

TQM implementation

A comparison of ISO 9000:2000 quality system standards, QS9000, ISO/TS 16949 and Baldrige criteria

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Abstract

This paper examines the relationship between ISO 9000:2000 quality standards, QS9000, ISO/TS 16949 and the Baldrige criteria for performance excellence revised in the year 2002. A comparison is made between Baldrige criteria and the various elements of ISO 9000, QS9000 and ISO/TS 16949 Standards and their similarities and differences are examined. Implementing ISO 9000 requirements as an initial step for TQM implementation is also discussed.

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Introduction

The quest for quality is probably more widespread and intense globally now than at any time in history. Organizations have realized that the key to increased productivity and profitability is improving quality and in order to survive competition from home and abroad, they are forced to return to the basics of better quality management and cost competitiveness measures for their products and services.

One of the most effective strategies evolved over the years that has been successfully used by business organizations is total quality management (TQM). TQM is a systems approach to management that aims to enhance value to customer by designing and continually improving organizational processes and systems. It provides a new vision for management leadership. It places customers as principal focal point and redefines quality as customer satisfaction. The emphasis is on continuous improvement of processes through employee involvement and empowerment. TQM relies on fact-based decision-making.

A number of large corporations have been actively involved in the introduction and implementation of TQM in the last few years. An emerging need for guidelines and standards for TQM implementation forced countries to develop models for self-appraisal and for identifying and addressing quality issues. Perhaps, the first such attempt in the West to develop a comprehensive set of guidelines for achieving world-class quality was in the United States. In 1987 the Congress established the Malcolm Baldrige National Quality Award. The purpose was to promote quality awareness, recognize quality achievements in the US companies, and to publicize successful quality strategies. The criteria used for the award incorporates all major elements of TQM and is often referred to as a *de facto* definition of TQM.

The international organization for standardization (ISO) subsequently developed a set of quality standards, ISO 9000, as a model for quality assurance standards in design, development, production, installation and service. The whole purpose behind the deployment of ISO 9000 was to simplify the international exchange of goods and services by developing a common set of quality standards. It is a series of standards on quality assurance and quality management. The standards are not specific to products or services, but apply to all processes. The standards are generic and therefore can be used by manufacturing and service organizations around the world. The European Community (EC) nations adopted ISO 9000 as the model for international standards for quality and required



ISO 9000 registration as a mandatory condition for doing business with other nations. The registration implies compliance to documented practices so as to guarantee a consistent level of quality.

QS9000, an extended version of ISO 9000 standards, is a quality system developed by the big three automobiles manufacturers in the US in 1994. Until the introduction of QS9000 these individual manufacturers has imposed separate quality requirements on their suppliers, each with its own set of demands. Since the automakers often share the same supplier base this caused suppliers to spend time and resources to satisfy individual customer requirements, which were often redundant. By streamlining the big three separate requirements into one commonly used set of standards QS9000 virtually eliminated the varying demands and the wastefulness that accompanied them thereby making it easier for the suppliers to do business with the automakers.

ISO/TS 16964 is an ISO technical specification jointly developed by the International Automotive Task Force (IATF) and the ISO that serves as a common automotive quality system requirements catalog. It specifies the quality system requirements for the design, development, production, installation and servicing of automotive-related products.

The specific criteria underlying each of the quality appraisal systems, with emphasis on their relevance to the basic principles of TQM, are summarized first. The relationships between individual requirements are examined and comparisons made in the second part of this paper. There are organizations interested in implementing TQM, but are in the process of identifying the specific direction they should pursue. These comparisons may be beneficial for them in making those decisions. The strategy of implementing ISO requirements as a first step towards TQM implementation is also discussed.

Description of criteria

In this section, brief descriptions of the relevant quality appraisal systems and their underlying criteria are presented.

Baldrige Award

The Baldrige criteria addresses seven major categories and several sub-categories that primarily focus on customer-driven quality and performance excellence. The contents and the format of these categories undergo revisions on a systematic basis for improving clarity and quality.

We will use the year 2002 revision of the Baldrige Award criteria in this paper.

The criteria considers quality management as part of the total business system with primary goals that include achieving customer satisfaction. The seven categories incorporate the core values and concepts and determine the framework for evaluation. Each written application is evaluated by members of a volunteer Board of Examiners and involves a four stage process. The top contenders site are visited by teams of examiners. A panel of judges reviews the site visit reports and recommends award recipients. Final contenders for the award each receive about 500 hours of review by experts. All applicants receive comprehensive feedback reports. The award criteria categories, and sub-categories and the point values are summarized in Table I. A brief description of the categories is as follows.

(1) *Leadership*. The leadership category examines senior executives' personal leadership and involvement in creating and sustaining a customer focus and clear and visible quality values. The way in which these quality values are integrated into the company's management system and the way in which the

Table I 2002 Baldrige Award items point values

2002 Categories/Items	Point values
1. Leadership	120
1.1 Organizational leadership	80
1.2 Public responsibility and citizenship	40
2. Strategic planning	85
2.1 Strategy development	40
2.2 Strategy deployment	45
3. Customer and market focus	85
3.1 Customer and market knowledge	40
3.2 Customer relationships and satisfaction	45
4. Information and analysis	90
4.1 Measurement and analysis of organizational performance	50
4.2 Information management	40
5. Human resource focus	85
5.1 Work systems	35
5.2 Employee education, training, and development	25
5.3 Employee well-being and satisfaction	25
6. Process management	85
6.1 Product and service processes	45
6.2 Business processes	25
6.3 Support processes	15
7. Business results	450
7.1 Customer focused results	125
7.2 Financial and market results	125
7.3 Human resource results	80
7.4 Organizational effectiveness results	120
Total points	1000

Source: US Department of Commerce, National Institute of Standards and Technology (2002)

- company addresses its public responsibilities are also examined.
- (2) *Strategic planning.* This category examines the manner in which the company sets strategic directions to define and strengthen its competitive position. How do the company's key action plans link to their performance?
 - (3) *Customer and market focus.* The manner in which the company determines requirements and expectations of customers and markets are addressed in this category. Also of importance is the process through which customer satisfaction is enhanced and assessed.
 - (4) *Information and analysis.* This category deals with how the company manages its information. These procedures aid in sustaining company performance. The company's selection, use, and management of information and data affect its process management. Thus, both financial and nonfinancial data management techniques are examined.
 - (5) *Human resource development and management.* This category examines how the company develops and realizes the full potential of its workforce in pursuing the company's quality and performance objectives. Does the company maintain an environment for excellence that encourages full participation and personal and organizational growth?
 - (6) *Process management.* Key aspects of process management, which include customer-focused design, product and service delivery processes, support processes, and vendor and partnering processes involving all work units are examined in this category. Does the company incorporate changing customer requirements and technology into its product and service designs? Are production and delivery processes designed to meet the operational performance requirements?
 - (7) *Business results.* This category examines the company's performance and improvement in such key business areas as customer satisfaction, financial and market-place performance, human resources, vendor and partner performance, and operational performance. Performance levels relative to competitors are also considered. Current levels and trends in key measures of customer satisfaction and dissatisfaction are considered. Financial and marketplace performance include such measures as aggregate return on investment, market share, business growth, and new markets entered. Human resource results include employee well being,

satisfaction, development, and work system performance.

ISO 9000:1994/QS9000 series

ISO is a worldwide federation of national standards bodies. The ISO9000 is a series of internationally accepted guidelines as to how companies should set-up quality assurance systems. Focusing on procedures, controls, and documentation, the standards are designed to help a company identify mistakes, streamline its operations, and be able to guarantee a consistent level of quality.

The ISO 9000:1994 consists of five documents, ISO 9000-9004, and provide a series of three international standards – ISO 9001, 9002, and 9003 – dealing with quality systems that can be used for external quality assurance purposes. ISO 9000 provides guidelines for selection and use of the appropriate standard from the three. ISO 9004 is for internal use by organizations to develop their own quality systems. ISO 9001 deals with model for quality assurance in design/development, production, installation, and servicing; ISO 9002 for only production and installation; and ISO 9003 deals with final inspection and test.

The ISO 9000 standards are used in ensuring a supplier's conformance to specified requirements. The quality system requirements specified in these standards are considered complementary to technical product and service requirements. The ISO 9001 is more detailed and includes management responsibility for the quality system, procedures for contract review, and procedures to control and verify product design. In addition, requirements for document control, purchasing, process control, inspection and testing, quality records, quality audits, training and servicing are discussed. The document contains procedures for a total of 20 items. They are listed in Section 1 of Table II.

The standards require documenting conformance of quality systems to the company's quality manual and established quality system requirements. The registration process involves a document review, pre-assessment to identify potential noncompliance, and final assessment leading to registration. Periodic reaudits are required. Feedback from assessment includes a record of nonconformance with specific requirements of the standards.

QS9000 standard

ISO 9000 is the building block of QS9000, making it the foundation of automakers' quality system standard but its requirements are much broader. Unlike the requirements in the ISO 9000

Table II QS9000 requirements

QS/ISO 9001:1994
<i>Section I: ISO 9001-based requirements</i>
4.1 Management responsibility
4.2 Quality system
4.3 Contract review
4.4 Design control
4.5 Document and data control
4.6 Purchasing
4.7 Control of customer-supplied product
4.8 Product identification and traceability
4.9 Process control
4.10 Inspection and testing
4.11 Control of inspection, measuring and test equipment
4.12 Inspection and test status
4.13 Control of nonconforming product
4.14 Corrective and preventive action
4.15 Handling, storage, packaging, preservation and delivery
4.16 Control of quality records
4.17 Internal quality audits
4.18 Training
4.19 Servicing
4.20 Statistical techniques
<i>Section II: QS9000 sector-specific requirements</i>
Production part approval process
1.1 General
1.2 Engineering change validation
Continuous improvement
2.1 General
2.2 Quality and productivity improvements
2.3 Techniques for continuous improvement
Manufacturing capabilities
3.1 Facilities, equipment, and process planning and effectiveness
3.2 Mistake proofing
3.3 Tool design and fabrication
3.4 Tooling management
<i>Section III: QS9000 customer-specific requirements</i>
Chrysler-specific requirements
Ford-specific requirements
General-motors requirements

standards this quality system incorporates continuous improvement strategy into major functions of the organization. It emphasizes defect prevention as well as reduction of variation and waste. QS9000 eliminates redundant requirements while maintaining customer specific, division-specific and commodity-specific requirements. Internal and external suppliers of production and service parts, sub-assemblies, materials components, or other items to the major automakers must conform to the requirements set forth by QS9000.

There are three sections in the QS9000 standards. The first section, common requirements, include the exact text of ISO 9001,

one of the core ISO 9000 quality system models, and the addition of automotive and heavy trucking requirements. The second section covers production part approval process, continuous improvement, and manufacturing capabilities.

The production part approval process (PPAP) plays such a large role in QS9000 that the automobile manufacturers created a separate manual to document all of its PPAP requirements. The QS9000 standard states that production part approval must be granted for an engineering change level, a part number, manufacturing location, material subcontractor(s), and production process environment. When change occurs to any of these situations, customer notification is required, and sometimes, the PPAP documents have to be resubmitted. It was created as a means of assuring that suppliers have a clear understanding of their customers' design specifications for parts and products.

In QS9000, Chrysler, Ford and General Motors stipulate that a comprehensive, continuous improvement philosophy must be established and promoted throughout the supplier's organization. Suppliers should develop a specific action plan for continuous improvement in quality, service (including timing and delivery) and price for all customers. The supplier must identify opportunities for quality and productivity and implement the appropriate improvement projects using measures and methodologies that are suitable. Manufacturing capabilities specifies the following required activities to support manufacturing process improvement: facilities, equipment, and process planning; mistake proofing; tool design and fabrication; and tooling management.

Sections one and two in QS9000 define the quality system requirements. The third section deals with customer-specific requirements that are unique to Chrysler, Ford and General Motors. Requirements that are unique to each company are identified here. For example, a supplier to Chrysler must also comply with the "Chrysler-Specific Requirements" portion of section three.

A complete list of specific item requirements for the ISO/QS 9000 series is given in Table II.

ISO 9000:2000 revision

The original standards which were introduced in 1987 as well as its 1994 revision only required that an organization has a documented, verifiable quality system in place to ensure that it consistently produces what it says it will produce. In fact, compliance to the standards did not necessarily prevent an organization from producing poor-quality products. There was no emphasis on continuous improvement or defect

prevention. In part, it was the deficiencies of ISO 9000 that led to the development of QS9000 by the big three automobile manufacturers in 1994. The goal was to develop fundamental quality systems that provide for continuous improvement, a proactive approach to defect reduction, as well as reduction of variation and waste. In addition, QS9000 also required demonstration of effectiveness in meeting the intent of the standards.

ISO 9000:2000 is the latest revision of the standards. It addresses a number of issues in the old standards that created widespread dissatisfaction and criticism. The new standards have a completely new structure and are based on eight principles that emphasize the core values and concepts of TQM. The new revision also incorporates several of the principles underlying the Baldrige criteria.

Some of the most significant aspects of the revised standard include its emphasis on using a process related structure, using information from the system to facilitate quality improvement, and including customer satisfaction in improvement activities. The new revision also attempts to address the needs and interests of organizations in specific sectors such as telecommunication and automotive.

The ISO 9000:2000 standards consist of four parts:

- (1) ISO 9000: Quality Management Systems – Fundamentals and Vocabulary
- (2) ISO 9001: Quality Management Systems – Requirements
- (3) ISO 9004: Quality Management Systems – Guidance for Performance Improvement
- (4) ISO 19011: Guidelines on Quality and Environmental Auditing

The ISO 9000 provides definitions of key terms. A set of minimum requirements for a quality management system is provided in ISO 9001 and ISO 9004 focuses on improving the quality management system beyond these minimum requirements. The new revision is based on a process model approach and structures 21 elements into four major sections: management responsibility, resource management, product realization and measurement, analysis and improvement. The eight quality management principles as defined by ISO with explanations as to how they should be interpreted in the standards are listed as follows.

ISO 9000:2000 quality management principles

Principle 1: customer focus. Organizations depend on their customers and therefore, should understand current and future customer needs, should meet

customer requirements, and strive to exceed customer expectations.

Principle 2: leadership. Leaders establish unity of purpose and direction of the organization. They should create and maintain the internal environment in which people can become fully involved in achieving the organization's objectives.

Principle 3: involvement of people. People at all levels are the essence of an organization and their full involvement enables their abilities to be used for the organization's benefit.

Principle 4: process approach. A desired result is achieved more efficiently when activities and related resources are managed as a process.

Principle 5: system approach to management. Identifying, understanding, and managing interrelated processes as a system contributes to the organization's effectiveness and efficiency in achieving its objectives.

Principle 6: continual improvement. Continual improvement of the organization's overall performance should be a permanent objective of the organization.

Principle 7: factual approach to decision making. Effective decisions are based on the analysis of data and information.

Principle 8: mutually beneficial supplier relationships. An organization and its suppliers are interdependent and a mutually beneficial relationship enhances the ability of both to create value.

ISO 9000:2000 requirements are listed as follows.

- 1 *Scope*
 - 1.1 General
 - 1.2 Permissible exclusions
- 2 *Normative references*
- 3 *Terms and definitions*
- 4 *Quality management system*
 - 4.1 General requirements
 - 4.2 General documentation requirements
- 5 *Management responsibility*
 - 5.1 Management commitment
 - 5.2 Customer focus
 - 5.3 Quality policy
 - 5.4 Planning
 - 5.4.1 Quality objectives
 - 5.4.2 Quality planning
 - 5.5 Administration
 - 5.5.1 General
 - 5.5.2 Responsibility and authority
 - 5.5.3 Management representative
 - 5.5.4 Internal communication
 - 5.5.5 Quality manual
 - 5.5.6 Control of documents
 - 5.5.7 Control of quality records
 - 5.6 Management review
 - 5.6.1 Review input
 - 5.6.2 Review output

- 6 *Resource management*
 - 6.1 Provision of resources
 - 6.2 Human resources
 - 6.2.1 Assignment of personnel
 - 6.2.2 Training, awareness and competency
 - 6.3 Facilities
 - 6.4 Work environment
- 7 *Product realization*
 - 7.1 Planning of realization processes
 - 7.2 Customer-related processes
 - 7.2.1 Identification of customer requirements
 - 7.2.2 Review of product requirements
 - 7.2.3 Customer communication
 - 7.3 Design and/or development
 - 7.3.1 Design and/or development planning
 - 7.3.2 Design and/or development inputs
 - 7.3.3 Design and/or development outputs
 - 7.3.4 Design and/or development review
 - 7.3.5 Design and/or development verification
 - 7.3.6 Design and/or development validation
 - 7.3.7 Control of design and/or development changes
 - 7.4 Purchasing
 - 7.4.1 Purchasing control
 - 7.4.2 Purchasing information
 - 7.4.3 Verification of purchased products
 - 7.5 Production and service operations
 - 7.5.1 Operations control
 - 7.5.2 Identification and traceability
 - 7.5.3 Customer property
 - 7.5.4 Preservation of product
 - 7.5.5 Validation of processes
 - 7.6 Control of measuring and monitoring devices
- 8 *Measurement, analysis and improvement*
 - 8.1 Planning
 - 8.2 Measurement and monitoring
 - 8.2.1 Customer satisfaction
 - 8.2.2 Internal audit
 - 8.2.3 Measurement and monitoring of processes
 - 8.2.4 Measurement and monitoring of product
 - 8.3 Control of nonconformity
 - 8.4 Analysis of data
 - 8.5 Improvement
 - 8.5.1 Planning for continual improvement
 - 8.5.2 Corrective action
 - 8.5.3 Preventive action

The new revision is designed around a “process approach” and is much more closely aligned with the principles of TQM. The new requirements

emphasize several aspects of TQM such as customer focus, continual improvement, and increased attention to measure systems and for the analysis of data on the performance of the quality management system.

ISO/TS 16949

ISO/TS 16949:2002 is an ISO technical specification that represents a comprehensive quality management system for the global automotive industry to achieve world class levels of product quality, productivity, competitiveness and continual improvement. The IATF, which consists of an international group of vehicle manufacturers and national trade associations, developed these standards in conjunction with the ISO. This specification aligns existing American (QS9000), German (VDA6.1), French (EAQF) and Italian (AVSQ) automotive quality systems standards within the global automotive industry. IATF first developed ISO/TS 16949:1999. This first edition was extensively revised in line with ISO 9001:2000 and published in March 2002 as ISO/TS 16949:2002.

The goal of the new standard is the development of a global management system that provides for continual improvement, emphasizing defect prevention and the reduction of variation and waste in the supply chain. It emphasizes a process approach, commitment to quality by the top management, increased emphasis on customer focus and continual improvement. Together with ISO 9000:2000, ISO/TS 16949:2002 specifies the quality system requirements for the design/development, production, installation and servicing of automotive related products. In addition, there are customer specific requirements by individual manufactures.

Along with customer specific requirements, ISO/TS 16949:2002 standard will eliminate the need for multiple certifications to QS9000, VDA6, EAQF and AVSQ and will be recognized globally.

Applications

In this section, we will discuss how organizations have successfully used Baldrige and the ISO 9000 criteria to improve quality, productivity and profitability.

Since the Congress established the Baldrige Award program in 1987, in the last 15 years, there have been 46 award winners in the manufacturing/service category, three in the education category and one in the healthcare. The education and

healthcare categories were added to the original three categories: manufacturing, service and small business in 1999. These organizations are recognized for their superior business practices that resulted in performance excellence. The award winners include organizations such as Motorola, Xerox Business Services, 3M Dental Products, and Federal Express Corporation as well as two-time winners Selectron Corporation and the Ritz-Carlton Hotel Company.

The Baldrige criteria for performance excellence are widely used as an assessment and improvement tool. The criteria are unique in addressing all the critical elements of an organization's performance system. It provides a valuable framework for assessing and measuring performance on a composite of key financial, operational and customer satisfaction indicators of organizational performance. More than 43 states in the US and many countries, including Japan, have programs modelled after Baldrige.

The Ritz-Carlton Hotel Company, the recipient of 1992 and 1999 Baldrige Award for Service, reports that 75 per cent of its customers would not use a competitor regardless of the offer. It is reported that, in the past two years, Lucent Technologies Inc., Optical Networking Group has reduced new product introduction cycle time by 45 per cent while improving on-time new product availability from 91 to 95 per cent. This group includes what was formerly AT&T Network Systems Transmission Systems Business Unit that received the Baldrige Award in 1992. Marlow Industries, a 1991 Baldrige Award recipient in the small business category, reports that they are using the Baldrige criteria to further integrate their supplier chain into their upfront business processes.

Another Baldrige Award recipient in small business category, Wain Wright Industries Inc., is successfully using the Baldrige process as its foundation for developing their e-business strategy. A 1997 award recipient, 3M Dental Products Division, doubled its global sales and market share by implementing Baldrige process over ten years prior to applying for the award. Trident Precision Manufacturing, Inc., a 1996 Baldrige Award recipient, empowers its employees to make process improvements, implementing 98 per cent of the 5,000 suggestions it received between 1998 and 1999, and 95 per cent of the improvements at Trident come from its own resources and people. Similar success stories are reported by other Baldrige Award recipients including Cadillac Division on sales and service satisfaction, Globe Metallurgical Inc., on growth in revenue per employee, and by IBM Rochester on significant increase in customer satisfaction and loyalty rating.

Cessna Aircraft Co., not a Baldrige Award recipient, uses the Baldrige process to identify their best suppliers. All suppliers are expected to submit a 50-page Baldrige Award assessment application to a third party approved by Cessna for evaluation. Those who score high in the process are rewarded with more work and those who score low will be phased out of its supply base. The suppliers are asked to review the scoring process annually for improvements. The company believes that better quality and competitive cost control by suppliers will eventually turn a healthier profit.

A study by the National Institute of Standards and Technology (2002) that manages the Baldrige Award program reported that for the eighth year in a row the Baldrige index outperformed the S&P 500 in their stock investment study. The Baldrige index is a fictitious stock fund made up of publicly traded US companies that received the Baldrige Award between 1991 and 2000. Other studies have also found that organizations that receive quality awards generally continue to excel in key areas of performance including stock market.

Also a study of publicly traded firms that have won quality awards, including Baldrige by Hendrick and Singhal (1999), showed that these firms improved in many areas including stock price return, operating income and sales. The five-year study of more than 600 quality award winners provides hard evidence that the effective implementation of performance excellence principles embedded in various quality award criteria make good economic sense.

A comprehensive empirical analysis of the impact of ISO 9000 certification on publicly traded firms was conducted recently by Corbett *et al.* (2002). They tracked financial performance of all publicly traded ISO 9000 certified firms in several industrial sectors in the US and studied the impact of certification on productivity improvements, market benefits, and improved financial performance. Using a performance-based control group of non-certified firms, they found that a firm's decision to seek its first ISO 9000 certification did indeed lead to significant abnormal improvements in financial performance, though the extent to which these are driven by productivity or market conditions varied across sectors.

In analyzing the impact of ISO 9000 certification the researchers found that not only did the firms that receive ISO 9000 certification improve their performance but also the firms that failed to seek certification experienced substantial deterioration in return on assets, productivity and sales. They found that certified companies avoided such decline. Though the firms that received

certification did not, on the average, see their absolute performance improve, they did see their relative performance improve substantially compared to their uncertified peers. These results were true for all sectors in the study. However, some sectors such as industrial machinery and computers and electronics and electrical equipment showed substantially higher return on assets in comparison. For example, non-certified firms in the electronics and electrical equipment sector suffered a drop in the return on assets that amounted to a relative difference of 55 per cent from the two years prior to certification to three years later. Further they concluded that there are even greater financial improvements for companies that received multiple certifications by 1997 than for firms that received one certification.

A survey of 1,880 companies conducted by Irwin Professional Publishing and Dun & Bradstreet Information Services (1996) in a variety of industries whose sales ranged from less than 11 million to more than one billion dollars found significant benefits due to ISO 9000 registration. The companies that reported realized an external benefits of 85.4 per cent since registration. Of these companies, 46.9 per cent said that the most important benefit was a market perception that quality had improved, and 21.2 per cent said that it had given them a competitive advantage. Of the 95.2 per cent of the companies that agreed to have realized internal benefits due to registration, the most important benefits reported were better documentation (50.3 per cent) and greater quality awareness by employees (26.2 per cent). When asked about demand, 39 per cent responded increased customer demand as a result of having ISO 9000 registration. An earlier survey of ISO 9000 registered companies in the UK reported significant benefits in customer service, efficiency and productivity as a result of implementation of the system.

Discussion

In this section, we will consider the relationships between the Baldrige criteria, ISO 9000:2000, QS9000 and the ISO/TS 16949 requirements. There are similarities as well as differences based on both focus and philosophy. Added requirements such as continuous improvement, emphasis on process approach and customer focus to QS9000 and ISO/TS 16949 certainly make them closer to TQM. The ISO/TS 16949:2002 standard which includes the new revision of ISO 9000 is a further improvement in that direction. It stresses the importance of linking information such as customer satisfaction measures, audit results,

corrective and preventive action results and other relevant measures facilitate improvement.

The differences in the focus and philosophy between the Baldrige Award and the ISO 9000 registration were discussed by Reimann and Hertz (1993). They state that there is widespread misconception that the Baldrige Award and the ISO 9000 standards are equivalent, and that the companies should choose one or the other. In fact they differ fundamentally in focus, purpose, and content.

The focus on the Baldrige Award is competitiveness through increased customer satisfaction and improved overall operational performance. The focus of ISO 9000 registration is conformance to practices specified in the registrant's quality system. Quality is defined as customer-driven quality in the Baldrige criteria whereas ISO 9000 has its operational definition of quality as conformity to documented requirements. The ISO standards are aimed primarily at detecting and preventing nonconformance. Unlike the Baldrige Award, the registration does not use outcome oriented results or improvement trends in the assessment process and therefore, does not require demonstration of improving quality levels or similar levels of quality among registered companies. The Baldrige criteria are fully relevant to both manufacturing and service organizations, and the new revision of ISO standards have equivalent focus on both service as well as manufacturing quality issues. Registration requirements do not address customer related issues such as customer satisfaction relative to competitors, customer retention, market responsiveness and cycle time. Moreover, the ISO 9000 standards do not address certain human resource issues such as employee well-being and satisfaction. The scope of Baldrige Award criteria is considerably broader, and the ISO 9000 requirements do not fully address any of the criteria items. Since ISO 9000 registration means conformance to documented practices, the ongoing audits are a tool for assessing continuing compliance as opposed to the continuous improvement philosophy fostered by the Baldrige criteria. The documentation requirements for the ISO 9000 are generally resource intensive.

The primary focus of Baldrige criteria, customer-driven quality, is also emphasized in ISO 9000:2000 requirements. This latest revision of ISO 9000 standard requires that customers have a process for determining customer requirements and the top management is to ensure that all personnel understand the importance of meeting customer requirements. The required advanced product quality planning process in QS9000

integrates the customer requirements within the development and the implementation activities. Again, the QS9000 requirement that the supplier utilize a formal, documented, comprehensive business plan with short- and long-term goals and plans enhances the basic notion in the Baldrige criteria of quality management as part of the total business system. The criteria require that strategic concepts should be linked to short and long range planning to achieve performance excellence.

Another area of agreement between the two is the emphasis placed by both Baldrige criteria and QS9000 in continuous quality improvement as a strategic point, perhaps more than what is in the new revision of ISO 9000. QS9000 requires that a plan for continual quality improvement be fully deployed throughout the supplier's organization that includes all business processes and support services. The supplier is required to document trends in quality and operational performance and compare these with those of competitors and/or appropriate benchmarks. The Baldrige criteria emphasize continuous improvement using benchmarks for all business processes including the process of how the benchmarks are selected. However, neither QS9000 nor ISO 9000:2000 does address directly the issue of employee satisfaction and recognition as is clearly done in the Baldrige criteria.

The new ISO/TS 16949:2002 standard is more demanding than QS9000 due to the fact that it has been strengthened in several key areas which should benefit both manufacturer and customer. There is more emphasis on senior management involvement through setting and communicating quality objectives, allocating resources and integrating these into business plans. Data are used to continually improve product quality and processes. Also there are additional requirements on organizational performance focusing on delivered part quality, on time delivery and customer performance. There is also added emphasis on supplier development where organizations must demonstrate a stronger commitment to improving their own supply base. ISO/TS 16949:2002 registration also brings in increased reciprocal recognition among automobile manufacturers due to clearer and stronger oversight and greater consistency in registration process.

Conclusions

Although ISO 9000:2000 incorporates many of the principles in Baldrige criteria, it still is not a comprehensive business framework as proposed in the Baldrige Award criteria. Meeting the standards

does not necessarily give assurance against defective products but provides a set of good management practices for establishing a quality system. The focus of ISO 9000:2000, QS9000 and ISO/TS 16949:2002 registrations, unlike the Baldrige Award, is compliance to specified practices so as to guarantee a consistent level of product quality. Its main purpose is to enhance and facilitate trade. Perhaps, in today's extremely competitive global market place just making a quality product often may not be enough. Especially for new companies, a quality control certificate can be of great help to open a new market. From that point of view the ISO/QS 9000 registration process is extremely valuable. It has become even more important by the adoption of ISO 9000 standards by the EC. It is reported that in Europe, many companies refuse to do business with enterprises that are not certified by ISO 9000 requirements.

Since ISO 9000 requires to an organization define and document the way it does business, compliance can provide the basic quality system structure that can be improved further to achieve world class quality. In fact, compliance to QS9000 as well as ISO/TS 16949 takes even further in that journey to a world-class quality system. Certification to these standards can be an excellent starting point for TQM implementation. In fact, the requirements in ISO/QS 9000 and ISO/TS 16949 quality system standards serve as a subset of TQM overall requirements. They may be redundant in a mature total quality organization except where mandatory certification requirements are enforced for doing business especially in a global environment.

It is reasonable to expect that more companies would be seeking ISO 9000 and ISO/TS 16949 registrations in the next several years since companies view registration as a critical market tool. Perhaps a winning strategy could be to try to integrate more fully in their efforts to seek certification, important Baldrige criteria strategies such as customer-focus, continuous improvement, and competitiveness through improved overall performance.

References

- Corbett, C.J., Montes, M.J. and Kirsch, D.A. (2002), "The financial impact of ISO 9000 certification: an empirical analysis", unpublished manuscript.
- Hendrick, K.B. and Singhal, V.R. (1999), "The link between total quality management and financial performance", *Advanced Manufacturing*, available at: www.manufacturing.com/october1999/quality.htm

- Irwin Professional Publishing and Dun & Bradstreet Information Services (1996), ISO 9000 Survey.
- US Department of Commerce, National Institute of Standards and Technology (2002), 2002 criteria for performance excellence – Malcolm Baldrige National Quality Award, Gaithersburg, MD 20899.
- Reimann and Hertz (1993), “Baldrige Award and ISO 9000 Standard”, unpublished manuscript.
- National Institute of Standards and Technology (2002), “Baldrige award winners beat the S&P 500 for eighth year”, News release, March.

Further reading

- International Organization for Standards (1994), “ISO 9000:1994 Quality Systems: Model for quality assurance in design, development, production, installation and servicing”.
- “ISO Quality Standard Provide Corporations with Substantial Financial Rewards”, *Commentary*, Vol. 9 No. 15, August 2002, available at: manufacturingnews.com.
- ISO 9001:2000 Quality Management Systems, ISO Web site.
- Automotive Industry Action Group, Quality System Requirements QS9000, 3rd ed.