

Introduction to Quality

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Quality is by no means a new concept in modern business. In October 1887, William Cooper Procter, grandson of the founder of Procter & Gamble, told his employees, "The first job we have is to turn out quality merchandise that consumers will buy and keep on buying. If we produce it efficiently and economically, we will earn a profit, in which you will share." Procter's statement addresses three issues that are critical to managers of manufacturing and service organizations: *productivity*, *cost*, and *quality*. Productivity (the measure of efficiency defined as the amount of output achieved per unit of input), the cost of operations, and the quality of the goods and services that create customer satisfaction all contribute to profitability. Of these three determinants of profitability, the most significant factor in determining the long-run success or failure of any organization is quality. Some 125 years later, this sentiment was

echoed by the Conference Board, which concluded from a survey of more than 700 CEOs and executives from around the world that quality is uniquely positioned to accelerate organizational growth through better execution and alignment, and it also provides the voice of the customer critical to developing innovative products and services.¹

High-quality goods and services can provide an organization with a competitive edge. A reputation for high quality generates satisfied and loyal customers who reward the organization with continued patronage and favorable word-of-mouth advertising, often resulting in new customers. In contrast, the consequences of failing to adequately address quality can be devastating. Consider Toyota Motor Company: Toyota developed an impeccable reputation for high quality and low cost through relentless attention and continuous improvement of its production processes. The Camry became the best-selling car in America, and by 2008 Toyota overtook General Motors in global sales. But in 2009, a series of “unintended acceleration” incidents, including one involving a Lexus ES 350, led to \$2 billion in recalls to replace floor mats and gas pedal assemblies. Other defects involving antilock braking systems, the wire cables holding spare tires, and vehicle software were soon uncovered, resulting in additional recalls and even suspended sales of eight popular models. As one columnist noted, “No matter how rigorous an automaker’s development process might be, there’s still potential for problems with quality or reliability.”² The problem extended beyond engineering into the underlying management processes of the company. Newspaper articles accused the company of hiding defects that they knew about for many years. Toyota quickly lost its credibility and trustworthiness. Despite the fact that the company was later exonerated, with no finding of design flaws in their braking systems, the damage was done. Akio Toyoda, grandson

of the company’s founder, stated, “We maybe slacked in some of our core principles [like] attention to the basics of manufacturing.... We’re working hard to fill those gaps ... and secure the confidence of our customers.”³ To refocus on quality, Toyota appointed a chief quality officer and an advisory panel on safety, and restructured its reporting system to better communicate defect issues. As this case suggests, quality is vital to products (goods and/or services) as well as the management processes and systems that produce and deliver them.

The mandate for focusing on quality is clear and simple. In working with Chrysler Corporation to improve quality several decades ago, a vice president of the United Auto Workers (UAW) succinctly stated the importance of quality: “No quality, no sales. No sales, no profit. No profit, no jobs.” The role of quality is recognized in many organizations with senior executives in charge of quality at the highest levels of management. For instance, Apple created a new position—Senior Vice President of Operations Dedicated to Product Quality—whose responsibility is to ensure that Apple’s products meet “the highest standards of quality.”⁴

In this chapter, we introduce the notion of quality. We discuss how it is defined, historical developments, its importance in business and in building and sustaining competitive advantage, and the role of quality in manufacturing, service, and business systems.

At the beginning of each chapter we profile two “role-model” organizations, most of which are recipients of the Baldrige Award (also known as the Malcolm Baldrige National Quality Award). The Baldrige Award recognizes outstanding U.S. organizations that have highly effective management practices that lead to superior business results; we will learn more about it in Part III of this book. These examples will help you understand some of the approaches and cultural factors that are characteristic of organizations that have pursued a strategy of quality and performance excellence.

qualityprofiles

Motorola, Inc. and PricewaterhouseCoopers Public Sector Practice

Motorola, Inc. was a household name and a recognized leader in quality for a long time. Like many other companies, Motorola has had its share of difficulties in tough competitive technology markets and economic environments, and as a result, has made many changes in its business operations, existing today as two divisions: Motorola Mobility, which provides communication products for the consumer market, and Motorola Solutions, which provides mission-critical communications products and services to enterprises and governments.

Motorola was a leader in the U.S. quality revolution during the 1980s and was one of the first organizations to receive the Baldrige Award in 1988. It built its culture on two key beliefs: respect for people and uncompromising integrity. Motorola was a pioneer in continual reduction of defects and cycle times in all the company's processes, from design, order entry, manufacturing, and marketing, to administrative functions. Employees in every function of the business measure defects and use statistical techniques to analyze the results. Products that once took weeks to make are now completed in less than an hour. Even the time needed for closing the financial books has been reduced; what used to take a month was shortened to only four days by applying quality principles.

Throughout its history, Motorola's maintained a focus on quality. In 2002, the Commercial, Government, and Industrial Solutions Sector (CGISS) also received a Baldrige Award. CGISS was recognized around the world for its environmental, health, and safety efforts. Customers reported high levels of satisfaction, and the division demonstrated strong financial, product quality, cycle time, and productivity performance. These results came from exceptional practices in managing human assets, sharing data and information with employees, customers, and suppliers, and aligning all its

business processes with key organizational objectives.

PricewaterhouseCoopers Public Sector Practice (PwC PSP) was formed in 2005 and is one of 17 business units of PwC. Key customers are the U.S. federal government and state and local governments. PwC PSP provides business advisory services, including risk consulting, management consulting, and technology consulting. The company has four strategic goals focused on profit, workforce, customers, and operations. These goals are aligned to strategic objectives, strategic advantages, strategic challenges, short- and long-term plans, and performance projections/targets. PwC PSP aligns its workforce into a framework that delivers value to clients while encouraging individual staff career and leadership development. PwC PSP uses its formal Pursuit process to systematically capture business and engage customers. Pursuit integrates methods by which staff can better listen to potential, current, and former customers at various points in each relationship.

These and other approaches have yielded impressive results. Scores rating PwC PSP as "exceptional" or "very good" increased from 50 percent in fiscal year 2008 to levels at or near 100 percent for fiscal years 2010 through 2014. Net Promoter System (NPS; a tool for measuring and comparing customer engagement and loyalty discussed in Chapter 3) survey scores have been 50 or higher in all markets since fiscal year 2012. These scores are equal to or better than NPS scores for some of the most respected companies in the country. Workforce turnover has decreased each year since fiscal year 2009, from approximately 22 percent to 13 percent—a rate that is considerably better than the industry average of 20 percent.

Source: Adapted from Baldrige Award Recipient Profiles, National Institute of Standards and Technology, U.S. Department of Commerce.

DEFINING QUALITY

Quality can be a confusing concept, partly because people view quality subjectively and in relation to differing criteria based on their individual roles in the production-marketing value chain. In addition, the meaning of quality continues to evolve as the quality profession grows and matures. Neither consultants nor business professionals agree on a universal definition. The *Quality Improvement Glossary* defines quality as "a subjective term for which each person has his or her own definition."⁵ For example, one study that asked managers of 86 firms in the eastern United States to define quality produced several dozen different responses, including the following:

1. Perfection
2. Consistency
3. Eliminating waste
4. Speed of delivery
5. Compliance with policies and procedures
6. Providing a good, usable product
7. Doing it right the first time
8. Delighting or pleasing customers
9. Total customer service and satisfaction⁶

Thus, it is important to understand the various perspectives from which quality is viewed in order to fully appreciate the role it plays in the many parts of a business organization. Quality can be defined from six different perspectives: *transcendent*, *product*, *value*, *user*, *manufacturing*, and *customer*.⁷

Transcendent (Judgmental) Perspective

One common notion of quality, often used by consumers, is that it is synonymous with superiority or excellence. In 1931, Walter Shewhart, who was one of the pioneers of quality control, first defined quality as the goodness of a product. This view is referred to as the *transcendent* (*transcend*, "to rise above or extend notably beyond ordinary limits"), or judgmental, definition of quality. In this sense, quality is "both absolute and universally recognizable, a mark of uncompromising standards and high achievement."⁸ Common examples of products associated with an image of excellence are Rolex watches, Ritz-Carlton hotels, and Lexus automobiles. From this perspective, quality cannot be defined precisely—you just know it when you see it. It is often loosely related to the aesthetic characteristics of products that are promoted by marketing and advertising. Product excellence is also often associated with higher prices. However, high quality is not necessarily correlated with price. Just consider the case of a Florida man who purchased, albeit quite some time ago, a \$262,000 Lamborghini only to find a leaky roof, a battery that quit without notice, a sunroof that detached when the car hit a bump, and doors that jammed!⁹

Excellence is abstract and subjective, and standards of excellence may vary considerably among individuals. Hence, the transcendent definition is of little practical value to managers. It does not provide a means by which quality can be measured or assessed as a basis for practical business decisions.

Product Perspective

Another definition of quality is that it is related to the *quantity* of some product attribute, such as the thread count of a shirt or bed sheet, or the number of different features

in an automobile or a cell phone. This assessment implies that larger numbers of product attributes are equivalent to higher quality, so designers often try to incorporate more features into products, whether the customers want them or not. As with the transcendent notion of quality, the assessment of product attributes may vary considerably among individuals. Thus, good marketing research is needed to understand what features customers want in a product.

User Perspective

Individuals have different wants and needs and, hence, different expectations of a product. This leads to a user-based definition of quality—*fitness for intended use*, or how well the product performs its intended function. Both a Cadillac CTS and a Honda Civic are fit for use; they simply serve different needs and different groups of customers. If you want a highway-touring vehicle with luxury amenities, then a Cadillac may better satisfy your needs. If you want a vehicle for commuting in a congested urban environment, a Civic might be preferable.

Nissan Motor Company Ltd.'s early experience in the U.S. market provides an example of applying the fitness-for-use concept.¹⁰ Nissan tested the U.S. market in 1960. Not wanting to put the Nissan name on a very risky venture, they decided to use the name Datsun on all cars and trucks sold in North America. Although the car was economical to own, U.S. drivers found it to be slow, hard to drive, low-powered, and not very comfortable. In essence, it lacked most of the qualities that North American drivers expected and was not "fit for use." The U.S. representative, Mr. Katayama, kept trying to understand customer needs and providing feedback to the designers. For some time, his company refused to believe that U.S. tastes were different from its own. After many years of nagging, Mr. Katayama finally got a product that Americans liked, the sporty 1970 240Z. Eventually, the Nissan brand name replaced Datsun. Car enthusiasts will know that Nissan in 2002 reintroduced a modern version of this classic vehicle, currently the 370Z.

A second example comes from a U.S. appliance company whose stoves and refrigerators were admired by Japanese buyers. Unfortunately, the smaller living quarters of the typical Japanese home lack enough space to accommodate the U.S. models. Some could not even pass through the narrow doors of Japanese kitchens. Although the products' performance characteristics were high, the products were simply not fit for use in Japan.

Value Perspective

A fourth approach to defining quality is based on *value*; that is, the relationship of product benefits to price. Consumers no longer buy solely on the basis of price. They compare the quality of the total package of goods and services that a business offers (sometimes called the *customer benefit package*) with price and with competitive offerings. The customer benefit package includes the physical product and its quality dimensions; presale support, such as ease of ordering; rapid, on-time, and accurate delivery; and postsale support, such as field service, warranties, and technical support. If competitors offer better choices for a similar price, consumers will rationally select the package with the highest perceived quality. If a competitor offers the same quality package of goods and services at a lower price, customers would generally choose the one having the lower price. From this perspective, a quality product is one that provides similar benefits as competing products a lower price, or one that offers greater benefits at a

comparable price. A good example is generic pharmaceuticals, which usually provide the same medical benefits at a lower price.

Competing on the basis of value became a key business strategy in the early 1990s. Procter & Gamble, for example, instituted a concept it called *value pricing*—offering products at “everyday” low prices in an attempt to counter the common consumer practice of buying whatever brand happens to be on special. In this way, P&G hoped to attain consumer brand loyalty and more consistent sales, which also provided significant advantages for its manufacturing and distribution systems.

Competition demands that businesses continually seek to satisfy consumers’ needs at lower prices. The ability to keep prices low requires a strong internal focus on efficiency and quality, as quality improvements in operations generally reduce costs by reducing scrap and rework. Thus, organizations must focus on continually improving both the consumer benefit package and the quality and efficiency of their internal operations.

Manufacturing Perspective

Consumers and organizations want consistency in goods and services. When you frequent a Chipotle restaurant, you expect the same amount of ingredients and taste in every burrito. For the Coca-Cola Company, quality is “about manufacturing a product that people can depend on every time they reach for it,” according to Donald R. Keough, former president and chief operations officer. Through rigorous quality and packaging standards, Coca-Cola strives to ensure that customers will enjoy the taste of its products anywhere in the world. Service organizations likewise strive for consistency in performance; The Ritz-Carlton Hotel Company, for example, seeks to ensure that its customers will have the same quality experience at any of their properties around the world.

Having standards for goods and services and meeting these standards leads to the fifth definition of quality: *conformance to specifications*. **Specifications** are targets and tolerances determined by designers of goods and services. Targets (formally called *nominal specifications*) are the ideal values for which production is to strive; tolerances are necessary because it is impossible to meet targets all of the time. In manufacturing, for example, a part dimension might be specified as “0.236 ± 0.003 cm.” These measurements would mean that the target, or ideal value, is 0.236 centimeters, and that the allowable variation (tolerance) is 0.003 centimeters from the target. Thus, any dimension in the range 0.233 to 0.239 centimeters would conform to specifications. Likewise, in services, “on-time arrival” for an airplane is typically defined as being within 15 minutes of the scheduled arrival time. The target is the scheduled time, and the tolerance is specified to be 15 minutes. Specifications are meaningless, however, if they do not reflect attributes that are deemed important to the consumer. This definition provides an unambiguous way to measure quality and determine if a good is manufactured or a service is delivered as it was designed.

Customer Perspective

The American National Standards Institute (ANSI) and the American Society for Quality (ASQ) standardized official definitions of quality terminology in 1978.¹¹ They defined quality as *the totality of features and characteristics of a product or service that bears on its ability to satisfy given needs*. This definition draws heavily on the product and user definitions and is driven by the need to create satisfied customers. By the end of the 1980s, many organizations had begun using a simpler, yet powerful,

customer-based definition of quality that remains popular today: *meeting or exceeding customer expectations*.

To understand this definition, one must first understand the meanings of "customer." Most people think of a customer as the ultimate purchaser of a product or service; for instance, the person who buys an automobile for personal use or the guest who registers at a hotel is considered an ultimate purchaser. These customers are more precisely referred to as **consumers**. Clearly, meeting the expectations of consumers is the ultimate goal of any business. Before a product reaches consumers, however, it may flow through a chain of many firms or departments, each of which adds some value to the product. For example, an automobile engine plant may purchase steel from a steel company, produce engines, and then transport the engines to an assembly plant. The steel company is a supplier to the engine plant; the engine plant is a supplier to the assembly plant. The engine plant is thus a customer of the steel company, and the assembly plant is a customer of the engine plant. These customers are called **external customers**.

Every employee in an organization also has **internal customers** who receive goods or services from suppliers within the organization. An assembly department, for example, is an internal customer of the machining department, and a person on an assembly line is an internal customer of the person who performs the previous task. Most businesses consist of many such "chains of customers." Thus, the job of any employee is to satisfy the needs of their internal customers, or the entire system can fail. This focus is a radical departure from traditional ways of thinking in a functionally oriented organization. It allows workers to understand their role in the larger system and their contribution to the final product. (Who are the customers of a university, its instructors, and its students?)

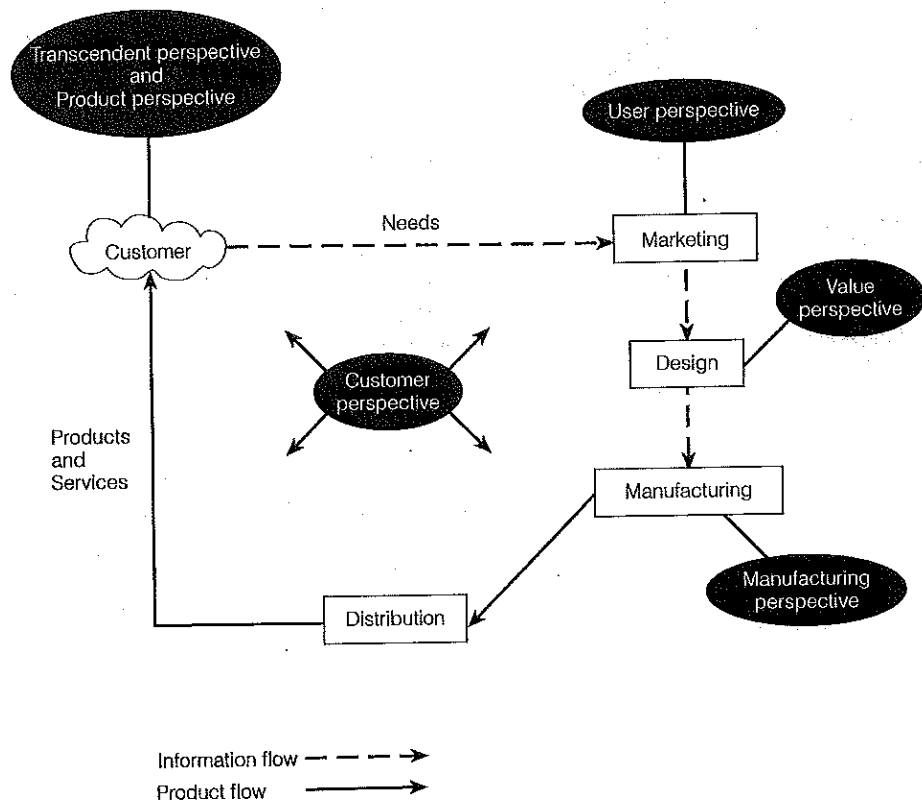
Customer-driven quality is fundamental to high-performing organizations. For instance, Hilton Hotels Corp. implemented its Ultimate Service program, which trains employees to anticipate guest needs, personalize service, and if necessary, deal with complaints quickly and seamlessly in an effort to ensure high levels of customer satisfaction. Hilton also uses rigorous inspections and satisfaction loyalty tracking surveys.¹²

Integrating Quality Perspectives in the Value Chain

Individuals in different business functions—for example, the designer, manufacturer or service provider, distributor, or customer—speak different "languages." Thus, different quality perspectives at different points in the value chain are important to ultimately create and deliver goods and services that will satisfy customers' needs and expectations. To understand this more clearly, examine Figure 1.1, which shows the essential elements of a value chain in manufacturing for developing, producing, and distributing goods to customers. The customer is the driving force for the production of goods and services, and customers generally view quality from either the *transcendent* or the *product perspective*. The goods and services produced should meet customers' needs and expectations. It is the role of the marketing function to determine these. Hence, the *user perspective* of quality is meaningful to people who work in marketing.

The manufacturer must translate customer requirements into detailed product and process specifications. Making this translation is the role of research and development, product design, and engineering. Product specifications might address such attributes as size, form, finish, taste, dimensions, tolerances, materials, operational characteristics, and safety features. Process specifications indicate the types of equipment, tools, and facilities to be used in production. Product designers must balance performance and cost to meet

FIGURE 1.1
Quality Perspectives
in the Value Chain



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financial and marketing objectives; thus, the *value perspective* of quality is most useful at this stage.

The manufacturing function is responsible for guaranteeing that design specifications are met during production and that the final product performs as intended. Thus, for production workers, quality is defined by the *manufacturing perspective*.

Throughout the value chain, each function is an internal customer of others, and the firm itself may be an external customer or supplier to other firms. Thus, the *customer perspective* provides the basis for coordinating the entire value chain.

HISTORY OF QUALITY MANAGEMENT

As the philosopher George Santayana once said, "Those who cannot remember the past are condemned to repeat it." Thus, an understanding of the history of quality can be quite insightful. Quality has been an important aspect of production operations throughout history.¹³ For instance, Egyptian wall paintings circa 1450 BC show evidence of measurement and inspection. Stones for the pyramids were cut so precisely that even today it is impossible to put a knife blade between the blocks. The Egyptians' success was due to good design, the consistent use of well-developed building methods and procedures, and precise measuring devices.

Modern quality assurance methods actually began millennia ago in China during the Zhou Dynasty. Specific governmental departments were created and given responsibility for:

- Production, inventory, and product distribution of raw material (what we now call supply chain management)
- Production and manufacturing
- Formulating and executing quality standards
- Supervision and inspection.

These departments were well organized and helped establish China's central control over production processes. The system even included an independent quality organization responsible for end-to-end oversight that reported directly to the highest level of government.

The central government issued policies and procedures to control production across China—including production of utensils, carts, cotton, and silk—and prohibited the sale of nonconforming, inferior, and substandard products. An example of one of the decrees of the Zhou Dynasty is: "Utensils under standards are not allowed to be sold on the market; carts under standards are not allowed to be sold on the market; cottons and

silks of which the quality and size are not up to the standards are not allowed to be sold on the market." In ancient China, inspection at various stages by the workers themselves was important in establishing responsibility for quality. When a product was found to be nonconforming, the responsible worker was identified and the root causes for the failure evaluated.

A Quality in Practice feature at the end of this chapter examines the role of quality in modern China.

The Age of Craftsmanship

During the Middle Ages in Europe, the skilled craftsperson served both as manufacturer and inspector. "Manufacturers" who dealt directly with the customer took considerable pride in workmanship. Craft guilds, consisting of masters, journeymen, and apprentices, emerged to ensure that craftspeople were adequately trained. Quality assurance was informal; every effort was made to ensure that quality was built into products by the people who produced them. These themes, which were lost with the advent of the Industrial Revolution, are important foundations of modern quality management.

In the middle of the eighteenth century, a French gunsmith named Honoré Blanc developed a system for manufacturing muskets to a standard pattern using interchangeable parts. Thomas Jefferson brought the idea to America, and in 1798, the new U.S. government awarded Eli Whitney a two-year contract to supply 10,000 muskets to its armed forces. The use of interchangeable parts necessitated careful control of quality. Whereas a customized product built by a craftsperson can be tweaked and hammered to fit and work correctly, random matching of mating parts provides no such assurance. The parts must be produced according to a carefully defined standard. Whitney designed special machine tools and trained unskilled workers to make parts following a fixed design, which were then measured and compared to a model. He underestimated the effect of variation in production processes, however (an obstacle that continues to plague many companies to this day). Because of the resulting problems, Whitney needed more than 10 years to complete the project. Nonetheless, the value of the concept of interchangeable parts was recognized, making quality assurance a critical component of the production process during the Industrial Revolution.

The Early Twentieth Century

In the early 1900s, the work of Frederick W. Taylor, often called the “father of scientific management,” led to a new philosophy of production. Taylor’s innovation was to separate the planning function from the execution function. Managers and engineers were given the task of planning; supervisors and workers took on the task of execution. This approach worked well at the turn of the century, when workers lacked the education needed for doing planning. By segmenting a job into specific work tasks and focusing on increasing efficiency, quality assurance fell into the hands of inspectors. Manufacturers were able to ship good-quality products, but at great costs. Defects were present, but were removed by inspection. Plants employed hundreds, even thousands, of inspectors. Inspection was thus the primary means of quality control during the first half of the twentieth century.

Eventually, manufacturing companies created separate quality departments. This artificial separation of production workers from responsibility for quality assurance led to indifference to quality among both workers and their managers. Concluding that quality was the responsibility of the quality department, many upper managers turned their attention to output quantity and efficiency. Because they had delegated so much responsibility for quality to others, upper managers gained little knowledge about quality, and when the quality crisis hit, they were ill-prepared to deal with it.

Ironically, one of the leaders of the second Industrial Revolution, Henry Ford, Sr., developed many of the fundamentals of what we now call “total quality practices” in the early 1900s. This piece of history was not discovered until Ford executives visited Japan in 1982 to study Japanese management practices. As the story goes, one Japanese executive referred repeatedly to “the book,” which the Ford people learned was a Japanese translation of *My Life and Work*, written by Henry Ford and Samuel Crowther in 1926 (New York: Garden City Publishing Co.). “The book” had become Japan’s industrial bible and helped Ford Motor Company realize how it had strayed from its principles over the years. Quality historians noted that Ford executives had to go to a used bookstore to find a copy when they returned to the United States.

The Bell System was the leader in the early modern history of industrial quality management.¹⁴ It created an inspection department in its Western Electric Company in the early 1900s to support the Bell operating companies. Although the Bell System achieved its noteworthy quality through massive inspection efforts, the importance of quality in providing telephone service across the nation led it to research and develop new approaches. In the 1920s, employees of Western Electric’s inspection department were transferred to Bell Telephone Laboratories. The duties of this group included the development of new theories and methods of inspection for improving and maintaining quality. The early pioneers of quality—Walter Shewhart, Harold Dodge, George Edwards, and others such as Joseph Juran and W. Edwards Deming—were members of this group. These pioneers coined the term **quality assurance**—which refers to any planned and systematic activity directed toward providing consumers with products (goods and services) of appropriate quality, along with the confidence that products meet consumers’ requirements—and developed many useful techniques for measuring, controlling, and improving quality. A related term (often used interchangeably with quality assurance) is quality control. **Quality control** is the evaluation of a process to determine if corrective action is needed to ensure that a requisite level of quality is achieved, often through some type of inspection or measurement activity. This term is said to have been invented at H. J. Heinz, when they were the only major food maker to support the 1906 Pure Food and Drug Act.¹⁵ Thus, quality became a technical discipline.

The Western Electric group, led by Walter Shewhart, ushered in the era of **statistical quality control (SQC)**, the application of statistical methods for controlling quality.

Shewhart is credited with developing control charts, which became a popular means of identifying quality problems in production processes and ensuring consistency of output. Others in the group developed many other useful statistical techniques and approaches.

During World War II the U.S. military began using statistical sampling procedures and imposing stringent standards on suppliers. The War Production Board offered free training courses in the statistical methods developed within the Bell System. The impact on wartime production was minimal, but the effort developed quality specialists, who began to use and extend these tools within their organizations. Thus, statistical quality control became widely known and gradually adopted throughout manufacturing industries. Sampling tables labeled MIL-STD, for military standard, were developed and are still widely used today. The discipline's first professional journal, *Industrial Quality Control*, was published in 1944, and professional societies—notably the American Society for Quality Control (now called the American Society for Quality, www.asq.org)—were founded soon after to develop, promote, and apply quality concepts. ASQ is recognized as the leading international society for quality.

Post-World War II

After the war, during the late 1940s and early 1950s, the shortage of civilian goods in the United States made production a top priority. In most companies, quality remained the province of the specialist. Quality was not a priority of top managers, who delegated this responsibility to quality managers. Top management showed little interest in quality improvement or the prevention of defects and errors, relying instead on mass inspection.

During this time, two U.S. consultants, Dr. Joseph Juran and Dr. W. Edwards Deming, introduced statistical quality control techniques to the Japanese to aid them in their rebuilding efforts. A significant part of their educational activity was focused on upper management, rather than quality specialists alone. With the support of top managers, the Japanese integrated quality throughout their organizations and developed a culture of continuous improvement (sometimes referred to by the Japanese term *kaizen*, pronounced *kī-zen*). Back in 1951, the Union of Japanese Scientists and Engineers (JUSE) instituted the Deming Prize (see Chapter 2) to reward individuals and organizations who meet stringent criteria for quality management practice.

Improvements in Japanese quality were slow and steady; some 20 years passed before the quality of Japanese products exceeded that of Western manufacturers. By the 1970s, primarily because of the higher quality levels of their products, Japanese companies' penetration into Western markets was significant. Hewlett-Packard reported one of the more startling facts in 1980. In testing 300,000 16K RAM chips from three U.S. and three Japanese manufacturers, Hewlett-Packard found that the Japanese chips had an incoming failure rate of *zero* failures per thousand compared to rates of 11 and 19 for the U.S. chips. After a thousand hours of use, the failure rate of the U.S. chips was up to 27 times higher. In a few short years, the Japanese made major inroads into a market previously dominated by American companies. Likewise, the number of quality problems reported by consumers for Japanese cars was significantly lower than for domestic models. In the 1980s the U.S. steel, consumer electronics, and even banking industries also were suffering from global competition. U.S. business recognized the crisis.

The U.S. "Quality Revolution"

The decade of the 1980s was a period of remarkable change and growing awareness of quality by consumers, industry, and government. During the 1950s and 1960s, when "made in

Japan" was associated with inferior products, U.S. consumers purchased domestic goods and accepted their quality without question. During the 1970s, however, increased global competition and the availability of higher-quality foreign products led U.S. consumers, armed with increased access to information, to consider their purchasing decisions more carefully and to demand high quality and reliability in goods and services at a fair price.

As technology advanced and products became more complex, the likelihood of a quality problem increased. Government safety regulations, product recalls, and the rapid increase in product-liability judgments changed society's attitude from "let the buyer beware" to "let the producer beware." Businesses began to recognize that quality was vital to their survival. A Westinghouse vice president of corporate productivity and quality summed up the situation with the quote often attributed to Dr. Samuel Johnson: "Nothing concentrates a man's mind so wonderfully as the prospect of being hanged in the morning."

One of the most influential individuals in the quality revolution was W. Edwards Deming. In 1980, NBC televised a special program entitled "If Japan Can ... Why Can't We?" The widely-viewed program revealed Deming's key role in the development of Japanese quality, and his name was soon a household word among corporate executives. Although Deming had helped to transform Japanese industry three decades earlier, it was only after viewing the television program that U.S. manufacturers asked for his help. From 1980 until his death in 1993, his leadership and expertise helped many U.S. organizations to revolutionize their approach to quality.

Quality became recognized as a key to worldwide competitiveness and was heavily promoted throughout industry.¹⁶ Most major U.S. firms instituted extensive quality improvement campaigns, directed not only at improving internal operations, but also toward satisfying external customers. Xerox, for instance, discovered that its Japanese competitors were selling small copiers for what it cost Xerox to make them at the time, and as a consequence, initiated a corporate-wide quality improvement focus to meet the challenge. Xerox, and its former CEO David Kearns, who led their "Leadership Through Quality" initiative, had a major influence in the promotion of quality among U.S. corporations. In the five years of continuous improvement culminating in the firm's receiving the Baldrige Award in 1989, defects per 100 machines were decreased by 78 percent, unscheduled maintenance was decreased by 40 percent, manufacturing costs dropped 20 percent, product development time decreased by 60 percent, overall product quality improved 93 percent, service response time was improved by 27 percent, and the company recaptured much of the market it had lost. The company experienced strong growth during the 1990s. However, Xerox lost focus on quality as a key business driver, much of it due to short-sightedness on the part of former top management. Fortunately, better corporate leadership recognized the crisis and renewed its focus and commitment to quality (see the Quality in Practice case at the end of this chapter).

Rapid Growth of Quality in Business

As business and industry began to focus on quality, the government recognized how critical quality is to the nation's economic health. In 1984, the U.S. government designated October as National Quality Month. In 1985, NASA announced an Excellence Award for Quality and Productivity. In 1987, the Baldrige Award, a statement of national intent to provide quality leadership, was established by an act of Congress. The Baldrige Award became the most influential instrument for creating quality awareness among U.S. businesses, and has also had significant global impact. In 1988, President Reagan established the Federal Quality Prototype Award and the President's Award for governmental agencies.

From the late 1980s and through the mid-1990s, interest in quality grew at an unprecedented rate. Manufacturers as well as service organizations made significant strides in improving quality. In the automobile industry, for example, improvement efforts by U.S. automakers reduced the number of problems reported per 100 domestic cars in the first 60 to 90 days of ownership from about 170 in 1987 to 136 in 1991. The gaps between Japanese and U.S. quality began to narrow, and U.S. firms regained much of the ground they had lost. (The rate has continued to improve, and many domestic models now rank among the top in recent J. D. Power and Associates' Initial Quality surveys.)

In 1989, Florida Power and Light was the first non-Japanese company to be awarded Japan's coveted Deming Prize for quality; AT&T Power Systems was the second in 1994. Quality practices expanded into the service sector and into such nonprofit organizations as schools and hospitals. By 1990, quality drove nearly every organization's quest for success. By the mid-1990s, thousands of professional books had been written, and quality-related consulting and training had blossomed into a thriving industry. Organizations began to share their knowledge and experience through formal and informal networking. The majority of states in the United States developed award programs for recognizing quality achievements in business, education, not-for-profits, and government. In 1999, Congress added nonprofit education and health care sectors to the Baldrige Award, and all other nonprofit organizations became eligible in 2007.

From Product Quality to Total Quality Management

In the 1970s, a General Electric task force studied consumer perceptions of the quality of various GE product lines.¹⁷ Lines with relatively poor reputations for quality were found to deemphasize the customer's viewpoint, regard quality as synonymous with tight tolerance and conformance to specifications, tie quality objectives to manufacturing flow, express quality objectives as the number of defects per unit, and use formal quality control systems only in manufacturing. In contrast, product lines that received customer praise were found to emphasize satisfying customer expectations, determine customer needs through market research, use customer-based quality performance measures, and have formalized quality control systems in place for all business functions, not just for manufacturing. The task force concluded that quality must not be viewed solely as a technical discipline, but rather as a management discipline. That is, quality issues permeate all aspects of business enterprise: design, marketing, manufacturing, human resource management, supplier relations, and financial management, to name just a few.

Managers began to realize that the approaches they use to listen to customers and develop long-term relationships, develop strategy, measure performance and analyze data, reward and train employees, design and deliver products and services, and act as leaders in their organizations are the true enablers of quality, customer satisfaction, and business results. In other words, they recognized that the "quality of management" is as important as the "management of quality." In this fashion, quality assurance gave way to *quality management*. Many began to use the term **Big Q** to contrast the difference between managing for quality in all organizational processes as opposed to focusing solely on manufacturing quality (**Little q**).

As organizations came to recognize the broad scope of quality, the concept of **total quality management (TQM)**, or simply **total quality (TQ)**, emerged. A definition of total quality was endorsed in 1992 by the chairs and CEOs of nine major U.S. corporations in cooperation with deans of business and engineering departments of major universities, and recognized consultants:

Total Quality (TQ) is a people-focused management system that aims at continual increase in customer satisfaction at continually lower real cost. TQ is a total system approach (not a separate area or program) and an integral part of high-level strategy; it works horizontally across functions and departments, involves all employees, top to bottom, and extends backward and forward to include the supply chain and the customer chain. TQ stresses learning and adaptation to continual change as keys to organizational success.

The foundation of total quality is philosophical: the scientific method. TQ includes systems, methods, and tools. The systems permit change; the philosophy stays the same. TQ is anchored in values that stress the dignity of the individual and the power of community action.¹⁸

Procter & Gamble proposed a more concise definition: Total quality is the unyielding and continually improving effort by everyone in an organization to understand, meet, and exceed the expectations of customers.

Actually, the concept of TQ had been around for some time. A. V. Feigenbaum recognized the importance of a comprehensive organizational approach to quality in the 1950s and coined the term *total quality control*.¹⁹ The Japanese adopted Feigenbaum's concept and renamed it *companywide quality control*. The term *total quality management* was developed by the U.S. Naval Air Systems Command to describe its Japanese-style approach to quality improvement that is based on participation of all members of an organization in improving goods, services, and the organizational culture.

Early Management Failures

With all the hype and rhetoric (and the unfortunate three-letter-acronym, TQM), organizations scrambled to institute quality programs in the early 1990s. In their haste, many failed, leading to very disappointing results. Consequently, TQM met some harsh criticism. In reference to Douglas Aircraft, a troubled subsidiary of McDonnell Douglas Corporation (since merged with the Boeing Corporation), *Newsweek* stated, "The aircraft maker three years ago embraced 'Total Quality Management,' a Japanese import that had become the American business cult of the 1980s ... At Douglas, TQM appeared to be just one more hothouse Japanese flower never meant to grow on rocky ground."²⁰ Other articles suggested that total quality approaches were passing fads and inherently flawed. However, reasons for TQM failures were most-often rooted in flawed organizational approaches and management systems, such as poor quality strategies or good strategies that were poorly executed, and not because of the underlying principles of quality management. As the editor of *Quality Digest* put it: "No, TQM isn't dead. TQM failures just prove that bad management is still alive and kicking." Although quality can drive business success, it cannot guarantee it, and one must not infer that business failures or stock price drops are the result of poor quality. Today, quality is a requirement just to play the game.

Performance Excellence

As TQM changed the way that organizations thought about customers, human resources, and manufacturing and service processes, many top executives began to recognize that *all* fundamental business activities—such as the role of leadership in guiding an organization, how an organization creates strategic plans for the future, how data and information are used to make business decisions, and so on—needed to be based on quality principles, work together as a system, and be continuously improved as environmental conditions and business directions change. From this perspective, the product-focused notion of quality

evolved into a new concept, called performance excellence. **Performance excellence** can be defined as an integrated approach to organizational performance management that results in

1. delivery of ever-improving value to customers and stakeholders, contributing to ongoing organizational success
2. improvement of overall organizational effectiveness and capabilities, and
3. learning for the organization and for people in the workforce

We will focus on performance excellence in Part III of this book after we have studied the basic practices, tools, and techniques of quality management.

Emergence of Six Sigma

In the quest to remain competitive, and after learning from the failures of TQM, a new approach to quality improvement emerged in the late 1990s, called *Six Sigma*. Six Sigma is a customer-focused, results-oriented approach to business improvement that integrates many traditional quality improvement tools and techniques that have been tested and validated over the years, with a bottom-line and strategic orientation that appeals to senior managers, thus gaining their support. Many organizations have adopted Six Sigma as a way of revitalizing their quality efforts. Recently, Six Sigma tools have been integrated with lean tools from the Toyota production system to address not only quality problems, but other key business problems involving cost reduction and efficiency. We will discuss Six Sigma in depth in Chapter 9.

Globalization of Quality

The global marketplace and domestic and international competition have made organizations around the world realize that their survival depends on high quality.²¹ Many countries, such as Korea and India, have mounted national efforts to increase quality awareness, including conferences, seminars, radio shows, school essay contests, and pamphlet distribution. Spain and Brazil have encouraged the publication of quality books in their native language to make them more accessible (this book has been translated into Spanish, Chinese, and Indonesian). Several professional groups united to form the Middle East Quality Association. Hamdan Bin Mohammed e-University (HBMeU) was established by the government of the United Arab Emirates in Dubai in 2009. It initiated its e-School of Business & Quality Management, which offers undergraduate and master's degree programs in various facets of quality management, as well as continuing education classes and conferences in the region through its e-TQM Institute.²²

Many people believe that quality practices vary widely among different countries and regions. While this may have been true in the past, a 2013 study by the American Society for Quality found no significant indication that the use of quality practices differs among regions around the world. The study suggests that increased accessibility to data, information, and people makes modern quality practices available to everyone and that globalization of organizations has also helped to introduce quality practices by transplanting quality leaders.²³

Current and Future Challenges

The real challenge today is to ensure that managers continue to focus on quality management and performance excellence throughout their organizations. An executive at Texas Instruments observed that "Quality will have to be everywhere, integrated into all aspects of a winning organization." Unfortunately, a survey sponsored by ASQ found significant gaps between executives' awareness of quality improvement processes and implementation, suggesting that many organizations either are not using these proven

approaches or simply don't realize that approaches they do use are rooted in the quality discipline (and may miss key opportunities to improve them).²⁴ As former Xerox president David Kearns observed, quality is "a race without a finish line."

Approaches such as Six Sigma require increased levels of training and education for managers and front-line employees alike, as well as the development of technical staff. Thus, a key challenge is to allocate the necessary resources to maintain a focus on quality, particularly in times of economic downturns. However, businesses will require an economic justification for quality initiatives: Quality must deliver bottom-line results. But as we noted earlier, the process is not easy; quality requires persistence, discipline, and steadfast leadership committed to excellence.

In 2011, the American Society for Quality identified eight key forces that will influence the future of quality:²⁵

1. *Global Responsibility*: An organization must be fully aware of the global impact of its local decisions and realize that as demand grows for the planet's finite resources, waste is increasingly unacceptable. Global responsibility also involves human rights, labor practices, fair operating practices, consumer interests and contributions to society. In an increasingly connected and informed world, responsible efforts are being rewarded by consumers, making it more important than ever to maintain a reputation as an organization driven by global concern.
2. *Consumer Awareness*: With today's technology such as the Internet, Twitter, and Facebook, consumers have access to a wealth of information on which to make purchasing decisions. As a result, organizations must be quick when responding to their customers' concerns and match their products to customers' wants and needs, or risk having their customers defect to a competitor. Many service providers maintain electronic databases that capture customer preferences, allowing them to customize the customer experience. Manufacturing technologies will need to provide similar levels of customization, allowing for economic order quantities of one, along with zero wait times.
3. *Globalization*: Globalization no longer means just an opportunity for organizations to enter new markets. Today, firms have to contend with a growing number of competitors and sources of lower-cost labor and assume the risks associated with global supply chains.
4. *Increasing Rate of Change*: Technology has shifted the rate of change into an entirely new gear, which brings with it opportunities and threats. The threat lies in the possibility that humanity won't be able to adapt to the disruptions that accompany technological advances. But, if it can, the opportunities are nearly limitless. Product life cycles are getting shorter, and industries come into existence, thrive, and die within our lifetimes. As a result, being first to market means more now than ever before, as does the ability to anticipate and respond quickly to consumer demand.
5. *Workforce of the Future*: Competition for talent will increase, and along with technological advances, will change how and where work is done. As a result, organizations will need to become more flexible with how and where their workforces operate. Organizations will need to make a greater investment in training and education, and place a greater emphasis on professional certifications, which will evolve based on organizations' demands for demonstrated competency from its employees.
6. *Aging Population*: As people live longer, organizations face higher costs for health-care and social welfare programs. Retirement becomes "a short-lived artifact of the latter half of the twentieth century." The result is a growing market for organizations to consider as the aging lifestyle becomes more prevalent.
7. *Twenty-first Century Quality*: Quality isn't the same as it was 50 years ago, or even five years ago. Quality is moving beyond the organization's walls to encompass a

customer's entire experience with the organization rather than just the quality of the product or service. This provides more opportunities for quality professionals to apply their skills; we may soon see quality applied to social problems, proving that "quality is exerting itself in new ways—in hopeful ways."

8. *Innovation:* According to the study, innovation is "the pursuit of something different and exciting." Innovation lies at the heart of organizational survival. As the study states, "If innovation means the ability of a company to anticipate customer needs—expressed or unexpressed, known or unknown—and bring products or services to the marketplace that excite customers, then clearly innovation is the fuel of growth in today's changing world, and more so tomorrow."

These eight forces will impact how organizations configure themselves, how managers plan and lead, and how all workers will perform to achieve quality. As ASQ noted, "Quality should shape society. Ultimately, quality methodology will be used to build a better world."

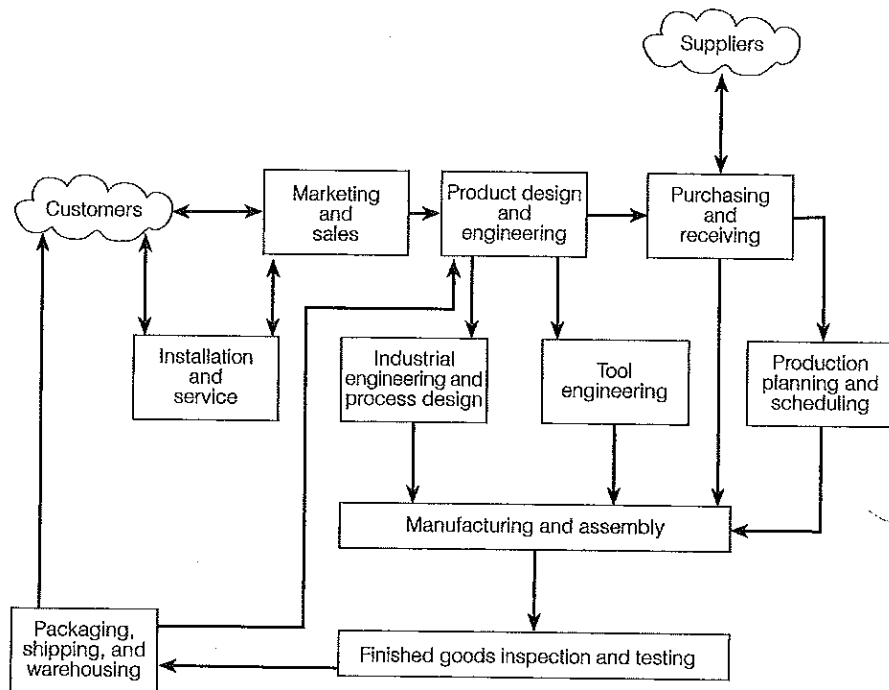
QUALITY IN MANUFACTURING

Quality management is rooted in manufacturing; therefore, that's where we will begin.

Manufacturing Systems

Figure 1.2 illustrates a typical manufacturing system and the key relationships among its functions. The quality concerns of each component of the system are described next.

FIGURE 1.2
Functional Relationships in a Typical
Manufacturing System



Marketing and Sales Milton Hershey, the founder of Hershey Foods Corporation, understood the relationship between quality and sales. He used to say, "Give them quality. That's the best advertising in the world." For the first 68 years it was in business, Hershey Foods did not see a need to advertise its products in the mass media.²⁶ Marketing and sales involve much more than advertising and selling. Today, marketing and sales employees have important responsibilities for quality, such as learning the products and product features that consumers want and knowing the prices that consumers are willing to pay for them. This information enables a firm to define products that are fit for use and capable of being produced within the technological and budgetary constraints of the organization. Salespeople can help to obtain feedback on product performance from customers and convey this information to product designers and engineers for further improvements. They should also help to ensure that customers receive adequate assistance and are completely satisfied.

**QUALITYSPOTLIGHT***Ames Rubber Corporation*

Ames Rubber Corporation, based in Hamburg, New Jersey, produces rubber rollers used to feed paper, transfer toner, and fuse toner to paper in office machines such as copiers, printers, and typewriters. All products are made to order to customer design and specification. Its warranties are among the best in the industry and include a refund of the customer's portion of development costs for prototype parts if Ames fails to achieve the specifications. Sales representatives take special note of such things as the volume of work a customer or prospective customer expects, the product features the customer seeks, and the customer's cost, service, and delivery requirements. Ames's sales department also conducts quarterly customer satisfaction surveys and monthly customer contact surveys. Customer satisfaction surveys collect data in the areas of products, service, information, and relationships. Customer contact surveys, which take the form of informal conversations, explore quality, cost, delivery, and service. The company uses all of this information to improve customer satisfaction.

Product Design and Engineering Under-engineered products will fail in the marketplace because they will not meet customer needs. Products that are over-engineered, that is, those that exceed the customer requirements, may not find a profitable market. Japanese automakers, for instance, discovered in the early 1990s that many consumers were unwilling to pay for some luxury features they had designed into their cars as standard features. Poorly designed manufacturing processes result in poor quality or higher costs. Good design can help to prevent manufacturing defects and service errors and to reduce the need for the non-value-adding inspection practices that have dominated much of U.S. industry.

**QUALITYSPOTLIGHT***Motorola*

Motorola places considerable emphasis on improving manufacturing quality by reducing defects through its product and process design activities. Motorola sets an ambitious goal of *six sigma quality*—a level of quality representing no more than 3.4 defects per million opportunities—for every process in the company. To reach this goal, Motorola knows that before it manufactures a product it must first determine the product characteristics

that will satisfy customers (marketing's role); decide whether these characteristics can be achieved through the product's design, the manufacturing process, or the materials used; develop design tolerances that will assure successful product performance; conduct measurements to determine process variations from existing specifications; and then hone the product design, manufacturing process, or both, in order to achieve the desired results.

Purchasing and Receiving The quality of purchased parts and services and the timeliness of their delivery are critical. The purchasing department can help a firm achieve quality by:

- Selecting quality-conscious suppliers
- Ensuring that purchase orders clearly define the quality requirements specified by product design and engineering
- Bringing together technical staffs from both the buyer's and suppliers' companies to design products and solve technical problems
- Establishing long-term supplier relationships based on trust
- Providing quality-improvement training to suppliers
- Informing suppliers of any problems encountered with their goods
- Maintaining good communication with suppliers as quality requirements and design changes occur

The receiving department is the link between purchasing and production. It must ensure that the delivered items are of the quality specified by the purchase contract, which it does through various inspection and testing policies. If the incoming material is of high quality, extensive inspection and testing is not necessary. Many companies now require that their suppliers provide proof that their processes can consistently turn out products of specified quality and give preferential treatment to those that can.

Production Planning and Scheduling A production plan specifies long-term and short-term production requirements for filling customer orders and meeting anticipated demand. The correct materials, tools, and equipment must be available at the proper time and in the proper places in order to maintain a smooth flow of production. Modern concepts of production planning and scheduling, such as small batch and single piece flow, have been shown to lead to quality improvements and cost savings.

Manufacturing and Assembly The role of manufacturing and assembly in producing quality is to ensure that the product is made correctly. The linkage to design and process engineering, as noted earlier, is obvious; manufacturing cannot do its job without a good product design and good process technology. Once in production, however, no defects should be acceptable. If and when they do occur, every effort must be made to identify their causes and eliminate them. Inspecting-out already defective items is costly and wasteful.



QUALITYSPOTLIGHT

Ames Rubber Corporation

Ames Rubber Corporation produces more than 17,000 custom parts by means of a wide range of manufacturing operations such as casting, extrusion, spraying, and molding. Each operation requires appropriate measuring methods and devices that can closely monitor the manufacturing process. Sophisticated measuring and testing equipment, such as laser-measuring devices, ensure in-line process control. All Ames manufacturing

staff must understand the importance and use of statistics in controlling processes. At each production step, operators, inspectors, and supervisors collect and evaluate performance data. This practice allows Ames to detect deviations from the processes immediately and to make the necessary adjustments.

Tool Engineering The tool engineering function is responsible for designing and maintaining the tools used in manufacturing and inspection. Worn manufacturing tools result in defective parts, and improperly calibrated inspection gauges give misleading information. These and other tool problems lead to poor quality and inefficiency. Engineers at Ames Rubber use statistical techniques to evaluate tooling and equipment and conduct periodic studies to ensure that Ames continues to meet or exceed product requirements. If they cannot, the result is excessive scrap, waste, and higher costs.

Industrial Engineering and Process Design The job of industrial engineers and process designers is to work with product design engineers to develop realistic specifications. In addition, they must select appropriate technologies, equipment, and work methods for producing quality products. For example, Nissan Motor Manufacturing has a fully automated paint system in which robots are programmed to move along with cars. Because the robots always know where the body is, the robot will stop if the line stops but continue the paint cycle until finished as a means of keeping paint quality consistent.²⁷ Industrial engineers also work on designing facilities and arranging equipment to achieve a smooth production flow and to reduce the opportunities for product damage. Recently, industrial engineering as a profession has been incorporating the types of activities more often taught in business schools.

Finished Goods Inspection and Testing If quality is built into the product properly, inspection should be unnecessary except for auditing purposes and functional testing. Electronic components, for example, are subjected to extensive "burn-in" tests that ensure proper operation and eliminate short-life items. In any case, inspection should be used as a means of gathering information that can be used to improve quality, not simply to remove defective items.

Packaging, Shipping, and Warehousing Even good-quality items that leave the plant floor can be incorrectly labeled or damaged in transit. Packaging, shipping, and warehousing—often termed logistics activities—are the functions that protect quality after goods are produced. Accurate coding and expiration dating of products is important for traceability (often for legal requirements) and for customers.

Installation and Service Products must be used correctly in order to benefit the customer. Users must understand a product and have adequate instructions for proper installation and operation. Should any problem occur, customer satisfaction depends on good after-the-sale service. At one company, truck drivers saw the opportunity to do more than merely deliver materials to receiving docks. Where labor relations permit, they make deliveries to specific locations within plants and assist with unloading, stocking, and inventory counts. Many companies specify standards for customer service similar to the dimensions and tolerances prescribed for manufactured goods. For example, associates are expected to arrive for all appointments on time and to return customer phone calls within a prescribed time period. They are also responsible for knowing and observing their respective customers' rules and regulations, especially those that concern safety procedures.

QUALITY IN SERVICE ORGANIZATIONS

Service organizations include all nonmanufacturing organizations such as hotels, restaurants, financial and legal services, and transportation, except such industries as agriculture, mining, and construction. The service sector grew rapidly in the second half of the twentieth century. Today more than 80 percent of the nonfarm employees in the United States are working in services, and more than half the jobs in manufacturing industries are service-related.

Service organizations were probably a good 10 years behind manufacturing in implementing quality approaches. This lag can be attributed to the fact that service industries had not confronted the same aggressive foreign competition that manufacturing faced. Another factor is the high turnover rate in service industry jobs, which typically pay less than manufacturing jobs. Constantly changing personnel makes establishing a culture for quality more difficult. Also, the very nature of quality is significantly different in services than in manufacturing. However, the importance of quality in services cannot be overestimated. Studies show that companies can boost their profits by almost 100 percent by retaining just 5 percent more of their customers than their competitors retain.²⁸ This drastic difference is because the cost of acquiring new customers is much higher than the costs associated with retaining customers. Companies with loyal, long-time customers—even with higher unit costs and smaller market share—can financially outperform competitors with higher customer turnover.

Pure service businesses deliver intangible products. Examples would include a law firm, whose product is legal advice, and a health care organization, whose product is comfort and better health. Service is also a key element for many traditional manufacturing companies. For instance, manufacturers such as Xerox provide extensive maintenance and consulting services, which may be more important to the customer than its tangible products. When you buy an automobile, you are also buying the manufacturer and dealer services. A columnist for *Autoweek* noted that most automakers “have the quality and design thing down pat.” However, he also noted: “None of this matters if a customer walks into the dealership and isn’t treated like a king. Ditto if you have to call the automaker’s customer-service line. You’d better be taken care of, and the experience has to be hassle-free.”²⁹

Contrasts with Manufacturing

The production of services differs from manufacturing in many ways, and these differences carry important implications for quality management. The most critical differences between services and manufacturing are:

1. Customer needs and performance standards are often difficult to identify and measure, primarily because the customers define what they are, and each customer is different.
2. The production of services typically requires a higher degree of customization than does manufacturing. Doctors, lawyers, insurance salespeople, and food-service employees must tailor their services to individual customers. In manufacturing, the goal is uniformity.
3. The output of many service systems is intangible, whereas manufacturing produces tangible, visible products. Manufacturing quality can be assessed against firm design specifications (e.g., the depth of cut should be 0.125 inch), but service quality can only be assessed against customers’ subjective, nebulous expectations, and past

experiences. (What is a "good" sales experience?) Also, the customer can "have and hold" a manufactured product, but can only remember a service. Manufactured goods can be recalled or replaced by the manufacturer, but poor service can only be followed up by apologies, corrective actions, and reparations.

4. Services are produced and consumed simultaneously, whereas manufactured goods are produced prior to consumption. In addition, many services must be performed at the convenience of the customer. Therefore, services cannot be stored, inventoried, or inspected prior to delivery as manufactured goods are. Much more attention must therefore be paid to training and building quality into the service as a means of quality assurance.
5. Customers often are involved in the service process and are present while it is being performed, whereas manufacturing is performed away from the customer. For example, customers of a quick-service restaurant place their own orders, carry their food to the table, and are expected to clear the table when they have finished eating.
6. Services are generally labor intensive, whereas manufacturing is more capital intensive. The quality of human interaction is a vital factor for services that involve human contact. For example, the quality of hospital care depends heavily on interactions among the patients, nurses, doctors, and other medical staff. Banks have found that tellers' friendliness is a key factor in retaining depositors. Hence, the behavior and morale of service employees is critical in delivering a quality service experience.
7. Many service organizations must handle large numbers of customer transactions. For example, on a given business day, the Royal Bank of Canada might process more than 5.5 million transactions for 7.5 million customers through 1,600 branches and more than 3,500 banking machines, and FedEx might handle several million shipments across the globe each day. Such large volumes increase the opportunity for error.

Components of Service Quality

Many service organizations such as airlines, banks, and hotels have well-developed quality systems. These systems begin with a commitment to the customer. For example, Amazon.com has pioneered a number of innovative approaches to improve customer satisfaction, ranging from easy-to-use website design to fast order fulfillment.

Service quality may be viewed from a manufacturing analogy, for instance, technical standards such as the components of a properly made-up guest room for a hotel, service transaction speed, or accuracy of information. However, managing intangible quality characteristics is more difficult, because they usually depend on employee performance and behavior. This dependence does not imply that these factors are not important in manufacturing, of course, but they have special significance in services—just as engineering technology might have in manufacturing.

The two most important drivers of service quality are *people* and *technology*. Many organizations rely on call centers as their primary means of customer contact. Call centers can be a means of competitive advantage by serving customers more efficiently and personalizing transactions to build relationships; however, they can also be a source of frustration if not designed and managed correctly. Customer-contact employees need access to the right technology and company information to do their jobs. FedEx, for example, furnishes employees with the information and technology they need to

continually improve their performance. The Digitally Assisted Dispatch System (DADS) communicates to all couriers through screens in their vans, enabling quick response to pickup and delivery dispatches; it allows couriers to manage their time and routes with high efficiency. Information technology improves productivity, increases communication, and allows customer contact employees to handle almost any customer issue.

Customers evaluate a service primarily by the quality of the human contact. A *Wall Street Journal* survey found that Americans' biggest complaints about service workers are of delivery people or salespeople who fail to show up when you have stayed home at a scheduled time for them; salespeople who are poorly informed; and salesclerks who talk on the phone while waiting on you, say "It's not my department," talk down to you, or cannot describe how a product works.

Many service organizations act on the motto "If we take care of our people, they will take care of our customers." FedEx, for example, has numerous policies and practices to take care of its people, including a "no layoff" philosophy, a "guaranteed fair treatment procedure" for handling grievances, and a well-developed recognition program for team and individual contributions to company performance. The company credo—*People, Service, Profits*—demonstrates the importance of people. All potential decisions in the company are evaluated first on their impact on the employees (people), and then on customers (service) and the company's financial performance (profits).

In many companies, unfortunately, the front-line workers—salesclerks, receptionists, delivery personnel, and so on, who have the most contact with customers—receive the lowest pay, minimal training, little decision-making authority, and little responsibility (when workers receive authority and responsibility, that is termed *empowerment*, which we discuss further in Chapter 4). Recruiting and selecting the right types of individuals and training them are particularly important, because service workers need to be skilled in 'handling every' customer interaction, from greeting customers to asking the right questions. High-quality service workers also require effective reward systems that recognize customer satisfaction results and customer-focused behaviors, appropriate skills and abilities for performing the job, and supervisors who act more as coaches and mentors than as administrators.



QUALITYSPOTLIGHT

The Ritz Carlton-Hotel Company

The Ritz-Carlton Hotel Company, LLC is one service company with an exemplary focus on its people.³⁰ The Ritz-Carlton is widely-recognized for its human resource practices. They train employees to know what they are supposed to do, how well they are doing, and have the authority to make changes as necessary. For example, the role of the housekeeper is not simply to make beds, but to create a memorable experience for the customer. Each hotel has a director of human resources and a training manager, who are assisted by the hotel's quality leader. Each work area has a departmental trainer who is responsible for training and certifying new employees in his or her unit. New employees receive two days' orientation in which senior executives personally demonstrate Ritz-Carlton methods and instill Ritz-Carlton values. Three weeks later, managers monitor the effectiveness of the instruction and then conduct a follow-up training session. Later, they must pass written and skill-demonstration tests in order to become certified in their work areas. Every day, in each work area, each shift supervisor conducts a quality line-up meeting and briefing session. The workforce receives continuous teaching and coaching to refresh skills and improve performance, reinforce

the purpose of the job, and to provide recognition for achievements. Through these and other mechanisms, workers receive more than 100 hours of quality education aimed at fostering a commitment to premium service, solving problems, setting goals, and generating new ideas. Workers are empowered to enlist the aid of others to resolve a problem swiftly, to spend up to \$2,000 to satisfy a guest, to decide the business terms of a sale, to be involved in setting plans for their particular work area, and to speak with anyone in the company regarding any problem. The Ritz-Carlton has improved the turnover rate of the workforce steadily to well below industry averages.

Many service industries exploit information technology to achieve high customer service. Restaurants, for example, use handheld order-entry computer terminals to speed up the ordering process. An order is instantaneously transmitted to the kitchen or bar, where it is displayed and the guest check is printed. In addition to saving time, such systems improve accuracy by standardizing the order-taking, billing, and inventory procedures and reducing the need for handwriting. Credit authorizations, which once took several minutes by telephone, are now accomplished in seconds through computerized authorization systems. FedEx's handheld "SuperTracker" scans packages' bar codes every time packages change hands between pickup and delivery. The Ritz-Carlton Hotel Company exploits information technology to remember each of its 800,000+ customers. Knowledge of individual customer preferences, previous difficulties, family and personal interests, and preferred credit cards is stored in a database accessible to every hotel. This guest-profiling system allows each customer to be treated individually by giving front-desk employees immediate access to such information as whether the guest smokes, whether he or she prefers scented or unscented soap, and what kind of pillow he or she prefers.

Without a doubt, the largest impact of information technology for service has been in e-commerce. Customers can shop for almost any product; configure, price, and order computer systems; and take virtual test drives of automobiles and select from thousands of possible combinations of options on the Internet in the convenience of their homes. Information technology can be used to develop and enhance customer relationships. Amazon.com, from which many readers have probably ordered, has been extremely successful at this. They provide extensive information about products, such as reader reviews to help customers evaluate books, search used bookstores for out-of-print books, and even provide e-mail thank you letters a month or so after purchase. However, while information technology reduces labor intensity and increases the speed of service, it can have adverse effects on other dimensions of quality. Some people, including some customers, will argue that customer satisfaction is decreased when less personal interaction takes place. (Have you ever gotten irritated when wading through multiple menus on an automated telephone answering system?) Thus, service providers must balance conflicting quality concerns.

QUALITY IN BUSINESS SUPPORT FUNCTIONS

In addition to manufacturing and service activities, other business support activities are necessary for achieving quality. Some of these activities are discussed here.

Finance and Accounting The finance function is responsible for obtaining funds, controlling their use, analyzing investment opportunities, and ensuring that the firm operates cost-effectively and—ideally—profitably. Financial decisions affect manufacturing equipment purchases, cost-control policies, price-volume decisions, and nearly all facets of the organization. Finance must authorize sufficient budgeting for equipment, training,

and other means of assuring quality. Financial studies can help to expose the costs of poor quality and opportunities for reducing it. Accounting data are useful in identifying areas for quality improvement and tracking the progress of quality improvement programs. Furthermore, inappropriate accounting approaches can hide poor quality.

Financial and accounting personnel who have contacts with customers can directly influence the service their company provides. At many companies, for example, employees chart invoice accuracy, the time needed to process invoices, and the time needed to pay bills. In addition, they can apply quality improvement techniques to improve their own operations. Financial personnel at Motorola, for example, were able to reduce the time needed to close the books from one month to four days.

Legal Services A firm's legal department attempts to guarantee that the firm complies with laws and regulations regarding such things as product labeling, packaging, safety, and transportation; designs and words its warranties properly; satisfies its contractual requirements; and has proper procedures and documentation in place in the event of liability claims against it. The rapid increase in liability suits has made legal services an important aspect of quality assurance.

Quality Assurance Because some managers lack the technical expertise required for performing needed statistical tests or data analyses, technical specialists—usually in the “quality assurance department”—assist the managers in these tasks. Quality assurance specialists perform special statistical studies and analyses and may be assigned to work with any of the manufacturing or business support functions. It must be remembered that a firm's quality assurance department cannot guarantee quality. Its proper role is to provide guidance and support to everyone in the organization in order to achieve this goal.

A customer-driven quality focus must involve every function in the organization, including manufacturing, service, and business support functions. Quality is indeed everyone's responsibility.

QUALITY AND COMPETITIVE ADVANTAGE

Traditionally, quality has focused on defect and error reduction and product control as a means to reduce costs. However, more progressive organizations have realized that high quality is itself an important source of competitive advantage. **Competitive advantage** denotes a firm's ability to achieve market superiority. A strong competitive advantage provides customer value, leads to financial success and business sustainability, and is difficult for competitors to copy. This was demonstrated by several research studies during the 1980s. PIMS Associates, Inc., a subsidiary of the Strategic Planning Institute, maintains a database of 1,200 companies and studies the impact of product quality on corporate performance.³¹ PIMS researchers found the following:

- Product quality is an important determinant of business profitability.
- Businesses that offer premium-quality products and services usually have large market shares and were early entrants into their markets.
- Quality is positively and significantly related to a higher return on investment for almost all kinds of products and market situations. (PIMS studies showed that firms whose products were perceived as having superior quality earned more than three times the return on sales of firms whose products were perceived as having inferior quality.)

- Instituting a strategy of quality improvement usually leads to increased market share, but at the cost of reduced short-run profitability.
- High-quality producers can usually charge premium prices.

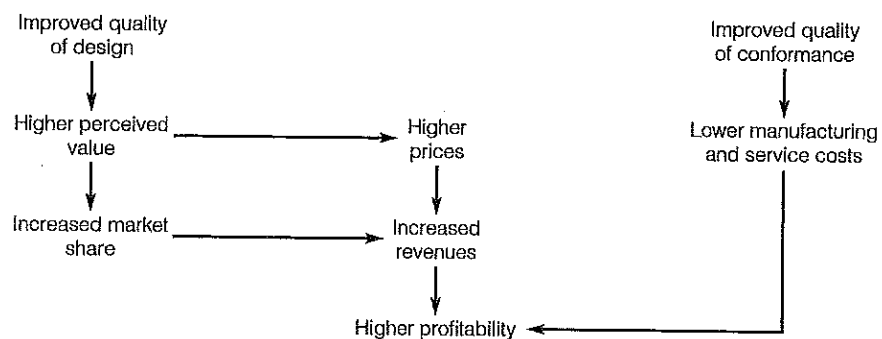
These findings are summarized in Figure 1.3. Profitability is driven by both the quality of design and conformance. Improvements in design will differentiate the product from its competitors, improve a firm's quality reputation, and improve the perceived value of the product. These factors allow the firm to command higher prices as well as to achieve a greater market share, which in turn leads to increased revenues that offset the costs of improving the design. Improved conformance in production or service delivery leads to lower costs through savings in rework, scrap, resolution of errors, and warranty expenses. Philip Crosby popularized this viewpoint in his book *Quality Is Free*.³² Crosby states:

Quality is not only free, it is an honest-to-everything profit maker. Every penny you don't spend on doing things wrong, over, or instead of, becomes half a penny right on the bottom line. In these days of "who knows what is going to happen to our business tomorrow," there aren't many ways left to make a profit improvement. If you concentrate on making quality certain, you can probably increase your profit by an amount equal to 5 percent to 10 percent of your sales. That is a lot of money for free. The net effect of improved quality of design and conformance is increased profits.

Many organizations focus only on one of these quality dimensions; for example, they might focus on defect elimination but fail to design products that customers really want, or they design great products that are plagued with defects and service errors. A case in point is the auto industry. For example, a new model of the Buick Regal beat out the Toyota Camry and Honda Accord in *Consumer Reports'* reliability rankings, but did not make the recommended list because of ho-hum design compared to its competition. In response to such criticism, U.S. automakers have recruited European designers to improve interior amenities and create more exciting exterior styling.³³ On the flip side of the coin is Nissan, which designed and launched many new hot-selling vehicles in the United States, but fell dramatically in J. D. Power & Associates' Initial Quality Survey, resulting in part from using cheaper materials at the expense of manufacturing precision and lacking the engineering resources to check thoroughly for defects during manufacturing.³⁴

Surprisingly, a recent study found that only 24 percent of organizations view quality as a strategic asset and competitive differentiator; the rest view quality as simply a continuous improvement activity, a compliance activity, or as a tool to fix problems and mitigate risks. Service industries view quality as a differentiator more than manufacturing. Organizations that use quality as a competitive differentiator have a

FIGURE 1.3
Quality and Profitability



significantly higher percentage of senior quality leaders who report directly to the CEO, which attests to its importance in the organization.³⁵

Quality and Business Results

As an old saying goes, "The proof is in the pudding." Various research studies have shown that quality-focused companies achieved better employee participation and relations, improved product and service quality, higher productivity, greater customer satisfaction, increased market share, and improved profitability.³⁶

Considerable evidence also exists that quality initiatives positively impact the bottom line. Kevin Hendricks and Vinod Singhal published one of the most celebrated studies in 1997.³⁷ Based on objective data and rigorous statistical analysis, the study showed that when implemented effectively, total quality management approaches improve financial performance dramatically. Using a sample of about 600 publicly traded companies that received quality awards either from their customers (such as automotive manufacturers) or through Baldrige and state and local quality award programs, Hendricks and Singhal examined performance results from six years before to four years after receiving their first quality award. The primary performance measure tracked was the percent change in operating income and a variety of measures that might affect operating income: percent change in sales, total assets, number of employees, return on sales, and return on assets. These results were compared to a set of control firms that were similar in size to the award recipients and in the same industry. The analysis revealed significant differences between the sample and the control group. Specifically, the growth in operating income averaged 91 percent versus 43 percent for the control group. Award recipients also experienced a 69 percent jump in sales (compared to 32 percent for the control group), a 79 percent increase in total assets (compared to 37 percent), a 23 percent increase in the number of employees (compared to 7 percent), an 8 percent improvement in return on sales (compared to zero percent), and a 9 percent improvement in return on assets (compared to 6 percent). Small companies actually outperformed large companies, and over a five-year period, the portfolio of award recipients beat the S&P 500 index by 34 percent.

One may also look at the exceptional performance of Baldrige Award recipients to show that a focus on quality breeds success. A sample of some operational and financial results are highlighted below.

1. Elevations Credit Union (ECU) has been named "Best Financial Institution" by readers of the *Boulder Daily Camera* for 15 of the past 16 years and repeatedly voted "Best Bank," "Best Mortgage Company," or "Best Customer Service" by readers of the *Colorado Daily*, *Boulder Weekly*, *Longmont Times-Call*, and *Loveland Reporter-Herald*.
2. Business satisfaction with the city of Coral Springs, Florida, rose from 76 percent to 97 percent over a four-year period. *Money* magazine named Coral Springs as one of the Best Places to Live. The city was named as one of the 100 best communities for young people by America's Promise Alliance for multiple years.
3. Supplier on-time delivery at Lockheed Martin Missiles and Fire Control has been essentially 100 percent since 2006, and overall supplier quality has been nearly 100 percent since 2007. Time reductions as a result of process and performance improvement programs have occurred in all lines of its businesses, yielding an estimated saving of \$225 million annually.
4. The overall Net Promoter (NP) scores (a loyalty metric defined by the level of repeat sales and referrals) for MEDRAD, a manufacturer of medical imaging devices, were consistently 60 percent or higher compared to the 50 percent or higher marks for

- other organizations nationwide. MEDRAD's global customer satisfaction ratings using the NP system steadily increased from 50 percent to 63 percent, surpassing the best-in-class benchmark of 50 percent.
5. AtlantiCare, a nonprofit health system in southeastern New Jersey, saw its system revenues grow from \$280 million to \$651 million over an eight-year period, reflecting an 11 percent compound annual growth rate, compared to a state average of 5.6 percent. During this time period, AtlantiCare's medical center volume increased from about 34,000 to over 56,000 discharges—also more than twice the state average.
 6. The Pewaukee School District (PSD) is the smallest K-12 educational system in Waukesha County, Wisconsin. Despite having one of the most rigorous public school graduation requirements (28 credits) in the state, PSD achieved a 97.4 percent graduation rate in 2012–2013 and had a higher graduation rate from 2008 through 2012 than other county, state, and nearby high-performing districts. PSD's economically disadvantaged students surpassed the performance of similar students in the county, state, and nearby high-performing schools on the Wisconsin Knowledge and Concept Examinations (WKCE) reading proficiency tests by achieving 45.5 percent proficiency compared to scores below 33 percent.
 7. North Mississippi Health Services leads its primary competitor in market share by 13 percent and all other hospitals combined by 8 percent. Despite its location in what has been called “the nation's epicenter of poverty,” it is the only health care organization in Mississippi or Alabama with a Standard & Poors AA Credit rating, which it has held for over 18 years.

QUALITY AND PERSONAL VALUES

Today, organizations are asking employees to take more responsibility for acting as the point of contact between the organization and the customer, to be team players, and to provide better customer service. Rath & Strong, a Lexington, Massachusetts-based management consulting firm, polled almost 200 executives from Fortune 500 companies about activities that foster superior performance results for an organization.³⁸ The survey revealed that *personal initiative*, when combined with a customer orientation, resulted in a positive impact on business success and sales growth rate.

Quality begins with individual attitudes and behavior. Robert Galvin, former CEO of Motorola, once told the Economic Club of Chicago, “Quality is a very personal obligation. If you can't talk about quality in the first person... then you have not moved to the level of involvement of quality that is absolutely essential.” Employees who embrace quality as a personal value often go beyond what they're asked or normally expected to do in order to reach a difficult goal or provide extraordinary service to a customer. Nordstrom's customer service stories are legendary, and include employees who have ironed a new shirt for a customer who needed it that afternoon, one who warmed customers' cars in winter while they shopped, and even one who refunded money for a set of tire chains, even though Nordstrom does not sell them!³⁹

Personal quality is an essential ingredient to make quality happen in the workplace, yet most organizations have neglected it for a long time. Perhaps management, in particular, operates under the idea that promoting quality is something that organizations do to employees, rather than something they do *with* employees.

Unless quality is internalized at the personal level, it will never become rooted in the culture of an organization. Thus, quality must begin at a personal level (and that means *you!*) and practiced in all activities of daily life.

SUMMARY OF KEY POINTS AND TERMINOLOGY



The Student Companion Site provides a summary of key concepts and terminology introduced in this chapter.

QUALITY *in* PRACTICE

The Evolution of Quality at Xerox⁴⁰

The Xerox 914, the first plain-paper copier, was introduced in 1959. Regarded by many people as the most successful business product ever introduced, it created a new industry. During the 1960s Xerox grew rapidly, selling all it could produce, and reached \$1 billion in revenue in record-setting time. By the mid-1970s its return on assets was in the low 20 percent range. Its competitive advantage was due to strong patents, a growing market, and little competition. In such an environment, management was not pressed to focus on customers.

Facing a Competitive Crisis

During the 1970s, however, IBM and Kodak entered the high-volume copier business—Xerox's principal market. Several Japanese companies introduced high-quality low-volume copiers, a market that Xerox had virtually ignored, and established a foundation for moving into the high-volume market. In addition, the Federal Trade Commission accused Xerox of illegally monopolizing the copier business. After negotiations, Xerox agreed to open approximately 1,700 patents to competitors. Xerox was soon losing market share to Japanese competitors, and by the early 1980s it faced a serious competitive threat from copy machine manufacturers in Japan; Xerox's market share had fallen to less than 50 percent. Some people even predicted that the company would not survive. Rework, scrap, excessive inspection, lost business, and other problems were estimated to be costing Xerox more than 20 percent of revenue, which in 1983 amounted to nearly \$2 billion. Both the company and its primary union, the Amalgamated Clothing and Textile Workers, were concerned. In comparing itself with its competition, Xerox

discovered that it had nine times as many suppliers, twice as many employees, cycle times that were twice as long, 10 times as many rejects, and seven times as many manufacturing defects in finished products. It was clear that radical changes were required.

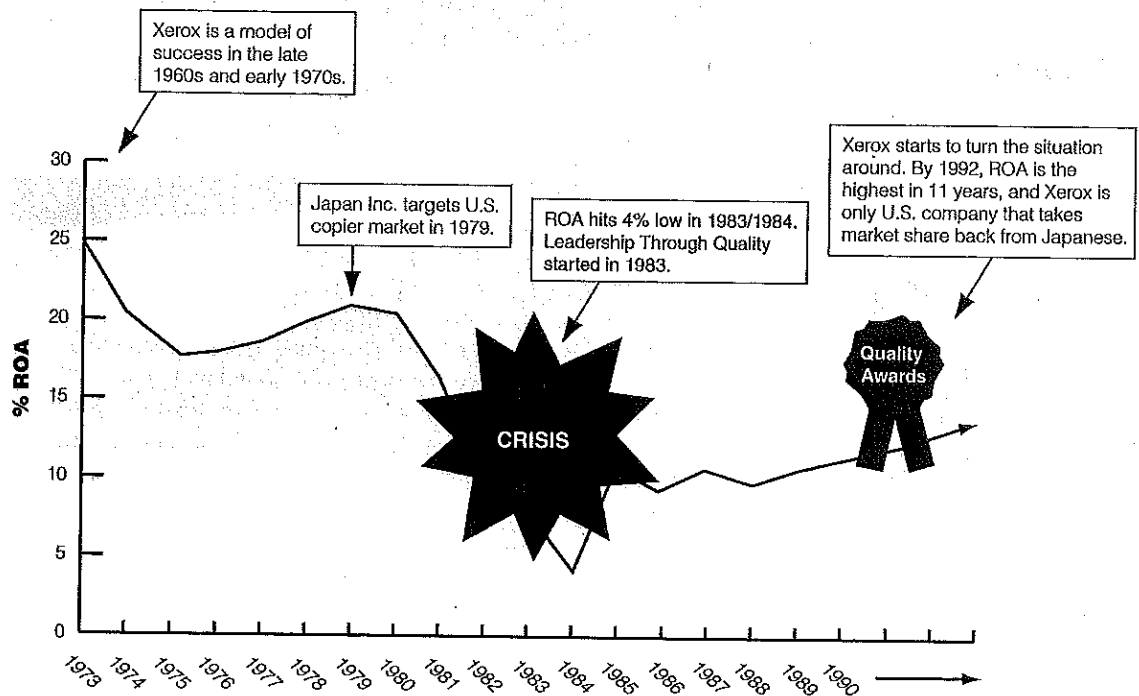
Leadership Through Quality

In 1983, company president David T. Kearns became convinced that Xerox needed a long-range, comprehensive quality strategy as well as a change in its traditional management culture (see Figure 1.4). Kearns was aware of Japanese subsidiary Fuji Xerox's success in implementing quality management practices and was approached by several Xerox employees about instituting total quality management. He commissioned a team to outline a quality strategy for Xerox. The team's report stated that instituting it would require changes in behaviors and attitudes throughout the company as well as operational changes in the company's business practices. Kearns determined that Xerox would initiate a total quality management approach, that they would take the time to "design it right the first time," and that the effort would involve all employees. Kearns and the company's top 25 managers wrote the Xerox Quality Policy, which states:

Xerox is a quality company. Quality is the basic business principle for Xerox. Quality means providing our external and internal customers with innovative products and services that fully satisfy their requirements. Quality improvement is the job of every Xerox employee.

This policy led to a process called Leadership Through Quality, which had three objectives:

FIGURE 1.4 Origin of the 1983 Xerox Quality Imperative



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1. To instill quality as the basic business principle in Xerox, and to ensure that quality improvement becomes the job of every Xerox person.
2. To ensure that Xerox people, individually and collectively, provide our external and internal customers with innovative products and services that fully satisfies their existing and latent requirements.
3. To establish, as a way of life, management and work processes that enable all Xerox people to continuously pursue quality improvement in meeting customer requirements.

In addition, Leadership Through Quality was directed at achieving four goals in all Xerox activities:

- Customer Goal: To become an organization with whom customers are eager to do business.
- Employee Goal: To create an environment where everyone can take pride in the organization and feel responsible for its success.

- Business Goal: To increase profits and presence at a rate faster than the markets in which Xerox competes.
- Process Goal: To use Leadership Through Quality principles in all Xerox does.

Leadership Through Quality radically changed the way Xerox did business. All activities, such as product planning, distribution, and establishing unit objectives, began with a focus on customer requirements. Benchmarking—identifying and studying the companies and organizations that best perform critical business functions and then incorporating those organizations' ideas into the firm's operations—became an important component of Xerox's quality efforts. Xerox benchmarked more than 200 processes with those of noncompetitive companies. For instance, ideas for improving production scheduling came from Cummins Engine Company, ideas for improving the distribution system came from L. L. Bean, and ideas for improving billing processes came from American Express.

Measuring customer satisfaction and training were important components of the program. Every month, 40,000 surveys were mailed to customers, seeking feedback on equipment performance, sales, service, and administrative support. Any reported dissatisfaction was dealt with immediately and was usually resolved in a matter of days. When the program was instituted, every Xerox employee worldwide, and at all levels of the company, received the same training in quality principles. This training began with top management and filtered down through each level of the firm. Five years, 4 million labor-hours, and more than \$125 million later, all employees had received quality-related training. In 1988, about 79 percent of Xerox employees were involved in quality improvement teams.

Several other steps were taken. Xerox worked with suppliers to improve their processes, implement statistical methods and a total quality process, and to support a just-in-time inventory concept. Suppliers that joined in these efforts were involved in the earliest phases of new product designs and rewarded with long-term contracts.

Employee involvement and participation was also an important effort. Xerox had always had good relationships with its unions. In 1980, the company signed a contract with its principal union, the Amalgamated Clothing and Textile Workers, encouraging union members' participation in quality improvement processes. It was the first program in the company that linked managers with employees in a mutual problem-solving approach and served as a model for other corporations. A subsequent contract included the provision that "every employee shall support the concept of continuous quality improvement while reducing quality costs through teamwork."

Most important, management became the role model for the new way of doing business. Managers were required to practice quality in their daily activities and to promote Leadership Through Quality among their peers and subordinates. Reward and recognition systems were modified to focus on teamwork and quality results. Managers became coaches, involving their employees in the act of running the business on a routine basis.

From the initiation of Leadership Through Quality until the point at which Xerox's Business Products and Systems organization won the Malcolm Baldrige

National Quality Award in 1989, some of the most obvious impacts of the Leadership Through Quality program included the following:

1. Reject rates on the assembly line fell from 10,000 parts per million to 300 parts per million.
2. Ninety-five percent of supplied parts no longer needed inspection; in 1989, 30 U.S. suppliers went the entire year defect-free.
3. The number of suppliers was cut from 5,000 to fewer than 500.
4. The cost of purchased parts was reduced by 45 percent.
5. Despite inflation, manufacturing costs dropped 20 percent.
6. Product development time decreased by 60 percent.
7. Overall product quality improved 93 percent.

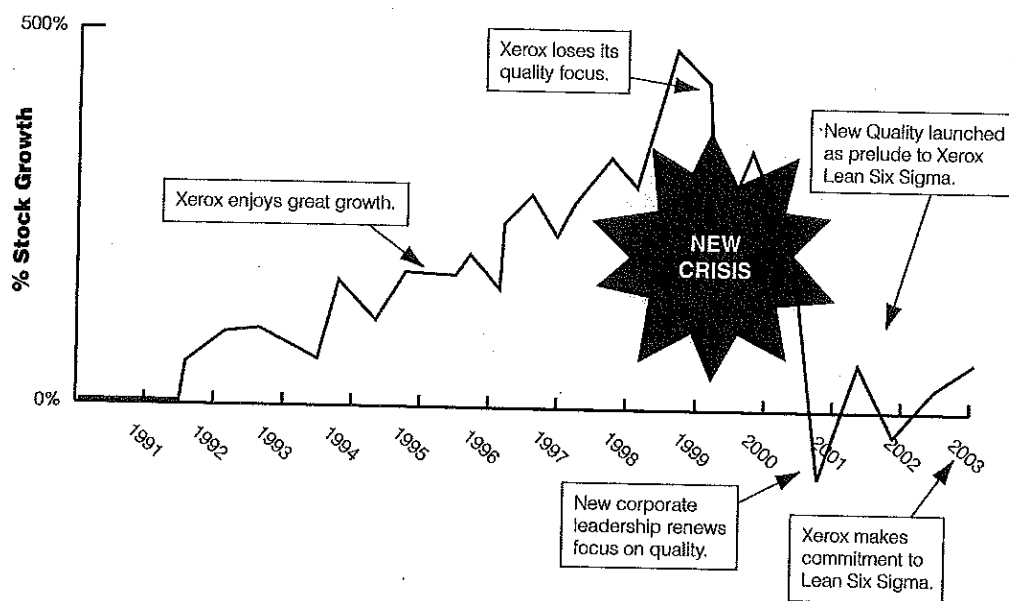
Xerox learned that customer satisfaction plus employee motivation and satisfaction resulted in increased market share and improved return on assets. In 1989, President David Kearns observed that quality is "a race without a finish line."

Crisis and Quality Renewal

Throughout the 1990s, Xerox grew at a steady rate. However, at the turn of the century, the technology downturn, coupled with a decreased focus on quality by top corporate management, resulted in a significant stock price drop and a new crisis (see Figure 1.5). A top management shake-up, resulting in new corporate leadership, renewed the company's focus on quality, beginning with "New Quality" in 2001 and leading to the current "Lean Six Sigma" initiative.

The New Quality philosophy built on the quality legacy established in the 1983 Leadership Through Quality process. Soon afterward, as Six Sigma became more popular across the United States, this approach was refined around a structured, Six Sigma-based improvement process with more emphasis on behaviors and leadership to achieve performance excellence. The new thrust, established in 2003 and called "Lean Six Sigma" (see Chapter 9 for a detailed discussion), includes a dedicated infrastructure and resource commitment to focus on key business issues: critical customer opportunities, significant training of employees and "Black Belt" improvement specialists, a value-driven project

FIGURE 1.5 Restrengthening Quality to Address a New Crisis



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selection process, and an increased customer focus with a clear linkage to business strategy and objectives. The basic principles support the core value "We Deliver Quality and Excellence in All We Do" and are stated as:

- Customer-focused employees, accountable for business results, are fundamental to our success.
- Our work environment enables participation, speed, and teamwork based on trust, learning, and recognition.
- Everyone at Xerox has business objectives aligned to the Xerox direction. A disciplined process is used to assess progress towards delivery of results.
- Customer-focused work processes, supported by disciplined use of quality tools, enable rapid changes and yield predictable business results.
- Everyone takes responsibility to communicate and act on benchmarks and knowledge that enable rapid change in the best interests of customers and shareholders.

The key components of Xerox's Lean Six Sigma are as follows:

1. Performance excellence process
 - Supports clearer, simpler alignment of corporate direction to individual objectives
 - Emphasizes ongoing inspection/assessment of business priorities
 - Clear links to market trends, benchmarking, and Lean Six Sigma
 - Supports a simplified "Baldrige-type" business assessment model
2. DMAIC (define, measure, analyze, improve, control) process
 - Based on industry-proven Six Sigma approach with speed and focus
 - Four steps support improvement projects, set goals
 - Used to proactively capture opportunities or solve problems
 - Full set of lean and Six Sigma tools
3. Market trends and benchmarking
 - Reinforces market focus and encourages external view
 - Disciplined approach to benchmarking

- Establishes a common four-step approach to benchmarking
 - Encourages all employees to be aware of changing markets
 - Strong linkage to performance excellence process and DMAIC
4. Behaviors and leadership
- Reinforces customer focus
 - Expands interactive skills to include more team effectiveness
 - Promotes faster decision making and introduces new meeting tool

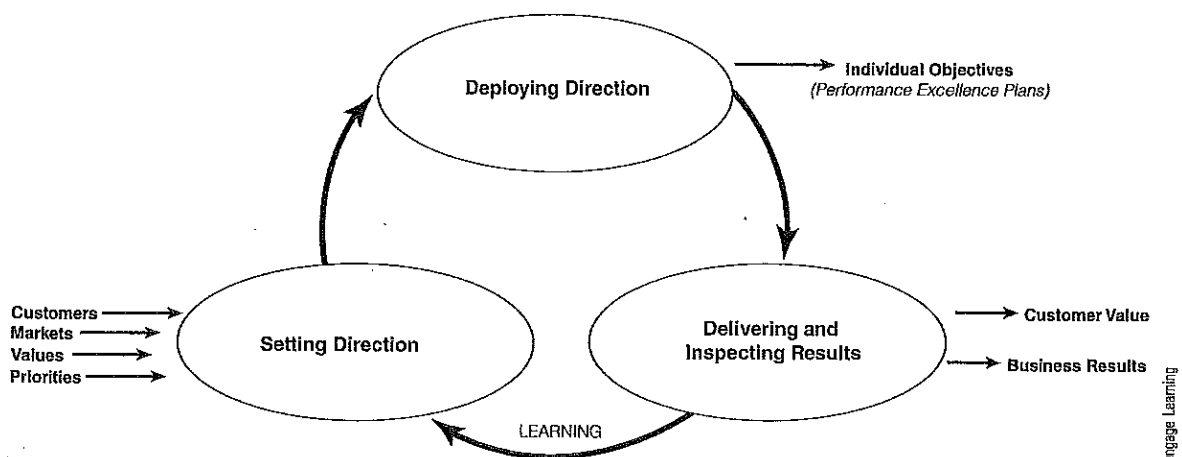
The heart of Xerox's Lean Six Sigma is the performance excellence process, illustrated in Figure 1.6. It consists of three phases: setting direction, deploying direction, and delivering and inspecting results. It starts at the top of the organization—even the chair and CEO has an individual performance excellence plan with objectives that are aligned with organization goals and measures and targets for assessment. This approach provides clear communication of direction and accountability for objectives. A structured approach is used to prioritize and select projects that have high benefits relative to the effort involved in accomplishing them. Statistical methods, lean work flow methods, and other process management skills are used to drive improvement from

a factual, objective basis, driven by the DMAIC methodology.

Market trends and benchmarking help provide an external perspective required to lead the market with innovative products, services, and solutions and add value to the customer experience. This component encourages all people to share information and knowledge that enable changes in the best interest of customers and shareholders. Finally, behaviors and leadership reinforce customer-focused behaviors, based on the principle that "Quality is the responsibility of every Xerox employee."

In 2003, Xerox trained more than 1,000 senior leaders across the company and communicated this business approach, the key differences from their quality legacy, and expectations to every employee, and rapidly moved Lean Six Sigma concepts from manufacturing and supply chain into all business areas. After Lean Six Sigma became internalized within Xerox, the company began to leverage its expertise through consulting services to help other companies improve. One application was at the Brooklyn Public Library. Using Lean Six Sigma, the Xerox Global Services team led library administrators through a fact-based analysis, seeking out core processes, making them controllable, and then automating them, resulting in a comprehensive Patron

FIGURE 1.6 Xerox Performance Excellence Process



Access Management system that effectively merged people, processes, and technology to provide better service and free up time for the library staff.

Key Issues for Discussion

1. Contrast Leadership for Quality and Lean Six Sigma as quality initiatives for Xerox. How did their motivations differ? What differences or similarities are evident in the principles behind these initiatives and the way in which they were implemented?
2. What lessons might this experience—particularly in responding to the new crisis—have for other organizations?
3. Discuss the meaning of “Quality is a race without a finish line.” What is its significance to Xerox, or to any organization?

QUALITY *in* PRACTICE

Quality Practices in Modern China

In this chapter, we noted that many of today's quality approaches evolved in ancient China. Jack Pompeo, a telecommunications professional who relocated to lead quality initiatives at Huawei Technologies, provides a first-hand look at quality in modern China.⁴¹

Quality processes today continue to be influenced by remnants of ancient policies and practices established 3,000 years ago. China continues to exercise strong centralized oversight over end-to-end production processes, extending from the purchase of incoming materials and in-process testing through final acceptances and customer care. Today's Chinese quality systems strongly emphasize tools, methodology and measurement, and place great importance on key quality management processes, including self-inspection, traceability, and recruiting and training of workers. However, even in light of recent and highly-publicized recalls, China's population is adapting and learning rapidly and is hungry for best practices and new challenges.

Today, China is seeking to introduce new ideas like total quality management and team empowerment, which have taken Western society decades to adapt and integrate into business management, in a fraction of the time. China is striving to improve its education, health, living standards, and, most important, its manufactured consumer products, and is embracing modern quality management philosophies. In just the past few years, Chinese manufacturers have adopted a wide array of quality tools and techniques. This has created a clash in China's desire to maintain balance between a centuries-old culture and the demands placed on the nation by technological progress.

China has an official policy to grow the economy about 8 percent annually, the rate state officials calculate would create the 15 million new jobs each year needed to absorb new entrants into the labor market and discards from the shrinking state sector. Every policy is calibrated to ensure economic output continues to expand at this rapid pace. Like businesses in the rest of the world, Chinese organizations are driven by numbers. They identify gaps in their quality management systems and are closing them quickly. They understand that they have a narrow window of opportunity to transform themselves from low cost producers to competitive and high quality global leaders.

Huawei Technologies is one of China's largest telecommunications manufacturers, with annual sales of more than \$10 billion. The company is located in Shenzhen, in the southern portion of the Guangdong Province on the eastern shore of the Pearl River Delta, neighboring Hong Kong to the south. Huawei's products provide reliable telecom services to more than 100 countries. But the company's goal is not to be just another telecom manufacturer; it is to be the quality leader in the telecommunications industry. Huawei's senior management recently declared the company's desire to be the “Toyota of the telecom industry.” To achieve this, Huawei has studied Western telecom manufacturing in great detail and has invested heavily in the latest tools and technology. For example, Huawei uses specific competency models and qualifications for each job role and level; to be promoted, an employee must show they are meeting the competency requirements for quality.⁴² It is constantly looking for better tools and techniques that

will make it a world leader, moving away from its current emphasis on low-cost production.

Huawei's rapid economic growth parallels the company's desire to be the world leader, and Huawei is now in the midst of understanding the critical role that quality processes play in its future expansion. The company places a strong focus on measurements, tools, and methods to enforce strict quality control of production processes. Its management systems are based on accepted worldwide processes and standards and are applied across all of Huawei's product lines in design, development, manufacturing, sales, installation, and service. Huawei also has a complete end-to-end integrated product development process that was implemented with the support of IBM in early 1998. In 2002, Huawei started Six Sigma quality initiatives in its manufacturing center and migrated them into R&D product lines. A Six Sigma steering committee oversees the deployment and reviews and approves projects to ensure they meet the launch criteria and resources are available to support the teams.

The QuEST Forum is a unique collaboration of telecommunications service providers and suppliers dedicated to telecom supply chain quality and performance. The Forum supports its member organizations to pursue performance excellence through implementing a common quality standard, emphasizing industry best practices and delivering a benchmarking measurement system. There are 11 benchmark measurements, including number of problem reports, problem report fix response time, on-time delivery, network element impact outage measurement, and field replacement unit returns. Huawei recently launched an initiative in partnership with the QuEST Forum's integrated global quality workgroup. The goal is to set up a benchmark study team to better understand causes of variability in the benchmark data and raise industry performance.

The benchmark data are a critical component of Huawei's quality management system and are integrated into top management's personal business commitments and the executive management team balanced scorecard. The balanced scorecard measures four key areas in corporation health: financial and profit, customer and quality, growth and learning,

and internal business performance. The report cards and quality metrics are linked to both the executives' performance reviews and bonuses.

Huawei Technologies is just one example of the progress that Chinese companies have made in quality. Today, its automobile industry is beginning to distribute in the United States and in Europe. The government has embarked on a nation-wide program to improve product quality and safety throughout the supply chain that includes a safety tracking and accountability system and a national product quality-monitoring network.⁴³ However, the nation is not without its obstacles. For example, Chinese automobile manufacturers have seen a significant decline in their home market share, which some attribute to poor quality relative to their competitors.⁴⁴ The continued rapid growth of the Chinese economy is threatened by infrastructure limitations, pollution, logistical bottlenecks, a young banking system, and the imbalance between male and female births. Also, China cannot continue progressing by copying foreign technologies forever. China might need another decade to overcome a long list of quality manufacturing problems, such as weak design, before its companies can compete with those in Japan and America.

A research project conducted by China Crosby Management Institute and Peking University's Quality Competitiveness Research Center that assessed the maturity of quality management of Chinese enterprises concluded that, in general, the overall quality mindset in China compares to that in Europe and the United States in the 1980s. Current problems stem from a lack of common quality values, organizational barriers and silos, poor implementation, lack of employee engagement and motivation, subservience of quality to delivery and cost objectives, and a focus on reaction rather than prevention.⁴⁵

Key Issues for Discussion

1. Do you see any parallels between today's China and post-World War II Japan? What differences are evident?
2. What opportunities does China have to learn from the progress made in quality in Japan and the West over the past half-century?