seven Habits of Highly Effective People.* New York: Fireside Books, 1989.

List 7. DOE Conduct of Operations Identified.
(Notations of listings are consistent with original articles for clarity.)

DOE ORDER 5480.19 CONDUCT OF OPERATIONS REQUIREMENTS FOR DOE FACILITIES

1. Operation Policies

a. Policies should document goals and the means to achieve them.

b. Responsibilities should be clearly defined.

2. Resources

a. Resources should be sufficient to conduct operations.

b. Implement long-range staffing plan to anticipate losses.

3. Monitoring of performance

a. Frequent supervisor assessment is essential.

b. Operating problems should be documented and dispositioned.

c. To minimize errors and costs the following goals you should consider:

- Minimizing the unavailability of safety systems;
- Minimizing personnel errors;
- As-Low-As-Reasonably-Achievable (ALARA);
- Minimizing lost facility capability;
- Minimizing unscheduled facility shutdowns per year;
- Timely completion of scheduled surveillance;
- Minimizing the amount of overtime;
- Achieving and maintaining complete staffing and training of shift positions;
- Minimizing waste; and,
- Minimizing the number of light annunciators.

d. Goals should be auditable, measurable, realistic, and challenging.

e. Deficiencies should be documented, trended, and corrected.

4. Accountability

a. Workers should be accountable for the operating performance of the facility.

b. Appraisals should include operating performance.

5. Management Training

a. Management training should be given to supervisors.

6. Planning for Safety

a. Document safety preplanning.

b. Guidance should explain the role of safety analysis.

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Adopted after:

DOE Order 5480.19, *Conduct of Operations Requirements for DOE Facilities*. 9 July 1990, Section I, Part C.

List 8. DOE Quality Assurance Guidelines Identified.
(Notations of listings are consistent with original articles for clarity.)

DOE ORDER 5700.6C
QUALITY ASSURANCE

A. Management

A1. Criterion 1—Program

a. Senior management develops and issues Quality Assurance Plan (QAP).

b. Senior management is responsible for QAP. Line management is responsible for achieving quality. Workers are responsible for quality of their own work.

c. QAP should promote achieving performance objectives.

d. QAP should apply to everyone.

e. ALARA policy should apply.

f. Should conduct complete systems analysis with concurrent engineering objectives kept in mind.

g. Establish good communications.

h. Control outside services.

i. Use data to establish performance goals.

j. Conduct readiness reviews.

k. Safety should be delegated throughout chain of command.

A2. Criterion 2—Personnel Training and Qualification

a. People should be qualified to perform their jobs and understand what aspects they have control over.

b. Emphasize "doing it right the first time."

c. Stimulate professional development.

d. Assess workers' qualifications.

e. Training should be Instructional Systems Design-based.

f. Training should be reviewed.

A3. Criterion 3—Quality Improvement

a. Quality should be implemented during design and planning stages.

b. Use data to identify performance trends so that process can be improved.

c. Identify quality improvement goals.

d. All workers should identify nonconforming processes and have authority to correct them.

e. Appropriate extent of cause analyses should be conducted.

f. A "no-fault" attitude should be established concerning nonconforming processes.

g. Control procedures for nonconforming processes should be established.

h. Inspect corrected work.

j. Personnel should have background information relative to nonconformance.

A4. Criterion 4—Documents and Records

a. Control documents appropriately.

b. Control records appropriately.

B. Performance

B1. Criterion 5—Work Processes

a. Work should be reviewed and controlled by supervisors.

b. Identification and control of items should be instituted.

c. Handling, storing, and shipping of items should be controlled.

d. Calibration and Maintenance of monitoring and data collection equipment should be controlled.

B2. Criterion 6—Design

a. Design process should use sound engineering principles and be controlled.

b. Design bases should translate to design output requirements.

c. Design should have adequate control processes.

d. Design interface among organizations should be established and controlled.

e. Design records should be controlled.

f. Design acceptability should be verified.

g. Design verification should be conducted by someone other than the worker.

h. Different types of verification methods should be used.

i. Design verification should be conducted under "worse case conditions."

j. Design verification should take place prior to implementation.

B3. Criterion 7—Procurement

a. Purchased items' requirements should be verified.

b. Procurement documents should include acceptance criteria.

c. Purchased items' performance should be verified.

d. Only qualified suppliers should be selected.

e. Qualified suppliers should be periodically inspected.

f. Purchased items and services should be accepted using specified methods.

g. Prior to use, purchase items should be verified and nonconformance dispositioned.

h. Purchased items should be compared to performance criteria.

i. Periodic conformance of purchase items should be established.

j. Inspector General should be informed of malfeasance and misfeasance.

B4. Criterion 8—Inspection and Acceptance Testing

a. Inspection should be a controlled process, from testing to dispositioning.

b. Performance testing should be controlled.

c. Measuring and Test Equipment should be controlled.

C. Assessment

C1. Criterion 9—Management Assessment

a. Planned and periodic management assessments should be established.

b. Senior management should retain responsibility for assessments.

c. Management assessments should be documents.

2. Criterion 10—Independent Assessment

a. Planned periodic independent assessments should be established.

b. Assessors should act in management advisory function.

c. Assessors should focus on improving the quality of the processes.

d. Assessors should not be from the area they are assessing.

e. Assessments should be based on published performance criteria.

f. Assessment scheduling should be flexible.

g. Assessment results should be controlled.

h. Response to assessments should be controlled.

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Adopted after:

DOE Order 54700.6C, *Quality Assurance, Attachment 1, Implementation Guide.* 21 August 1991.

List 9. DOD Total Quality Management Guidelines Identified.
(Notations of listings are consistent with original articles for clarity.)

DOD DIRECTIVE 5000.51G TOTAL QUALITY MANAGEMENT: A GUIDE FOR IMPLEMENTATION

Total Quality Management Strategy

1. Definition—Total Quality Management (TQM) consists of continuous process improvement activities involving everyone in an organization—managers and workers—in a totally integrated effort toward improving performance at every level. This improved performance is directed toward satisfying such cross-functional goals as quality, cost, schedule mission need, and suitability. TQM integrates fundamental management techniques, existing improvement efforts, and technical tools under a disciplined approach focused on continuous process improvement. The activities are ultimately focused on increased customer/user satisfaction.
2. TQM philosophy provides a comprehensive way to improve quality by examining the way work gets done in a systematic, integrated, consistent, organization-wide perspective. The focus is to:
   - Emphasize continuous improvement of processes, not compliance to standards.
   - Motivate to improve from within, rather than wait for complaints demands from users.
   - Involve all function, not just the quality organization.
   - Motivate and involve employees to become the driving force for improvements.
   - Satisfy the customer, not merely conform to requirements.
   - Use guides and target values as goals to improve on, not standards to conform.
   - Use model process control techniques.
   - Understand the effects of variation on processes and their implications for process improvement.
3. Some basic postulates include:
   - Providing customers/users with products and services that consistently meet their needs and expectations.
   - Quality is conformance to a set of customer requirements that, if met, result in a product that is fit for its intended use.

- A manager who fails to provide resources and time for prevention activities is practicing false economy.
- Use structured methodology for process improvement.
- Practice a continuous improvement strategy.

Total Quality Management Model

1. What distinguishes TQM from other improvement strategies is its unflagging dedication to:
   - Training.
   - Recognition of quality as the presence of value, rather than absence of defects.
   - A working environment where all employees seek continuous improvement.
   - Customer satisfaction (internal and external).
   - Quality awareness throughout the organization.
   - Long-term commitment to continuous improvement.
   - Focus on prevention rather than inspection.
   - Organizational discipline to practice the new behaviors day after day, forever.
   - Rigorous analysis of management systems and processes.
   - Cross-functional orientation and teamwork.
   - Elimination of non-value-added activity and reduction of cycle time.
   - Involvement of all employees.
   - Focus on the product/service and the process.
2. There is a seven-step model that defines TQM for the DOD:
   - Step 1—Establish the TQM management and cultural environment.
   - Step 2—Define mission of each component of the organization.
   - Step 3—Set performance improvement opportunities, goals and priorities.
   - Step 4—Establish improvement projects and action plans.
   - Step 5—Implement projects using improvement methodologies.
   - Step 6—Evaluate.
   - Step 7—Review and recycle.

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Adopted after:

DODD 5000.51G, *Total Quality Management: A Guide for Implementation.* 15 February 1989.

List 10. Federal Quality Institute Guidelines Identified.
(Notations of listings are consistent with original articles for clarity.)

RE-INVENTING GOVERNMENT THROUGH QUALITY MANAGEMENT

Driver—Leadership

1. Total commitment from upper level management.
2. Develop vision and organizational goals.

People—Workforce Excellence

1. People trained to do their jobs.
2. People committed to quality.

Systems—Planning and Managing

1. Organizational analysis and assessment.
2. Controlling processes within system.

Measure of Progress—Results

1. Develop concrete metrics.
2. Compare results to vision and goals.

Goal—Customer Satisfaction

1. Customer needs drive design and processes.
2. Measure customer assessment of quality.

Outcome—Transformed Government

1. Establishing and achieving national objectives.
2. Obtaining understanding and support of the public.

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Adopted after:

United States Office of Personnel Management, The Federal Quality Institute, *Introduction to Total Quality Management in the Federal Government.* May 1991.

III. TABLES SHOWING COMPARISONS BETWEEN DIFFERENT TQM APPROACHES

Table 1. Comparison Between ISO 9000 Criteria and Deming's 14 Points

ISO 9000 Criteria	Deming's 14 Points													
	1 Constancy of Purpose	2 Adopt New Philosophy	3 Minimize Inspections	4 Evaluate Quality of Supplier	5 Improve Processes Constantly	6 Institute Job Training	7 Institute Leadership	8 Drive Out Fear	9 Break Down Barriers	10 Eliminate Slogans	11 Eliminate Quotas	12 Eliminate Annual Ratings	13 Program of Self Improvement	14 Everyone Must Transform
1. Management Responsibility	●	○				○	●	●	●	○	●	○	○	●
2. Quality System	○	●			●	○	○			●		○		○
3. Contract Review				●								○	○	
4. Design Control	○	●			●	●	○	○	○		○	●		○
5. Document Control						○								
6. Purchasing		○		●										
7. Customer-Supplied Product				○	○							●		○
8. Product Identification & Traceability				○										
9. Process Control		●			●									○
10. Inspection and Testing			✖								✖	✖		
11. Inspection, Measuring & Test Equipment		○	✖		●						✖	✖		
12. Inspection & Test Status			✖		●						✖	✖		
13. Control of Non-conforming Product			✖		●						✖	✖		
14. Corrective Action		○			●		○	●						
15. Handling, Storage, Packaging & Delivery														
16. Quality Records	●	●			○								○	○
17. Internal Quality Audits	●				○		○							
18. Training	○				○	●		○	○	○	○	●	●	●
19. Servicing														
20. Statistical Techniques								○	○		○	○	○	○

● = Highly Aligned, ○ = Modestly Aligned, ✖ = Potential Conflict

Table 2. Comparison Between Malcolm Baldrige Award Criteria and Deming's 14 Points

Malcolm Baldrige Award	Deming's 14 Points													
	1 Constancy of Purpose	2 Adopt New Philosophy	3 Minimize Inspections	4 Evaluate Quality of Supplier	5 Improve Processes Constantly	6 Institute Job Training	7 Institute Leadership	8 Drive Out Fear	9 Break Down Barriers	10 Eliminate Slogans	11 Eliminate Quotas	12 Eliminate Annual Ratings	13 Program of Self Improvement	14 Everyone Must Transform
1. Leadership	●	●	○			○	●	○	○	○	○	○	○	○
2. Information and Analysis		○	○		●			○				○		○
3. Strategic Quality Planning		○			●		○				○	○		○
4. Human Resource Development and Management		○				●	●	○			○	●	●	○
5. Management of Process Quality	●		●	●	●						○		○	
6. Quality and Operational Results		○		●	●						○		○	
7. Customer Focus and Satisfaction	●	●	○		○		●				○	○		●

● = Highly Aligned, ○ = Modestly Aligned, ✖ = Potential Conflict

Table 3. Comparison Between Senge's Learning Organization and Deming's 14 Points

Senge's The Learning Organization	Deming's 14 Points													
	1 Constancy of Purpose	2 Adopt New Philosophy	3 Minimize Inspections	4 Evaluate Quality of Supplier	5 Improve Processes Constantly	6 Institute Job Training	7 Institute Leadership	8 Drive Out Fear	9 Break Down Barriers	10 Eliminate Slogans	11 Eliminate Quotas	12 Eliminate Annual Ratings	13 Program of Self Improvement	14 Everyone Must Transform
1. Systems Thinking	○				○						○		○	
2. Personal Mastery	○	○			○		○	●	○				○	
3. Mental Models	○	○		○	○								○	
4. Building Shared Vision					●	○			●		●	○	○	○
5. Team Learning					○	○			●			○	●	

● = Highly Aligned, ○ = Modestly Aligned, ✖ = Potential Conflict

Table 4. Comparison Between Senge's The Learning Organization Criteria and Malcolm Baldrige National Quality Award.

Senge's The Learning Organization	Malcolm Baldrige Award						
	1 Leadership	2 Information and Analysis	3 Strategic Quality Planning	4 Human Resource Development	5 Management of Processess	6 Quality and Operational Results	7 Focus on Customer Satisfaction
1. Systems Thinking					○		
2. Personal Mastery		○		○	○		○
3. Mental Models	○	○	○	○	○	○	
4. Building Shared Vision	●	○	●	○			
5. Team Learning		○		○		○	

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Table 5. Comparison Between Senge's The Learning Organization Criteria and Covey's Seven Habits of Successful People.

Senge's The Learning Organization	Covey's Seven Habits						
	1 Be Proactive	2 Begin with End in Mind	3 Put First Things First	4 Think Win-Win	5 Understand, Be Understood	6 Synergize	7 Sharpern the Saw
1. Systems Thinking			○				
2. Personal Mastery	●	○	●	●	○	○	●
3. Mental Models		●	○	○	●	○	○
4. Building Shared Vision		○	○	●	●	●	
5. Team Learning		○		○	○	○	

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Table 6. Comparison Between DOE Quality Assurance and Deming's 14 Points

DOE Quality Assurance Criteria	Deming's 14 Points													
	1 Constancy of Purpose	2 Adopt New Philosophy	3 Minimize Inspections	4 Evaluate Quality of Supplier	5 Improve Processes Constantly	6 Institute Job Training	7 Institute Leadership	8 Drive Out Fear	9 Break Down Barriers	10 Eliminate Slogans	11 Eliminate Quotas	12 Eliminate Annual Ratings	13 Program of Self Improvement	14 Everyone Must Transform
1. Program	●	○				○	●	●	●	○	●	○	○	●
2. Personnel Training and Qualification	○	●			●	○	○			●		○		○
3. Quality Improvement				●								○	○	
4. Documents and Records	○	●	✖		●	●	○	○	○		○	✖		○
5. Work Processes						○								
6. Design		○		●										
7. Procurement				○	○							✖		○
8. Inspection and Acceptance Testing			✖	○										
9. Independent Assessment		●			●									○

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Table 7. Comparison Between DOE Conduct of Operations and Deming.

DOE Conduct of Operations	Deming's 14 Points													
	1 Constancy of Purpose	2 Adopt New Philosophy	3 Minimize Inspections	4 Evaluate Quality of Supplier	5 Improve Processes Constantly	6 Institute Job Training	7 Institute Leadership	8 Drive Out Fear	9 Break Down Barriers	10 Eliminate Slogans	11 Eliminate Quotas	12 Eliminate Annual Ratings	13 Program of Self Improvement	14 Everyone Must Transform
1. Document Process				○								✖		
2. Define Roles						○								○
3 Sufficient Resources					○		○							
4. Long-Range Plan	●													
5. Frequent Assessment		✖	✖						✖			✖		
6. Document Problems			✖	✖					✖					
7. Minimize Errors and Costs			✖											
8. Audit Goals			✖	✖										
9. Document Deficiencies			✖											
10. Workers be Accountable													●	
11. Include Appraisals												✖		
12. Management Training						●	●							○
13. Document Safety Planning				○									○	
14. Provide Safety Guidance			✖											

● = Highly Aligned, ○ = Modestly Aligned, ✖ = Potential Conflict

Table 8. Comparison Between ISO 9000 and DOE Quality Assurance.

ISO 9000 Criteria	DOE Quality Assurance								
	1 Program	2 Personnel Training	3 Quality Improvement	4 Documents and Records	5 Work Processes	6 Design	7 Procurement	8 Inspection and Testing	9 Independent Assessment
1. Management Responsibility	○								
2. Quality System			●						○
3. Contract Review				●					
4. Design Control						●		○	○
5. Document Control									
6. Purchasing							●		
7. Customer-Supplied Material							●		
8. Product Identification & Traceability								●	
9. Process Control	○		●		●			○	
10. Inspection and Testing				○				●	
11. Inspection, Measuring & Test Equipment				○				●	
12. Inspection & Test Status				○				●	
13. Control of Non-conforming Product				○	○			●	
14. Corrective Action									
15. Handling, Storage, Packaging & Delivery				○	○				
16. Quality Records									
17. Internal Quality Audits			●	○				○	
18. Training		●							
19. Servicing		○						○	
20. Statistical Techniques				○	○			○	

● = Highly Aligned, ○ = Modestly Aligned, ✖ = Potential Conflict

Table 9. Comparison Between ISO 9000 Criteria and DOE Conduct of Operations

ISO 9000 Criteria	DOE Conduct of Operations													
	1 Document Process	2 Define Roles	3 Sufficient Resources	4 Long-Range Plan	5 Frequent Assessment	6 Document Problems	7 Minimize Errors	8 Audit Goals	9 Document Deficiencies	10 Accountable Workers	11 Include Appraisals	12 Management Training	13 Safety Planning	14 Safety Guidance
1. Management Responsibility		●										●		
2. Quality System														
3. Contract Review	○													
4. Design Control														
5. Document Control	●				○		○	○						
6. Purchasing														
7. Customer-Supplied Material														
8. Product Identification & Traceability	○							○	○					
9. Process Control	○													
10. Inspection and Testing					●	○	○	○	○					
11. Inspection, Measuring & Test Equipment					●	○	○	○	○					
12. Inspection & Test Status					●	○	○	○	○					
13. Control of Non-conforming Product									●					
14. Corrective Action														
15. Handling, Storage, Packaging & Delivery														
16. Quality Records	●													
17. Internal Quality Audits					●	○								
18. Training												●		
19. Servicing														
20. Statistical Techniques					●	○	○	○	○					

● = Highly Aligned, ○ = Modestly Aligned, ✖ = Potential Conflict

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