Part I

Background on QMS and EMS Programs

1 The Quality Movement

1.1 INTRODUCTION

Over the past 20 years or so quality systems have become a major focus in business circles. A business' customer base is continually demanding better product at a lower cost and, in doing so, has forced executive management to rethink how they operate their business from top to bottom. Many of the larger firms such as those in Table 1.1 have had quality auditing programs for their suppliers that have resulted in a steady stream of auditors visiting a business site. This "revolving door" of auditors has given a large number of firms a much stronger foundation for developing their own quality system. It has also given them a "jump start" on implementing ISO 9000 and some of the more stringent quality programs required by customers.

Apart from a few of the major corporations, a structured quality system early on was at best primitive and management was somewhat shortsighted to see the long-term benefits. This short-term thinking has caused the United States to fall behind the Europeans and Japanese in the quality of its manufacturing and in implementing ISO 9000. It has only been recently that U.S. firms have begun to regain the competitive edge. Unfortunately, this "wait and see" approach to new ideas, standards, and methods of doing business has been the norm for U.S. companies. It continues to dominate some of the thinking with the newly released ISO 14000 Environmental Management Standards.

This chapter is intended primarily for the environmental manager. It will focus on giving an overview of the various quality programs in place on a global basis, discuss various national programs, and provide a basic understanding of how the "quality movement" evolved.

1.2 THE UNITED STATES

1.2.1 American National Standards Institute (ANSI)

ANSI is a private federation founded in 1918 that consists of manufacturing and service-oriented businesses, professional societies, government agencies, and consumer and labor groups serving the private and public sectors. One of its functions is to coordinate the United States' involvement in the standards systems. ANSI is the U.S. representative to the International Standardization Organization (ISO) which has developed both the ISO 9000 and ISO 14000 Standards. The well-known "ANSI Standards" have provided conformity in many areas, primarily in the area of health and safety. One of these publications, done jointly with ASQC, is a first attempt at integrating quality and environmental management systems. Known as ANSI/ASQC

TABLE 1.1
Examples of Corporate Quality Systems

Industry	Quality System
Motorola	Quality Systems Review (QSR)
AT&T	Quality Leadership Program (QLP)
U.S. Automotive	Quality System Requirements (QS-9000)
ASMO	Supplier Quality Audit (SQA)
Xerox	Quality Improvement Process (QIP)

TABLE 1.2
Basic Contents of ANSI/ASQC E4–1994

(1) General Provisions Evaluation of Environmental Data	**(3) Part B: Collection and Evaluation of Enivronmental Data**
1.1 Introduction	3.0 General
1.2 Purpose and Content	3.1 Planning and Scoping
1.3 Scope and Field of Application	3.2 Design of Data Collection Operations
1.4 Normative References	3.3 Implementation of Planned Operations
1.5 Definitions	3.4 Assessment and Response
	3.5 Assessment and Verification of Data Usability
(2) Part A: Management Systems	**(4) Part C: Design, Construction, and Operation of Environmental Technology**
2.0 General	4.0 General
2.1 Management and Organization	4.1 Planning
2.2 Quality System and Description	4.2 Design of Systems
2.3 Personnel Qualification and Training	4.3 Construction/Fabrication of Systems and Components
2.4 Procurement of Items and Services	4.4 Operation of Systems
2.5 Documents and Records	4.5 Assessment and Response
2.6 Computer Hardware and Software	4.6 Verification and Acceptance of Systems
2.7 Planning	
2.8 Implementation of Work Processes	
2.9 Assessment and Response	
2.10 Quality Improvement	

E4–1994, *Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs,* its purpose is to provide a system for standardizing a quality management system for environmental data collection and evaluation, and environmental technology design, construction, and operation. Table 1.2 describes the contents of ANSI/ASQC E4–1994.

1.2.2 American Society of Quality Control (ASQC)

Founded on Feb. 16, 1946, ASQC's mission is to facilitate quality improvement tools. This includes providing programs to share information on statistical process control, quality cost measurement and control, total quality management (TQM), failure analysis, and zero defects. ASQC administers, on behalf of ANSI, the U.S. TAG to ISO/TC 176 and TC 207 and, in conjunction with ANSI, is the primary source of ISO 9001 and ISO 14001 information and documentation. Where many industry quality programs have provided a defining structure to the quality system, it has been the ASQC quality improvement tools that have actually helped a business to complete the process.

1.2.3 Total Quality Management

As a pre-ISO 9000 system, TQM is a uniquely American view on how to manage quality and, in its early stages, was the United States' response to Total Quality Control (TQC) begun in Japan. TQM, however, was about 20 years behind TQC (late 1980s vs. early 1960s) in its development. Even after almost 10 years it has still failed to reach the level of maturity TQC has attained, and most likely never will. This is primarily due to three factors: first, the early, short term thinking and "get rich quick" philosophy of American business vs. the long term thinking of Japanese business; second, TQM's focus on management techniques whereby each manager and each employee applies their knowledge and skills to assure high work productivity, then high product quality, and, ultimately, high customer satisfaction (whereas TQC has developed the integration of product and process development through engineering efforts); and, third, the introduction of ISO 9000 has provided a much more defined structure for the establishment of a quality management system. As more structured programs become established, it can be expected that TQM as a system in itself will steadily lose ground and potentially disappear as a viable quality management system.

The TQM philosophy was born in the early 1980s as a result of the frantic search by U.S. industry for a system that would steer it in a direction that would correct its short-term thinking and narrow the gap between it and Japanese industry. TQM, as a result, has "fathered" various quality assurance programs now in use in U.S. industry, such as those in Table 1.1. It has also had its influence on the development of other management systems, one of which is Total Quality *Environmental* Management (see Chapter 2).

1.2.4 QS-9000

Quality Systems Requirements, QS-9000, was developed by the "Big Three" of the U.S. automotive industry — General Motors, Ford, and Chrysler. The purpose of the program is to harmonize and standardize the product quality of their suppliers through continuous improvement as it impacts product safety (preventing defects) and cost reduction (reducing variations and minimizing waste). What QS-9000 does is take ISO 9000 to a higher level of requirements that are more sector (e.g., automotive) and customer-specific as compared to ISO 9000's general international requirements.

One important feature of QS-9000 is its inclusion of some environmental requirements not found in ISO 9000, but are found in ISO 14001. The U.S. automotive industry has recognized the importance of including environmental management into quality management. These environmental requirements are found in QS-9000, Section 2, *Sector-Specific Requirements*, and Section 3, *Customer-Specific Requirements*. Along with ISO 9000 and ISO 14001, QS-9000 will be one of the primary management systems evaluated in this book in terms of quality and environmental integration.

1.2.5 Malcolm Baldridge National Quality Award

In August 1987, President Ronald Reagan signed Public Law 100–107, the Malcolm Baldridge National Quality Award. The purpose of the award was threefold: (1) to promote the awareness of quality excellence; (2) to recognize quality achievements of U.S. businesses; and (3) to publicize successful quality strategies. The responsibility for administering the award was bestowed on the National Institute of Standards and Technology (NIST).

The quality criteria listed in Table 1.3 can assist in the development of an environmental management system. A strong commitment to environmental management has been beneficial to several companies in their pursuit of this award. Specifically, two past winners of the National Quality Award indicated their environmental management systems greatly influenced and enhanced their overall quality systems.

Although the Baldridge Quality Award has its primary focus on quality, it also enhanced their environmental programs. Xerox, a 1989 winner, began formalizing its commitment to the environment when it established a corporate environmental, health, and safety department. This environmental commitment has been greatly reinforced by the company's Leadership Through Quality program, launched in 1984, which led to Xerox Business Products and Systems winning the National Quality Award. Motorola, a 1988 winner, began implementing an environmental information system as a tool in its overall Six Sigma quality systems. The Environmental Information Management System (EIMS) has provided a mechanism for measuring environmental performance and the development of an associated sigma metric for the continual improvement of Motorola's environmental programs.[1]

1.3 THE EUROPEAN UNION

Since it might be expected that most of the readers of this book will be from the United States, it might be important for you to gain a brief understanding of how the European nations operate in their implementation of quality and environmental management systems. This is important because of the primary leadership role the European Union has assumed in the development of the international standards and the potential impact this may play as trade negotiations between the United States and Europe rise to a new level of understanding.

As the major player in the endorsement and establishment of international standards, the European Union consists of 15 European nations much the same way as the United States consists of 50 individual states. These 15 member nations are:

TABLE 1.3
The Malcolm Baldridge National Quality Award 1997 Criteria

1997 Categories/Items	Point Values
1.0 Leadership	**110**
1.1 Leadership System	80
1.2 Company Responsibility and Citizenship	30
2.0 Strategic Planning	**80**
2.1 Strategy Development Process	40
2.2 Strategy Deployment	40
3.0 Customer and Market Focus	**80**
3.1 Customer and Market Knowledge	40
3.2 Customer Satisfaction and Relationship Enhancement	40
4.0 Information and Analysis	**80**
4.1 Selection and Use of Information and Data	25
4.2 Selection and Use of Comparative Information and Data	15
4.3 Analysis and Review of Company Performance	40
5.0 Human Resource Development and Management	**100**
5.1 Work Systems	40
5.2 Employee Education, Training, and Development	30
5.3 Employee Well-Being and Satisfaction	30
6.0 Process Management	**100**
6.1 Management of Product and Service Processes	60
6.2 Management of Support Processes	20
6.3 Management of Supplier and Partnering Processes	20
7.0 Business Results	**450**
7.1 Customer Satisfaction Results	130
7.2 Financial and Market Results	130
7.3 Human Resources Results	35
7.4 Supplier and Partner Results	25
7.5 Company-Specific Results	130
Total Points:	**1000**

Germany, France, the United Kingdom, Italy, Spain, Belgium, The Netherlands, Sweden, Denmark, Norway, Finland, Switzerland, Italy, Austria, and Liechtenstein. They have joined together and recognize the authority of the European Union just as the U.S. states recognize the authority of the United States Federal government.

However, not all of the European Union member nations (e.g., the United Kingdom) fully endorse the extension of the European Union as a strong federal government structure and do not desire to give up their own identity. Table 1.4 shows the comparative rulemaking bodies for the European Union compared to the United States.

TABLE 1.4
Comparative U.S. and European Rulemaking Bodies

United States	European Union
Executive Branch	European Commission (EC)
Senate	European Council
House of Representatives	European Parliament

1.3.1 European Commission (EC)

This Commission's primary responsibility is to propose legislation that will impact the environment of the member nations. Legislation is normally issued as a regulation or a directive.

Regulations are laws that are binding in all member nations without the implementation of any national legislation. An example of a regulation is: EC 1836/93, *EMAS, Eco-Management Audit Scheme*. *Directives* are also laws, but each member can implement the requirements in any manner that will achieve the desired end effect that may include the implementation of national legislation.

1.3.2 British Standards Institute

The British Standards Institute (BSI) was founded in 1901 to assist in the development of British national standards and was the very first national standards body in the world — predating ANSI, ASQC, and ISO. BSI participates as an active member of ISO, CEN (Comitee Europeen de Normalization or Committee for European Standardization), and CENELEC (Comitee Europeen de Normalization Electrotechnique or European Committee for Electrotechnical Standardization). It provides guidance on the development of the European standards as the European Union marches towards a single market.

As mentioned earlier, the United Kingdom does not completely endorse the growing influence of the European Union. It is expected that the British Standards Institute will continue to attempt to take a leadership role in the issuance of standards for application worldwide.

1.4 CANADA

First established in 1919, the Canadian Standards Association (CSA) is Canada's primary standards developer. It certifies and provides registration through its Quality Management Institute (QMI) division. The Canadian Standards Association has been one of the principal players in the development of international standards, such as ISO 9000 and ISO 14000 (primarily on the development of ISO 14040, *Life Cycle Assessment*). As the Canadian counterpart of ANSI, it also supports the International Electrotechnical Commission (IEC) and has been a primary driver of standards in

the areas of design and safety. The famous CSA logo is carried on millions of products throughout the world.

1.5 JAPAN

Many people would argue that the global "quality movement," as we know it, began in Japan after World War II when W.S. Magil of Bell Labs introduced Statistical Quality Control (SQC) to a Japanese industry undergoing rebuilding. However, throughout most of the 1950s and early 1960s, product labeled as "Made in Japan" was considered to be cheap and of inferior quality. Since the mid 1960s, however, that has changed 180 degrees; a quality manufactured product is not only a German hallmark, but now a Japanese one as well. The Japanese not only produce quality, but also demand high quality from their suppliers.

As mentioned earlier when discussing TQM, Total Quality Control originated primarily in Japan in the early 1950s and was developed over the years by utilizing the quality teachings of Deming and others. The Deming Prize originated in Japan and is awarded by the Japan Union of Scientists and Engineers (JUSE). TQC has been the primary instrument for implementing "Kaizen" (continuing improvement), Ishikawa (cause and effect), and the "Taguchi methods" (design of experiments).

1.6 INTERNATIONAL STANDARDIZATION ORGANIZATION

Established in 1947, the International Standardization Organization (ISO) is a non-governmental, worldwide federation consisting of some 90 national bodies. It promotes the development of standardization and related activities with the view to facilitating international exchange of goods and services in most standardization fields. The exceptions are electrical and electronic engineering that are the responsibility of the International Electrotechnical Commission (IEC). The ISO accomplishes this by:

- improving product quality and reliability.
- better compatibility and operability of products and services.
- improving environmental, health, and safety protection.
- simplification for improved usability.
- reducing the number of models and thus cost.
- increasing distribution efficiency.

In 1979, ISO formed Technical Committee (TC) 176 to harmonize the preponderance of national and international standards in the quality field. The result was the release in 1987 of ISO 9000, *Quality Management and Quality Assurance*. Since 1987, certification to the ISO 9000 series of standards has been growing in momentum and has become, in many instances, a requirement to conduct business. It has had its sources of controversy; many businesses have resisted ISO 9000 certification because of the initial and upkeep expenses and the overall time commitment involved.

TABLE 1.5
The ISO 9000 Series of Standards

Description	Standard	Primary Focus
Quality Management and Quality Assurance Standards	ISO 9000	Guidelines for Selection and Use
Quality Systems — Model for Quality Assurance in Design, Development, Production, Installation, and Servicing	ISO 9001	Design, Manufacturing, Installation, and Service
Quality Systems — Model for Production, Installation, and Servicing	ISO 9002	Production and Installation
Quality Systems — Model for Final Inspection and Test	ISO 9003	Final Product Inspection and Test
Quality Management and Quality Assurance Elements	ISO 9004	Guidelines

Additionally, as Table 1.1 points out, many firms have had their own world-class quality programs in place and, therefore, feel they have nothing to gain from implementing an ISO 9000 certification process. ISO 9000 is a set of five related standards tailored for the user and dependent on the scope or type of business. Table 1.5 gives a brief description of the overall system.

Being ISO 9000 certified has not necessarily resulted in fewer customer quality audits. However, as time has passed, the resistance to ISO 9000 certification has dropped off sharply. As acceptance of the system has gained momentum, many firms have begun to recognize certification to the international standards as the only way to unlock new marketing areas despite the high quality systems that they may already have in place.

1.7 THE DEMING PRIZE

For more than 40 years of "preaching" quality, W. Edwards Deming focused on the need to empower the average worker to take control of the quality of his work and for management to accept the blame for everything that goes wrong in business. Although Deming had been "preaching" management responsibility, it was not until 1980 that he actually became known to U.S. industry. For the previous thirty years, he worked primarily with Japanese industry to be more effective in utilizing the techniques of statistical quality control (SQC) introduced into Japan just after World War II by W. S. Magil.

Since 1951, the "Deming Application Prize" has been given by the Japan Union of Scientists and Engineers (JUSE) to companies who display outstanding quality programs. The Deming Prize is given to outstanding individuals in the quality field. The award is an international award and is only given once a year. Deming's 14 Points for Management, initially developed in the 1960s, is basically an abbreviation of his "preaching."

1.7.1 Deming's 14 Points for Management*

1. Create constancy of purpose toward improvement of product and service, with the aim to become competitive and to stay in business, and to provide jobs.
2. Adopt the new philosophy. We are in a new economic age. Western management must awaken to the challenge, must learn their responsibilities, and take on leadership for change.
3. Cease dependence on inspection to achieve quality. Eliminate the need for inspection on a mass basis by building quality into the product in the first place.
4. End the practice of awarding business on the basis of price tag. Instead, minimize total cost. Move toward a single supplier for any one item, on a long-term relationship of loyalty and trust.
5. Improve constantly and forever the system of production and service, to improve quality and productivity, and thus constantly decrease costs.
6. Institute training on the job.
7. Institute leadership. The aim of supervision should be to help people and machines and gadgets to do a better job. Supervision of management is in need of overhaul as well as supervision of production workers.
8. Drive out fear, so that everyone may work effectively for the company.
9. Break down barriers between departments. People in research, design, sales, and production must work as a team, to foresee problems of production and in use that may be encountered with the product or service.
10. Eliminate slogans, exhortations, and targets for the work force asking for zero defects and new levels of productivity. Such exhortations only create adversarial relationships, as the bulk of the causes of low quality and low productivity belong to the system and thus lie beyond the power of the work force.
11. a. Eliminate work standards (quotas) on the factory floor. Substitute leadership.
    b. Eliminate management by objective. Eliminate management by numbers, numerical goals. Substitute leadership.
12. a. Remove barriers that rob the hourly worker of his right to pride of workmanship. The responsibility of supervisors must be changed from sheer numbers to quality.
    b. Remove barriers that rob people in management and in engineering of their right to pride of workmanship. This means, *inter alia*, abolishment of the annual merit rating and of management by objective.
13. Institute a vigorous program of education and self-improvement.
14. Put everybody in the company to work to accomplish the transformation. The transformation is everybody's job.

---

* Reprinted from *Out of the Crisis* by W. Edwards Deming by permission of MIT and The W. Edwards Deming Institute. Published by MIT, Center for Advanced Educational Services, Cambridge, MA 02139. Copyright 1986 by The W. Edwards Deming Institute

1.8 CONCLUSION

There is a tremendous amount of diversity in the quality world. As expected, the more industrialized nations have very advanced programs and have organizations whose primary purpose is to develop and promote quality standards on a national and international scale. A large percentage of small to medium-sized businesses have quality management systems in place and/or are aware of the need of implementing such a program. In contrast, quality programs in less industrialized nations are primarily focused on quality management systems established by a few of their prominent national industries. Small to medium-sized business either do not have the resources and even the awareness of the various quality programs in existence and the need for one.

An environmental manager must become aware of the quality management systems his firm is using or pursuing. It is not expected that an environmental manager should gain an exhaustive understanding of his firm's quality program requirements. The more you understand, the easier it will be to integrate environmental decisions into the quality decisions.

The environmental manager may also require knowledge of several quality systems if the firm is multinational in its operations. The same will be true for a quality manager's need to understand the environmental arena — this will be discussed in the next chapter.