CHAPTER 6

QUALITY ASSURANCE AND RELIABILITY IN THE JAPANESE ELECTRONICS INDUSTRY

Michael Pecht
William R. Boulton

Quality and reliability are two attributes required for all Japanese products, although the JTEC panel found these attributes to be secondary to customer cost requirements. While our Japanese hosts gave presentations on the challenges of technology, cost, and miniaturization, quality and reliability were infrequently the focus of our discussions. Quality and reliability were assumed to be sufficient to meet customer needs. Fujitsu's slogan, "quality built-in, with cost and performance as prime consideration," illustrates this point. Sony's definition of a next-generation product is "one that is going to be half the size and half the price at the same performance of the existing one." Quality and reliability are so integral to Japan's electronics industry that they need no new emphasis.

HISTORY OF JAPAN'S QUALITY MOVEMENT

The quality movement in Japan began in 1946 with the U.S. Occupation Force's mission to revive and restructure Japan's communications equipment industry. General Douglas MacArthur was committed to public education through radio. Homer Sarasohn was recruited to spearhead the effort by repairing and installing equipment, making materials and parts available, restarting factories, establishing the equipment test laboratory (ETL), and setting rigid quality standards for products (Tsurumi 1990). Sarasohn recommended individuals for company presidencies, like Koji Kobayashi of NEC, and he established education for Japan's top executives in the management of quality. Furthermore, upon Sarasohn's return to the United States, he recommended W. Edwards Deming to provide a seminar in Japan on statistical quality control (SQC).

Deming's 1950 lecture notes provided the basis for a 30-day seminar sponsored by the Union of Japanese Scientists and Engineers (JUSE) and provided the criteria for Japan's famed Deming Prize. The first Deming Prize was given to Koji Kobayashi in 1952. Within a decade, JUSE had trained nearly 20,000 engineers in SQC methods. Today Japan gives high rating to companies that win the Deming prize; they number about ten large companies per year. Deming's work has impacted industries such as those for radios and parts, transistors, cameras, binoculars, and sewing machines. In 1960, Deming was recognized for his contribution to Japan's reindustrialization when the Prime Minister awarded him the Second Order of the Sacred Treasure.

In 1954, Dr. Joseph M. Juran of the United States raised the level of quality management from the factory to the total organization. He stressed the importance of systems thinking that begins with product designs, prototype testing, proper equipment operations, and accurate process feedback. Juran's seminar also became a part of JUSE's educational programs. Juran provided the move from SQC to TQC (total quality control) in Japan. This included company-wide activities and education in quality control (QC), QC circles and audits, and promotion of quality management principles. By 1968, Kaoru Ishikawa, one of the fathers of TQC in

Japan, had outlined the elements of TQC management:

- quality comes first, not short-term profits
- the customer comes first, not the producer
- customers are the next process with no organizational barriers
- decisions are based on facts and data
- management is participatory and respectful of all employees
- management is driven by cross-functional committees covering product planning, product design, production planning, purchasing, manufacturing, sales, and distribution (Ishikawa 1985)

By 1991, JUSE had registered over 331,000 quality circles with over 2.5 million participants in its activities. Today, JUSE continues to provide over 200 courses per year, including five executive management courses, ten management courses, and a full range of technical training programs.

One of the innovative TQC methodologies developed in Japan is referred to as the "Ishikawa" or "cause-and-effect" diagram. After collecting statistical data, Ishikawa found that dispersion came from four common causes, as shown in Figure 6.1.

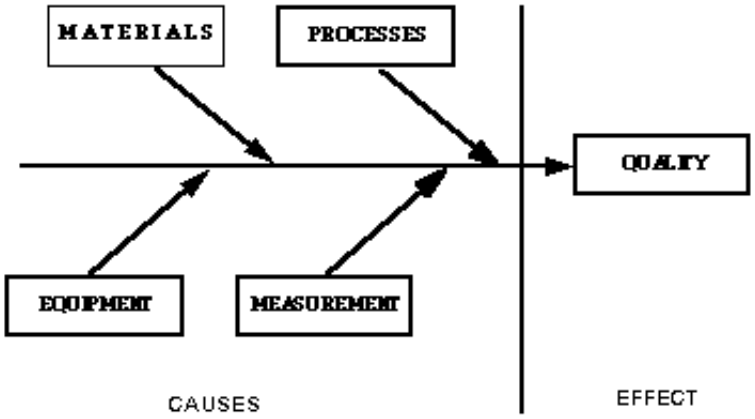

Figure 6.1. Cause-and-effect diagram (Ishikawa 1982, 13).

Materials often differ when sources of supply or size requirements vary. *Equipment or machines* also function differently depending on variations in their own parts, and they operate optimally for only part of the time. *Processes or work methods* have even greater variations. Finally, *measurement* also varies. All of these variations affect a product's quality. Ishikawa's diagram has lead Japanese firms to focus quality control attention on the improvement of materials, equipment, and processes.

JTEC panelists observed statistical process control (SPC) charts, often with goal lines extending into 1995, in a few of the factories they visited in 1993. For example, at Ibiden, process control was apparent in its laminated process board manufacture, where there was extensive use of drawings and descriptions of the processes necessary to do the job. Companies that were competing for the Deming Prize made extensive use of such charts, and companies that had received ISO 9000 certification also posted the process information required for each machine. However, the panel was surprised at the relatively limited use of SPC charts within the factories visited. The Japanese believe that the greatest benefit occurs when defect detection is implemented within the manufacturing sequence, thus minimizing the time required for detection, maximizing return on investment, and indirectly improving product reliability.

ISO 9000 Standards Certification

The concept of certification and standards, however, breaks down when global competitiveness is at stake. Most recently, ISO 9000 certification has become a requirement for exports to Europe, and Japan has been forced to obtain ISO certification, not because it is a quality issue, but because it is a way of increasing market share. The Japanese companies provide some of the highest-quality products, typically using company product standards (best commercial practices) rather than external standards like QML or any U.S. military standards.

The Japan Quality Association (JQA) is responsible for ISO certification. It was established in 1958 as the Japan Management Institute (JMI) under Japan's Ministry of International Trade and Industry for the purpose of export inspection. In 1960, JMI moved from inspection to process certification, and in October 1993, JMI was renamed JQA to more aptly identify its mission. It has provided ISO 9000 certification in Japan since 1990 after receiving training from the British Standards Institution's (BSI) quality assurance division, and it has memoranda of understanding with both BSI and Underwriters Laboratory (UL) in the United States for reciprocal certification acceptance.

By October of 1993, JQA had ISO-certified 300 firms in Japan, about 80% of which were electronics firms; the rest were chemical firms. JQA expected to have about 540 companies certified by the end of 1994. It was already booked through 1994, and there was a backlog of over a hundred companies waiting for certification. Most firms seeking certification were electronics firms that depended on exports to Europe. At the time of the JTEC visit, JQA was limited to about thirty assessments per month. It typically took companies one year to eighteen months to gain certification; most had little difficulty in obtaining ISO certification. In addition to JQA certification, there were an equal number of firms obtaining ISO certification from non-Japanese auditors.

When the JTEC panel visited Japan, Fujitsu, NEC, and Hitachi had the largest number of certified factories. Yamagata Fujitsu became ISO 9002-certified in February 1993 and was applying for ISO 9001 certification for early 1994. Fujitsu had over ten certified factories by the end of 1993. Most of the factories visited by the panel had either received ISO certification or were in the process of certification.

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