SECTION 40
QUALITY IN THE UNITED STATES

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THE BACKGROUND

The economy of the United States of America (U.S.) rests mainly on a base of numerous autonomous producers and marketers of goods and services. These autonomous companies are characterized by:

1. A high concentration of industry in relatively few companies. The number of companies runs to over a million, but the top 1000 companies account for most of the goods and services produced.
2. A high degree of private ownership of these large companies. Normally, a large company will have thousands of owners, no one of whom owns more than a few percent of the company.
3. A "professional" management. The companies are run by professional managers—persons who consider their lifetime career to be that of managing. These managers become the real power in the company, since the owners are too numerous. In addition, under the prevailing legal system of boards of directors, the managers usually dominate the board. The managers and the concept of professional management are among the main strengths of the U.S. economy.

The features of autonomous companies and professional managers to run them have a considerable impact on how quality is managed. Within the flexibility permitted by the "anarchy of the marketplace,"

each company determines which products it will make or stop making, what quality policies it will employ, and so on. Innovation plays an important role throughout, owing to the rather unusual industrial history of the country.

The early European colonists faced the problems and opportunities associated with exploiting the natural resources of a huge land mass. An innovative spirit was developed in the early agricultural days, and carried over when the nation industrialized. Self-reliance and risk-taking emerged as respected traditions. These traditions then raised entrepreneurship and individualism to a state of respect. The resulting companies tended to organize in ways which assigned responsibility to individuals rather than to teams. The tradition of self-reliance also stimulated job mobility. In the U.S., workers, engineers, and managers tend to change jobs more often than their counterparts in other countries. The concept of a lifetime career has usually been viewed as being associated with a trade, a union, or a profession rather than with a specific company.

Early Systems of Managing for Quality. Late in the eighteenth century, the colonists broke with their European rulers and established an independent United States. The domestic economy was unified by the laws governing movement of goods in interstate commerce. These laws avoided the obstacles inherent in the national boundaries then prevailing in Western Europe—passports, customs offices, import duties, and so on—that have plagued the countries of Europe for centuries. The absence of such barriers enabled the United States to become a unified common market and contributed to the speed with which the country emerged as an economic superpower.

As the colonies began to industrialize, they generally followed the craftsmanship concept which prevailed in their European country of origin. Apprentices learned a trade and qualified to become craftsmen. Achievement of quality was one of the essential skills learned by the apprentice. A major force for assuring quality of product was the village form of society in which the craftsman met face-to-face with the users. In a shop of any size, the master carried out a form of product inspection and process audit which provided added quality assurance. Alternatively, the master delegated this function to an inspector.

When the Industrial Revolution of the mid-eighteenth century was exported from Europe to the United States, the colonists again followed European practice. Many craftsmen became factory workers, and many masters became factory foremen. Quality was assured as before—by the skills of the craftsmen supplemented by supervisory audit or by departmental inspection.

The Taylor System and Its Impact. Late in the nineteenth century many American companies broke sharply with European tradition by adopting the Taylor system of "Scientific Management." The basic concept was the separation of planning from execution. This separation made possible a considerable increase in productivity and was a major contributor to making the United States the world leader in productivity. (For elaboration, see Juran 1973.)

The Taylor system also included some adverse side effects. It dealt a crippling blow to the concept of craftsmanship. In addition, the new emphasis on productivity had a negative effect on quality. To restore the balance, the factory managers created a central Inspection department headed by a chief inspector. The various departmental inspectors were transferred to the new department over the bitter opposition of production supervisors. In due course, the inspection departments grew into broad-based organizations called variously Quality Control, Quality Assurance, Quality Management, and so on. These organizations evolved quality-oriented specialties such as quality engineering and reliability engineering.

The central activity of these quality-oriented departments remained that of inspection and test—separating good product from bad. The prime benefit of this activity was to reduce the risk that defective products would be shipped to customers. However, there were serious detriments:

This central activity of the quality department helped to foster a widespread belief that achievement of quality was the responsibility of the quality department.

In turn, this belief hampered efforts at eliminating the causes of defective products–the responsibilities were confused.

As a result, failure-prone products and incapable processes remained in force and continued to generate high costs of poor quality.

What emerged *de facto* was a concept of managing for quality somewhat as follows:

Each functional department carried out its assigned function and then delivered the result to the next function in the sequence of events.

At the end, the quality department separated the good product from the bad.

For defective product which escaped to the customer, redress was to be provided through customer service based on warranties.

By the standards of later decades, this concept of prime reliance on inspection and test was unsound. However, it was not a handicap if competitors employed the same concept, and such was usually the case. Despite the deficiencies inherent in this "concept of detection," American goods came to be well regarded as to quality. In some product lines, American companies became quality leaders. In addition, the American economy grew to superpower size. Some of this growth was achieved in ways which had implications for quality:

Entrepreneurs were on the alert to create sales in various ways: e.g., bring new, improved products to market; create additional production capacity to eliminate shortages. (Elimination of shortages also eliminates an inevitable cause of poor quality.)

Managers were willing to invest in facilities to improve productivity. Some of those investments (e.g., in machines, tools, instruments) improved quality as well.

The United States became a leader in the concept of a "professional" approach to management, involving extensive training for managers and specialists.

The growing number of quality specialists developed numerous new methods and tools specifically oriented to managing for quality. However, use of these methods was limited by the prevailing functional organization forms and, especially, by upper management's limited understanding of how to manage for quality.

WORLD WAR II AND ITS IMPACT

During World War II, American industry was faced with the added burden of producing enormous quantities of military products, many of which made use of new, sophisticated technology. However, the basic system of managing for quality remained unchanged. Each function carried out its responsibility and delivered the result to the next function in the sequence. At the end, inspection and test separated the good from the bad.

The military clients secured their quality assurance largely by additional inspection and test. Not until well after World War II did they evolve a concept of mandating the quality system to be followed by contractors.

A part of the American grand strategy during World War II was to shut off production of many civilian products: automobiles, household appliances, entertainment products, and so on. A massive shortage of goods developed amid a huge buildup of purchasing power. It took the rest of that decade (the 1940s) for supply to catch up with demand. In the interim, the manufacturing companies gave top priority to meeting delivery dates, so that quality of product went down. (Quality always goes down during shortages.) The habit of giving top priority to delivery dates then persisted long after the shortages were gone.

During this progression of events, the priority given to quality declined significantly. In addition, the leadership of the quality function became vague and confused. What emerged was a concept in which upper management became detached from the process of managing for quality. (For elaboration on the impact of World War II, see AT&T 1989, Grant 1991, Juran 1991, Wareham and Stratton 1991.)

THE JAPANESE QUALITY REVOLUTION AND ITS IMPACT

Following World War II, the Japanese embarked on a course of reaching national goals by trade rather than by military means. The major manufacturers, who had been largely involved in military production, were faced with converting to civilian products. The chief obstacle to selling these products in international markets was a national reputation for shoddy goods, created by export of poor-quality goods prior to World War II.

The Japanese adopted a variety of strategies for improving their quality. (See generally, Section 41, Quality in Japan.) In the judgment of the author, several of those strategies were decisive in creating a successful revolution in quality.

The upper managers personally took charge of leading the revolution.

They trained all levels and functions of the hierarchy in how to manage for quality.

They trained the specialists in statistical process control.

They undertook quality improvement at a continuing, revolutionary pace.

They provided means for the work force to participate in control and improvement of quality.

In the early postwar period, the affected American companies logically considered Japanese competition to be in price rather than in quality. Their response was to shift the manufacture of labor-intensive products to low-cost areas, often abroad. Then, as the years unfolded, price competition declined while quality competition increased. However, the American companies generally failed to recognize these trends or to heed the warning signals. In 1966, the author sounded an alarm at the annual conference of the European Organization for Quality Control:

> The Japanese are headed for world quality leadership and will attain it in the next two decades because no one else is moving there at the same pace. (Juran 1967)

During the 1970s and 1980s, numerous Japanese manufacturers greatly increased their share of the American market. A major reason was superior quality. Many industries were affected: automobiles, consumer electronics, steel, machine tools, and so on. Some research quantified the quality differences. [See Juran 1979 (color television sets); also Garvin 1983 (room air conditioners).]

RESPONSES TO THE JAPANESE QUALITY REVOLUTION

The most obvious effect of the Japanese quality revolution was a massive export of goods to the United States. These goods were welcomed by consumers because of their superior quality along with their competitive and even lower prices. However, these same goods did much damage to other sectors of the American economy:

The affected manufacturing companies were damaged by the resulting loss of sales.

Workers and their unions were damaged by the resulting "export of jobs."

The national economy was damaged by the resulting unfavorable trade balance.

Some of the American companies' responses to the Japanese invasion had no relation to improving American competitiveness in quality.

Block the Imports. Some of the affected companies tried to respond by reducing or eliminating the imports. They urged legislators to establish restrictive import quotas and tariffs. They urged criminal prosecutions on the grounds of violation of laws against "dumping," (selling below cost, or at "less than fair value"). They filed civil lawsuits on the grounds of unfair trade practices. They appealed to the citizenry to "Buy American."

These responses did not arouse broad sympathy among the buying public. Influential journalists, economists, legislators, and others pointed out that restriction of imports generates serious side effects: Buyers are deprived of better values; restriction invites retaliatory restriction; companies have no incentive to become more competitive; and so on. (For some case examples in which import restrictions damaged the very industries they were intended to protect, see Levinson 1987.)

Reduce Costs. Some companies viewed the problem as one of price competition, arising from the low wage rates then prevailing in Japan. Such companies responded by moving their production to low wage areas, including locations overseas. These actions often did reduce labor costs but did not solve the main problem which was competition in quality.

Give Up. Still other companies concluded that to become competitive in quality required expenditures (in product design and process facilities) which would not yield adequate return on the investment. These companies either sold out or otherwise went out of business.

During the 1960s, there were over 30 American-owned companies making color television sets. By the early 1990s there was only one.

INITIATIVES TO IMPROVE QUALITY

By the end of the 1970s, the American quality crisis had reached major proportions. It attracted the attention of the national legislators and administrators. It was featured prominently in the media—it was regularly "on the front page." It forced many chief executive officers (CEOs) to become involved in managing for quality.

During the 1980s, a great many American companies undertook initiatives to deal with the quality crisis. These initiatives were largely focused on three strategies:

Exhortation. Some consultants proposed a sweeping solution by exhorting the work force to make no mistakes—to "do it right the first time." This simplistic approach was persuasive to those managers who, at the time, believed that the primary cause of their company's quality problems was the carelessness and indifference of the work force. The facts were that the bulk of the quality problems had their origin in managerial and technological processes. In due course, this approach was abandoned but not before it generated a lot of divisiveness.

Training in Statistical Methods. During the 1980s, many American companies undertook to train company personnel in application of statistical methods to quality problems. The term "Statistical Process Control" (SPC) became the popular label for this training.

While SPC is a useful tool, most companies assumed it to be the panacea claimed by its advocates. The companies lost precious years before learning that leadership in quality comes from multiple strategies, no one of which is a panacea. To make matters worse, the training was done before the companies had identified their quality problems and defined their quality goals. In a sense, the personnel were trained in remedies before the diseases were known.

Eastman Chemical Company, when relating its approach to managing for quality (it became a 1993 winner of the Malcolm Baldrige National Quality Award), stated that it had trained 10,000 of its personnel in SPC. However, many trainees lacked the opportunity to apply the training, so much was forgotten. (Eastman Chemical Co. 1994)

Quality Improvement, Project by Project. One of the consulting companies, Juran Institute, Inc., created and published a series of videocassettes titled "Juran on Quality Improvement," (Juran 1980). These were tested by many companies. Some achieved notable quality improvements

while others did not. The decisive variable was the extent of personal leadership provided by the upper managers. By the end of the 1980s, the improvement process described in those videocassettes had become the basic model for the process of continuous quality improvement adopted by most companies.

Results of the Initiatives of the 1980s. In retrospect, the quality initiatives of the 1980s were deeply disappointing. Most fell well short of their goals. Some produced negative results—the companies lost several years of potential progress. The poor results were due mainly to poor choice of strategies and to poor execution of valid strategies. In turn, these were largely traceable to the limitations of leadership by upper managers who lacked training and experience in managing for quality. In the minds of some observers, the lessons learned during the 1980s were chiefly *lessons in what not to do.*

THE ROLE MODELS

During that same disappointing decade of the 1980s, a relatively few company initiatives achieved stunning results. Such companies attained quality leadership—"world-class quality"—and thereby became the role models for the rest of the American economy.

The role models were few in number. They included the winners of the Malcolm Baldrige National Quality Award plus other companies that had achieved similar results. Together, they made up only a tiny part of the economy. Yet there were enough of these companies to prove that world-class quality is attainable within the American culture—"They did it, so it must be doable."

The successes achieved by the role-model companies stimulated great interest among upper managers and others who sought to learn how such stunning results had been achieved. The role models were quite willing to share information about the strategies they had used to achieve those results. In addition, steps were taken to share the lessons learned through company visits, conferences, publications, and so on.

LESSONS LEARNED—THE CORE STRATEGIES

Each role-model company is different. In groping for ways to attain world-class quality, each serves as a laboratory, testing out various strategies, adopting some, modifying others, rejecting still others. In this sense each role-model company is unique. Yet despite differences among the role-model companies, analysis shows that their strategies have much in common. There is *a core list of strategies* which were widely adopted by most of the role models. These core strategies, some of which are listed below, deserve careful study—they are a body of *lessons learned,* a list of the key strategies which enabled the role models to achieve those stunning results.

Customer Focus. All role models adopted the concept that the customer has the last word on quality. Adoption of this concept then led to intensified action to identify: who are the customers, internal as well as external; what are the needs of customers; what product features are required to meet those needs; how do customers decide which of the competing products to buy; and so on. (For elaboration, see Section 3, The Quality Planning Process.)

Many quality problems of the past have been traced to failure to meet the needs of *internal* customers. As a result, customer focus is increasingly being extended to include internal as well as external customers.

A widespread example has been product designs which designers "threw over the wall" to be produced, sold, and serviced by internal customers—other company departments.

The concept of customer focus has led to broader use of the concept of participation. This minimizes the damage done when planners are unaware of (or indifferent to) the problems their plans will create

for their customers. It provides early warning—those affected are able to point out, "If you plan it that way, here are the problems we will face." The participation concept is also being extended to supplier relations, a popular label being "partnering."

Upper Managers in Charge. One element present in all successes, and absent in most failures, was the personal involvement of the upper managers. In effect, the upper managers took charge of quality by accepting responsibility for certain roles, including:

Serve on the Quality Council
Establish the strategic quality goals
Provide the needed resources
Provide quality-oriented training
Stimulate quality improvement
Review progress
Give recognition
Revise the reward system

Many upper managers resisted such additions to their own workload. Their preference was to establish broad goals and then to urge their subordinates to meet the goals. However, the lessons learned from the role models are that *the above roles are not delegable*—they must be carried out by the upper managers, personally.

Strategic Quality Planning. The role models recognized that the new priority given to quality requires enlarging the business plan to include quality-related goals. These goals are then "deployed" to identify the needed actions and resources, to establish responsibility for taking the actions, and so on. The resulting plans parallel those long used to meet goals for sales and profit. A common name for this concept is Strategic Quality Planning. (For elaboration, see Section 13, Strategic Deployment.)

The Concept of "Big Q." The role models grasped the concept that managing for quality should not be limited to manufacturing companies and manufacturing processes. It should also include service companies and business processes. This concept broadens the area under the "quality umbrella." (For details, see Table 2.1 of Section 2.) Some companies call this broader concept "Big Q," in contrast to the traditional concept which they call "Little Q."

Cost of Poor Quality. Cost of poor quality (COPQ) consists of those costs which would disappear if everything were perfect—if there were no errors, no waste, no field failures, and so on.

As upper managers were drawn into managing for quality, they learned a good deal about COPQ. Some of what they learned came as surprises.

Relation to Big Q: Many upper managers had assumed that COPQ consisted of the cost of running the quality department, or alternatively, the costs of deficient factory goods and processes. It is now widely accepted that COPQ should include costs traceable to deficiencies anywhere—deficiencies in Big Q.

COPQ is huge: In the early 1980s, the author estimated that in the United States, close to a third of the work done consisted of redoing what had been done before. Depending on the nature of the industry, COPQ consumed between 20 and 40 percent of the total effort. Translated into financial terms, the sums are staggering. Translated into other terms, the effects are equally staggering: delays in getting new products to market or in providing service, damage done to customer relations, damage to internal morale, and so on.

Higher quality costs less: Many upper managers have long believed that to attain higher quality requires increasing the costs. This belief is often valid as applied to "higher quality" in the sense of better product features to increase sales. The belief is seldom valid as applied to "higher quality" in the sense of less errors, less redoing, fewer field failures, and so on. In these latter cases, higher quality almost always costs less, and often a lot less.

Upper managers who have become deeply involved in managing for quality have gained new insights relative to COPQ. They came to realize that high COPQ presented an opportunity for cost reductions, at a higher return on investment than virtually any other managerial activity. (For additional discussion, see Section 8, Quality and Costs.)

Quality Improvement. Without exception, the role models went extensively into quality improvement—most of the stunning results came from projects to improve quality. These projects extended to all activities under the Big Q umbrella. They reduced costs, raised productivity, shortened cycle times, improved customer service, and so on.

Quality improvement required special organization. The vital few projects were carried out by multifunctional teams of managers and specialists. The useful many projects were carried out at lower levels, including members of the work force.

The role models also adopted the concept that quality improvement must go on year after year—it must be woven into the company culture. To this end, they mandated that goals for quality improvement be included in the annual business plans. They also redesigned the systems of recognition and reward to give added weight to performance on quality improvement. (For elaboration, see Section 5, The Quality Improvement Process.)

Business Process Quality Management ("Re-engineering"). A major extension of quality improvement was to the area of business processes. This extension resulted from fresh thinking relative to the multifunctional processes prevalent in functional organizations.

Figure 40.1 shows the interrelation between the typical "vertical" functional organization and the "horizontal macroprocesses" through which things get done.

Each horizontal macroprocess consists of numerous steps or "microprocesses" which thread their way through multiple functions. Every microprocess has an "owner," but there is no clear "ownership" of the macroprocess.

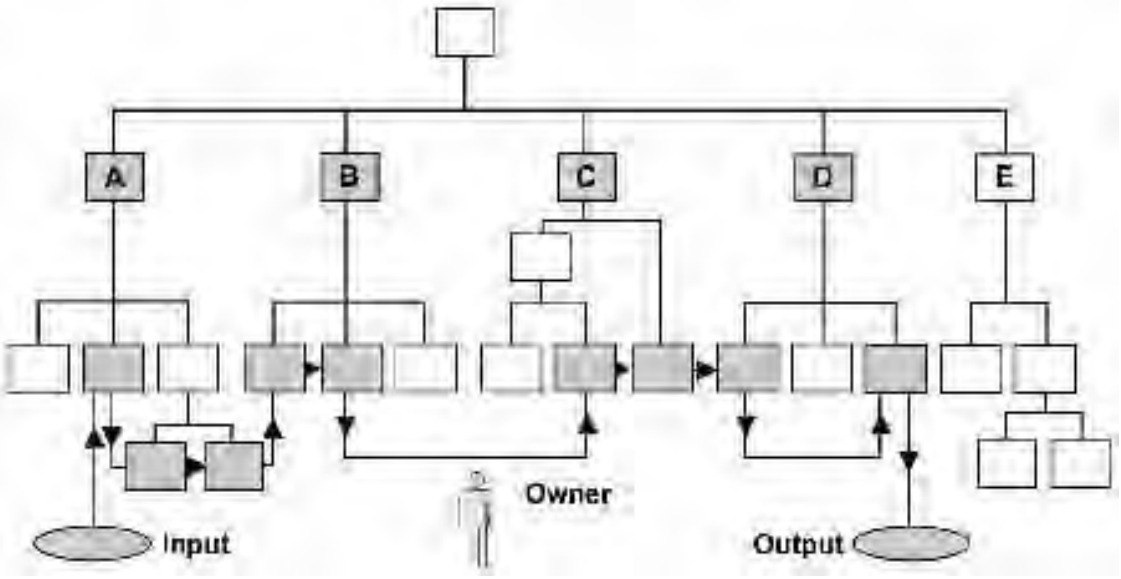

FIGURE 40.1 Interrelation between "vertical" functions and "horizontal" processes. [*Adapted from Re-engineering Processes for Competitive Advantage: Business Process Quality Management, 2nd ed.* (*1994*). *Juran Institute, Inc., Wilton, CT, pp. 3–35.*]

The role models concluded that each key macroprocess should have an owner, and they took action to create such owners (individuals or teams). They also defined the responsibilities of an owner, including responsibility for improving the macroprocess. An important part of the "stunning results" achieved by the role models came from improvements made in the business processes. (For elaboration, see Section 6, Process Management.)

Training for Quality. The earliest training for quality was the system of apprenticeship through which young boys became certified as craftsmen. More recently, with the proliferation of inspectors and inspection departments, there emerged training for inspectors—interpreting specifications, use of measuring instruments, and so on.

During World War II, the American government sponsored courses in statistical quality control, based on the Shewhart control chart and other tools developed by AT&T during the 1920s, (Working 1945). Following the end of the war, these courses continued to be offered by some colleges (as extension courses), by societies such as American Management Association (AMA) and the American Society for Quality Control (ASQC), and by consultants. Then, as quality departments broadened their scope, there emerged courses oriented to the functional needs of those departments: inspection and test, quality engineering, reliability engineering, and advanced courses in statistical methodology such as design of experiments and analysis of variance.

During the 1970s, there emerged the quality crisis resulting from the Japanese quality revolution. As companies tried to respond, it became clear that training for quality should not be confined to the quality department—it should be extended to all functions, and to all levels of the hierarchy. It also became clear that this extension required design of new courses, especially courses in managing for quality.

For example, when planning a new product or process, it is usual to assign a project planner to plan for the numerous parameters: technology, finance, schedule, quality, and so on. Such planners are often experts in the technology, but seldom in planning for quality. This is known as "quality planning by amateurs." One of the remedies is to train the planners in how to plan for quality, as set out in Section 3, The Quality Planning Process.

(Some large companies extended the concept of training in managing for quality to their suppliers. They urged and even demanded that their suppliers provide training in managing for quality to the appropriate personnel).

Much of the training done during the 1980s failed to produce tangible results. The chief reasons included:

The line managers (the customers) often did not participate in the planning of the courses.

Training through exhortation (banners and slogans) was frequently counterproductive.

Training in "awareness" failed to provide employees with answers to the question "What should I do that is different from what I have been doing?"

There was overemphasis on changing attitudes and underemphasis on changing behavior.

Training in the use of tools was usually done before identifying the quality problems or setting quality goals.

Training in quality improvement consisted of training in use of statistical tools rather than by being assigned to a quality improvement team.

By the 1990s numerous course designs were available for training in managing for quality. No consensus had been reached, but three designs were in wide use:

One was based on the criteria for the Malcolm Baldrige National Quality Award.

Another was based on Deming's lectures in statistics plus his "14 points" (Deming 1986).

A third was based on the Juran Trilogy, which organizes the subject matter into three fundamental processes: quality planning, quality control, and quality improvement. (For elaboration, see Section 2, How to Think About Quality, under How to Manage for Quality: The Juran Trilogy.)

There is also a growing feeling among industrial companies that, while quality has risen greatly in importance, the national educational system has not kept up with this trend. As a result, the graduates lack knowledge of the subject, forcing the companies to fill the gap through training. Schools at all levels have begun to address this problem. In addition, some companies have set up alliances with selected schools to help redesign the curricula, provide training materials, train faculty members, and otherwise support the alliances. (For elaboration on training for quality, see Section 16, Training for Quality.)

Measurement of Quality. Measurement of quality has long been used at the technological level. What is new is measuring quality at the business level: customer satisfaction, competitors' quality, performance of key business processes, and so on. To meet such needs may require inventing new measures as well as new methods of analysis and presentation. The need for measurement may also require creating a National Quality Index to parallel indexes already in use, such as for consumer prices, unemployment, and productivity. (For elaboration, see Section 9, Measurement, Information, and Decision-Making.)

Benchmarking. The concept of benchmarking grew out of the need to establish quality goals based on factual analysis rather than empiricism. The approach is to discover, for the process under study, what is the best performance, whether within one's own company, or in a competitor's company, or in a completely different industry.

For example, in one company, the best warehouse takes an average of five working days to fill customers' orders. The leading competitor takes an average of four days. A company in a different industry takes only three days. The benchmarked goal then becomes three days. There may well be a reaction "It can't be done," and this may be true as applied to the present process. However, the response is "It's being done now." So the problem is then to create (or re-create) a process which can meet the benchmark. The concept of benchmarking has been widely accepted in the United States. Progress is being made to develop data banks on what are the best known performances, and on the methods used to achieve them. (For elaboration, see Section 12, Benchmarking.)

Empowerment. As of the early 1990s, many American companies still retained the separation of planning from execution inherent in the Taylor system of Scientific Management. Such companies were failing to make use of a huge underemployed asset—the education, experience, and creativity of the work force. It was generally agreed that the Taylor system was obsolete and should be replaced, but there was no consensus on what should replace it.

Replacing the Taylor system requires transfer of tasks from specialists and supervisors to nonsupervisory workers. The word "empowerment" has become a label for such transfer. Empowerment takes various forms, all of which have been undergoing test. The more usual forms of empowerment have included:

Establish worker self-control: This requires providing workers with all the essentials for doing good work: means of knowing what are the quality goals; means of knowing what is the actual process performance; and means for adjusting the process in the event that quality does not conform to goals. A state of self-control empowers workers to make decisions on the *process,* decisions such as: Is the process in conformance? Should the process continue to run or should it stop? Ideally, such decisions should be made by the work force. There is no shorter feedback loop.

Establish worker self-inspection: This empowers workers to make decisions on whether the *product* conforms to the quality goals. Such empowerment shortens the feedback loop, confers a greater sense of job ownership, and removes the police atmosphere created by use of inspectors.

Enlarge workers' jobs: The enlargement may be horizontal—assigning a greater assortment of tasks within the same function to reduce the monotony of short-cycle work. It may also be vertical—assigning multiple functions around the core task. A widespread example has been the training and empowerment of workers who answer telephones, to enable them to provide "one-stop shopping" to customers who call in.

Establish self-directed teams of workers: Under this concept, teams of workers are trained to conduct operations which consist of multiple functions as well as multiple tasks. The empowerment may include process planning, establishing work schedules, deciding who is to perform which tasks, recruiting new team members, maintaining discipline, and still other responsibilities formerly carried out by specialists and supervisors.

The concept of self-directed teams has been widely tested. The published results indicate that quality and productivity improve significantly. The ratio of workers to managers rises sharply. Jobs cross functional lines and become team jobs. Workers become team members. All this requires extensive training.

Because empowerment involves extensive transfer of work from supervisors and specialists to the work force, it is meeting much cultural resistance. There is also some resistance from labor unions. They sense that empowerment establishes a new communication link between management and the work force which may weaken the linkage between workers and the union.

In the view of the author, replacing the Taylor system is an idea whose time has come. It is also his view that all of the above options will grow, and that the major successor to the Taylor system will be self-directed teams of workers.

Motivation; Recognition; Reward. To meet the new competition in quality has required company personnel to adapt to numerous changes such as:

Quality is to receive top priority.

Personnel are to accept training in various quality-related disciplines.

A new responsibility—quality improvement—is added to the traditional list of responsibilities.

The use of teams requires the personnel to learn how to behave as team members.

Generally, American companies have recognized that for such changes to be accepted, it is necessary to make revisions with respect to motivation. The companies responded by increasing the use of recognition and, to a lesser degree, by revising the reward systems.

Recognition is public acknowledgment of superior performance. The companies expanded their use of prizes, plaques, ceremonial dinners, publicity, and so on. Generally, they did this with skill and in good taste.

While recognition relates to voluntary action, the reward system relates to the mandated actions which define the job description. Here, the company responses were less sure-footed—there was no precedent on how to make the needed changes. Mostly, the companies expanded the list of parameters used annually to judge employee performance by adding a new parameter such as "performance on quality improvement." (Some companies even failed to realize that there was need for changing the reward system.)

Total Quality Management (TQM). By the late 1980s, it was becoming clear to upper managers that competitiveness and quality leadership could not be achieved by pecking away—by bringing in this or that tool or technique. Instead, it was necessary to apply the lessons learned (from the role models) to all functions and all levels, and to do so in a coordinated way. The popular label adopted to designate that collection of lessons learned was "Total Quality Management," or TQM. (The usual Japanese term is Company Wide Quality Control.)

There has been no agreed standard definition for TQM, so communication has been confused within companies, in training courses, and in the general literature. This confusion has since been reduced by publication of the criteria used by the National Institute for Standards and Technology (NIST) to judge the applications for the United States' Malcolm Baldrige National Quality Award (Baldrige Award). NIST, Gaithersburg, MD, administers the United States Malcolm Baldrige National Quality Award.

Those criteria have been widely disseminated, NIST has filled over a million requests for application forms. While there have been relatively few applications for the award, many companies have

conducted self-audits against the criteria. In addition, as state and local quality awards have proliferated, many have used the Baldrige Award criteria as major inputs to their own list of criteria. By the early 1990s, this wide exposure had, in the opinion of the author, made the Baldrige Award criteria the most widely accepted definition of what is included in TQM.

PROGNOSIS

Until the 1980s, the prognosis for the United States was gloomy. Japanese companies had successfully invaded the American market with products which offered superior quality and value. The resulting public perception then became a force in its own right, continuing to damage those American companies who had been slow to respond.

Emergence of Role Models. During the 1980s, the quality crisis deepened despite quality initiatives launched by many companies—most of those initiatives fell far short of their goals. The good news was the emergence of role models, discussed above, and identification of the strategies they used to become quality leaders. The job ahead then became one of scaling up—of applying those lessons learned across the entire economy, including the giant service industries—health, education, and government.

The Urge to Scale Up. By the early 1990s, some powerful forces had converged to stimulate scaling up. The growing quality crisis had raised awareness of the subject, as did the growth of awards for quality, notably the Malcolm Baldrige National Quality Award. Self-assessment against the Baldrige criteria helped many companies to identify their strengths and weaknesses. The results achieved by the role-model companies stimulated a desire to secure similar results. The publicized "lessons learned" showed the way to get such results. The role models demanded better quality from their suppliers, who in turn transmitted those demands through the entire supplier chain. The supplier base shrank, and a major test for supplier survival was to attain world-class quality.

An additional and growing force is the increasing sophistication of American upper managers. For decades, they had been detached from the quality function—they had delegated the job of managing for quality to their quality managers. As a result, the upper managers were, in the true sense of the word, ignorant of how to manage for quality.

When the quality crisis deepened, the upper managers were forced to move in. At first their ignorance led to poor choice of strategies. But once upper managers moved in they did not remain ignorant, they learned from their mistakes as well as from the role models.

A further powerful force is waiting to emerge—the urge to "buy American." Most Americans do prefer to buy American, all other things being equal. During the 1960s and 1970s, other things were not equal, so the urge to buy American was overcome by the superior quality and value of Japanese products. We can expect the quality gap to narrow in the coming century. That will translate into growth in market share for American companies, once customer perception catches up with the realities. Some of this has happened already.

Yet another force which urges scaling up is the rise of quality to a position of prominence in the public mind. Quality has moved to center stage due to a convergence of multiple trends:

Growing public awareness of the role of quality not only in competitive trade, but also in other fields such as national defense

Pressure from consumer organizations for better quality and more responsive redress if products fail

Fear of major disasters and near disasters arising from quality failures

Growing concerns about damage to the environment

Action by the courts to impose strict liability (For elaboration, see Section 35, Quality and Society)

Limitations to Scaling Up. Despite the forces urging scaling up, progress will be slow. The American economy is huge and, like a huge aircraft carrier, it has a great turning radius. Most companies have a sizable backlog of needed quality improvements; it will take them years to work this off. It will take additional years to improve the quality planning processes so as to minimize creating new chronic wastes.

A preview of the pace of scaling up is seen in the time required for companies to attain the status of role models. No company known to the author became a role model in less than 6 years; more usually it took 8 to 10 years. This length of time was consumed by several common steps:

Conduct a pilot test of selected strategies

Analyze the results

Make the needed mid-course corrections

Scale up

The Upcoming Century of Quality. The twentieth century can rightly be called the Century of Productivity. During that century, the United States became the most productive country on earth, thanks in part to adoption of the Taylor system. Productivity is still an important element of competition, but meanwhile, quality has moved to center stage. The twenty-first century will probably be known as the Century of Quality.

The lessons learned from the role models have identified the principal sources of quality leadership, such as:

Upper managers take charge of quality by carrying out certain nondelegable roles. (See above, under LESSONS LEARNED—THE CORE STRATEGIES; Upper Managers in Charge.)

Quality improvement is carried out at a revolutionary rate, year after year.

In the view of the author, the United States is now well poised to share world quality leadership during the next century. The failures of the 1980s provided lessons learned about what *not* to do. The role models provided lessons learned about what *to* do. Scaling up is under way, and the pace seems to be accelerating.

Nevertheless, for this scaling up to permeate the massive size of the American economy will take decades (as it did in Japan). Moreover, public perception lags behind events, sometimes for years. It may well take another two or three decades before "Made in USA" is widely accepted as a universal symbol of world-class quality.

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REFERENCES

AT&T (1989). "A History of Quality Control and Assurance at AT&T, 1920–1970." This series of 14 videocassettes contains interviews with W. Edwards Deming, J. M. Juran, Ralph Wareham, and others who played significant roles in quality control during the 50-year span 1920–1970. Available from AT&T Customer Information Center, phone 1-800-432-6600, select code 500-721.

Deming, W. Edwards (1986). *Out of the Crisis.* Massachusetts Institute of Technology, Center for Applied Engineering Study, Cambridge, MA.

Eastman Chemical Co. (1994). Papers presented at Quest for Excellence Conference. National Institute for Standards and Technology, Washington, DC.

Garvin, David A. (1983). "Quality on the Line." *Harvard Business Review,* September-October, pp. 64–75.

Grant, E. L. (1991). "Statistical Quality Control in the World War II Years." *Quality Progress,* December, pp. 31–36.

Juran, J. M. (1967). "The QC Circle Phenomenon." *Industrial Quality Control,* January, pp. 329–336.

Juran, J. M. (1973). "The Taylor System and Quality Control." A series of articles in *Quality Progress,* May through December (listed under "Management Interface").

Juran, J. M. (1979). "Japanese and Western Quality—A Contrast." *Quality,* January and February. Also published under the same title, in *Proceedings of the International Conference on Quality Control,* Japanese Union of Scientists and Engineers, Tokyo, 1978, pp. A3-11 to A3-25.

Juran, J. M. (1980). "Juran on Quality Improvement." A series of 16 videocassettes plus associated manuals. Published by Juran Institute, Inc., Wilton, CT.

Juran, J. M. (1991). "World War II and the Quality Movement." *Quality Progress,* December, pp. 19–24.

Juran, J. M. (1995). ed., *A History of Managing for Quality.* Sponsored by Juran Foundation Inc., Quality Press, Milwaukee, WI.

Levinson, Marc (1987). "Asking for Protection Is Asking for Trouble." *Harvard Business Review,* July–August, pp. 42–47.

Wareham, Ralph E., and Stratton, Brad (1991). "Standards, Sampling and Schooling." *Quality Progress,* December, pp. 38–42.

Working, Holbrook (1945). "Statistical Quality Control in War Production." *Journal of the American Statistical Association,* December, pp. 425–447.