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U.S. managers know that they have to improve the quality of their products because, alas, U.S. consumers have told them so. A survey in 1981 reported that nearly 50% of U.S. consumers believed that the quality of U.S. products had dropped during the previous five years; more recent surveys have found that a quarter of consumers are "not at all" confident that U.S. industry can be depended on to deliver reliable products. Many companies have tried to upgrade their quality, adopting programs that have been staples of the quality movement for a generation: cost of quality calculations, interfunctional teams, reliability engineering, or statistical quality control. Few companies, however, have learned to *compete* on quality. Why?

Part of the problem, of course, is that until Japanese and European competition intensified, not many companies seriously tried to make quality programs work even as they implemented them. But even if companies *had* implemented the traditional principles of quality control more rigorously, it is doubtful that U.S. consumers would be satisfied today. In my view, most of those principles were narrow in scope; they were designed as purely defensive measures to preempt failures or eliminate "defects." What managers need now is an aggressive strategy to gain and hold markets, with high quality as a competitive linchpin.

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Quality Control

To get a better grasp of the defensive character of traditional quality control, we should understand what the quality movement in the United States has achieved so far. How much expense on quality was tolerable? How much "quality" was enough? In 1951, Joseph Juran tackled these questions in the first edition of his *Quality Control Handbook*, a publication that became the quality movement's bible. Juran observed that quality could be understood in terms of avoidable and unavoidable costs: the former resulted from defects and product failures like scrapped materials or labor hours required for rework, repair, and complaint processing; the latter were associated with prevention, i.e., inspection, sampling, sorting, and other quality control initiatives. Juran regarded failure costs as "gold in the mine" because they could be reduced sharply by investing in quality improvement. He estimated that avoidable quality losses typically ranged from $500 to $1,000 per productive operator per year—big money back in the 1950s.

Reading Juran's book, executives inferred roughly how much to invest in quality improvement: expenditures on prevention were justified if they were lower than the costs of product failure. A corollary principle was that decisions made early in the production chain (e.g., when engineers first sketched out a product's design) have implications for the level of quality costs incurred later, both in the factory and the field.

In 1956, Armand Feigenbaum took Juran's ideas a step further by proposing "total quality control" (TQC). Companies would never make high-quality products, he argued, if the manufacturing department were forced to pursue quality in isolation. TQC called for "interfunctional teams" from marketing, engineering, purchasing, and manufacturing. These teams would share responsibility for all phases of design and manufacturing and would disband only when they had placed a product in the hands of a satisfied customer—who remained satisfied.

Feigenbaum noted that all new products moved through three stages of activity: design control, incoming material control, and product or shopfloor control. This was a step in the right direction. But Feigenbaum did not really consider how quality was first of all a strategic question for any business; how, for instance, quality might govern the development of a design and the choice of features or options. Rather, design control meant for Feigenbaum mainly preproduction assessments of a new design's manufacturability, or that projected manufacturing techniques should be debugged through pilot runs. Materials control included vendor evaluations and incoming inspection procedures.

In TQC, quality was a kind of burden to be shared—no single department shouldered all the responsibility. Top management was ultimately accountable for the effectiveness of the system; Feigenbaum, like Juran, proposed careful reporting of the costs of quality to senior executives in order to ensure their commitment. The two also stressed statistical approaches to quality, including process control charts that set limits to acceptable variations in key variables affecting a product's production. They endorsed sampling procedures that allowed managers to draw inferences about the quality of entire batches of products from the condition of items in a small, randomly selected sample.

Despite their attention to these techniques, Juran, Feigenbaum, and other experts like W. Edwards Deming were trying to get managers to see beyond purely statistical controls on quality. Meanwhile, another branch of the quality movement emerged, relying even more heavily on probability theory and statistics. This was "reliability engineering," which originated in the aerospace and electronics industries.

In 1950, only one-third of the U.S. Navy's electronic devices worked properly. A subsequent study by the Rand Corporation estimated that every vacuum tube the military used had to be backed by nine others in warehouses or on order. Reliability engineering addressed these problems by adapting the laws of probability to the challenge of predicting equipment stress.

Reliability engineering measures led to:

Techniques for reducing failure rates while products were still in the design stage.

Failure mode and effect analysis, which systematically reviewed how alternative designs could fail.

Individual component analysis, which computed the failure probability of key components and aimed to eliminate or strengthen the weakest links.

Derating, which required that parts be used below their specified stress levels.

Redundancy, which called for a parallel system to back up an important component or subsystem in case it failed.

Naturally, an effective reliability program required managers to monitor field failures closely to give company engineers the information needed to plan new designs. Effective field failure reporting also demanded the development of systems of data collection, including return of failed parts to the laboratory for testing and analysis.

Now, the proponents of all these approaches to quality control might well have denied that their views of quality were purely defensive. But what else was implied by the solutions they stressed—material controls, outgoing batch inspections, stress tests? Perhaps the best way to see the implications of their logic is in traditional quality control's most extreme form, a program called "Zero Defects." No other program defined quality so stringently as an absence of failures—and no wonder, since it emerged from the defense industries where the product was a missile whose flawless operation was, for obvious reasons, imperative.

In 1961, the Martin Company was building Pershing missiles for the U.S. Army. The design of the missile was sound, but Martin found that it could maintain high quality only through a massive program of inspection. It decided to offer workers incentives to lower the defect rate, and in December 1961, delivered a Pershing missile to Cape Canaveral with "zero discrepancies." Buoyed by this success, Martin's general manager in Orlando, Florida accepted a challenge, issued by the U.S. Army's missile command, to deliver the first field Pershing one month ahead of schedule. But he went even further. He promised that the missile would be perfect, with no hardware problems or document errors, and that all equipment would be fully operational 10 days after delivery (the norm was 90 days or more).

Two months of feverish activity followed; Martin asked all employees to contribute to building the missile exactly right the first time since there would be virtually no time for the usual inspections. Management worked hard to maintain enthusiasm on the plant floor. In February 1962, Martin delivered on time a perfect missile that was fully operational in less than 24 hours.

This experience was eye-opening for both Martin and the rest of the aerospace industry. After careful review, management concluded that, in effect, its own changed attitude had assured the project's success. In the words of one close observer: ''The one time management demanded perfection, it happened!''[1] Martin management thereafter told employees that the only acceptable quality standard was ''zero defects.'' It instilled this principle in the work force through training, special events, and by posting quality results. It set goals for workers and put great effort into giving each worker positive criticism. Formal techniques for problem solving, however, remained limited. For the most part, the program focused on motivation—on changing the attitudes of employees.

Strategic Quality Management

On the whole, U.S. corporations did not keep pace with quality control innovations the way a number of overseas competitors did. Particularly after World War II, U.S. corporations expanded rapidly and many became complacent. Managers knew that consumers wouldn't drive a VW Beetle, indestructible as it was, if they could afford a fancier car—even if this meant more visits to the repair shop.

But if U.S. car manufacturers *had* gotten their products to outlast Beetles, U.S. quality managers still would not have been prepared for Toyota Corollas—or Sony televisions. Indeed, there was nothing in the principles of quality control to disabuse them of the idea that quality was merely something that could hurt a company if ignored; that added quality was the designer's business—a matter, perhaps, of chrome and push buttons.

The beginnings of strategic quality management cannot be dated precisely because no single book or article marks its inception. But even more than in consumer electronics and cars, the volatile market in semiconductors provides a telling example of change. In March 1980, Richard W. Anderson, general manager of Hewlett-Packard's Data Systems Division, reported that after testing 300,000 16K RAM chips from three U.S. and three Japanese manufacturers, Hewlett-Packard had discovered wide disparities in quality. At incoming inspection, the Japanese chips had a failure rate of zero; the comparable rate for the three U.S. manufacturers was between 11 and 19 failures per 1,000. After 1,000 hours of use, the failure rate of the Japanese chips was between 1 and 2 per 1,000; usable U.S. chips failed up to 27 times per thousand.

Several U.S. semiconductor companies reacted to the news impulsively, complaining that the Japanese were sending only their best components to the all-important U.S. market. Others disputed the basic data. The most perceptive market analysts, however, noted how differences in quality coincided with the rapid ascendancy of Japanese chip manufacturers. In a few years the Japanese had gone from a standing start to significant market shares in both the 16K and 64K chip markets. Their message—intentional or not—was that quality could be a potent strategic weapon.

U.S. semiconductor manufacturers got the message. In 16K chips the quality gap soon closed. And in industries as diverse as machine tools and radial tires, each of which had seen its position erode in the face of Japanese competition, there has been a new seriousness about quality too. But how to translate seriousness into action? Managers who are now determined to compete on quality have been thrown back on the old questions: How much quality is enough? What does it take to look at quality from the customer's vantage point? These are still hard questions today.

To achieve quality gains, I believe, managers need a new way of thinking, a conceptual bridge to the consumer's vantage point. Obviously, market studies acquire a new importance in this context, as does a careful review of competitors' products. One thing is certain: high quality means pleasing consumers, not just protecting them from annoyances. Product designers, in turn, should shift their attention from prices at the time of purchase to life cycle costs that include expenditures on service and maintenance—the customer's total costs. Even consumer complaints play a new role because they provide a valuable source of product information.

But managers have to take a more preliminary step—a crucial one, however obvious it may appear. They must first develop a clear vocabulary with which to discuss quality as *strategy.* They must break down the word quality into manageable parts.

1. James F. Haplin, *Zero Defects* (New York: McGraw-Hill, 1966), p. 15.

Only then can they define the quality niches in which to compete.

I propose eight critical dimensions or categories of quality that can serve as a framework for strategic analysis: performance, features, reliability, conformance, durability, serviceability, aesthetics, and perceived quality.[2] Some of these are always mutually reinforcing; some are not. A product or service can rank high on one dimension of quality and low on another—indeed, an improvement in one may be achieved only at the expense of another. It is precisely this interplay that makes strategic quality management possible; the challenge to managers is to compete on selected dimensions.

1 Performance

Of course, performance refers to a product's primary operating characteristics. For an automobile, performance would include traits like acceleration, handling, cruising speed, and comfort; for a television set, performance means sound and picture clarity, color, and the ability to receive distant stations. In service businesses—say, fast food and airlines—performance often means prompt service.

Because this dimension of quality involves measurable attributes, brands can usually be ranked objectively on individual aspects of performance. Overall performance rankings, however, are more difficult to develop, especially when they involve benefits that not every consumer needs. A power shovel with a capacity of 100 cubic yards per hour will "outperform" one with a capacity of 10 cubic yards per hour. Suppose, however, that the two shovels possessed the identical capacity—60 cubic yards per hour—but achieved it differently: one with a 1–cubic-yard bucket operating at 60 cycles per hour, the other with a 2–cubic-yard bucket operating at 30 cycles per hour. The capacities of the shovels would then be the same, but the shovel with the larger bucket could handle massive boulders while the shovel with the smaller bucket could perform precision work. The "superior performer" depends entirely on the task.

Some cosmetics wearers judge quality by a product's resistance to smudging; others, with more sensitive skin, assess it by how well it leaves skin irritation-free. A 100–watt light bulb provides greater candlepower than a 60–watt bulb, yet few customers would regard the difference as a measure of quality. The bulbs simply belong to different performance classes. So the question of whether performance differences are quality differences may depend on circumstantial preferences—but preferences based on functional requirements, not taste.

Some performance standards *are* based on subjective preferences, but the preferences are so universal that they have the force of an objective standard. The quietness of an automobile's ride is usually viewed as a direct reflection of its quality. Some people like a dimmer room, but who wants a noisy car?

2 Features

Similar thinking can be applied to features, a second dimension of quality that is often a secondary aspect of performance. Features are the "bells and whistles" of products and services, those characteristics that supplement their basic functioning. Examples include free drinks on a plane, permanent-press cycles on a washing machine, and automatic tuners on a color television set. The line separating primary performance characteristics from secondary features is often difficult to draw. What is crucial, again, is that features involve objective and measurable attributes; objective individual needs, not prejudices, affect their translation into quality differences.

To many customers, of course, superior quality is less a reflection of the availability of particular features than of the total number of options available. Often, choice is quality: buyers may wish to customize or personalize their purchases. Fidelity Investments and other mutual fund operators have pursued this more "flexible" approach. By offering their clients a wide range of funds covering such diverse fields as health care, technology, and energy—and by then encouraging clients to shift savings among these—they have virtually tailored investment portfolios.

Employing the latest in flexible manufacturing technology, Allen-Bradley customizes starter motors for its buyers without having to price its products prohibitively. Fine furniture stores offer their customers countless variations in fabric and color. Such strategies impose heavy demands on operating managers; they are an aspect of quality likely to grow in importance with the perfection of flexible manufacturing technology.

3 Reliability

This dimension reflects the probability of a product malfunctioning or failing within a specified time period. Among the most common measures of relia-

2. This framework first appeared, in a preliminary form, in my article "What Does 'Product Quality' Really Mean?" *Sloan Management Review*, Fall 1984.

bility are the mean time to first failure, the mean time between failures, and the failure rate per unit time. Because these measures require a product to be in use for a specified period, they are more relevant to durable goods than to products and services that are consumed instantly.

Reliability normally becomes more important to consumers as downtime and maintenance become more expensive. Farmers, for example, are especially sensitive to downtime during the short harvest season. Reliable equipment can mean the difference between a good year and spoiled crops. But consumers in other markets are more attuned than ever to product reliability too. Computers and copying machines certainly compete on this basis. And recent market research shows that, especially for young women, reliability has become an automobile's most desired attribute. Nor is the government, our biggest single consumer, immune. After seeing its expenditures for major weapons repair jump from $7.4 billion in fiscal year 1980 to $14.9 billion in fiscal year 1985, the Department of Defense has begun cracking down on contractors whose weapons fail frequently in the field.

4 Conformance

A related dimension of quality is conformance, or the degree to which a product's design and operating characteristics meet established standards. This dimension owes the most to the traditional approaches to quality pioneered by experts like Juran.

All products and services involve specifications of some sort. When new designs or models are developed, dimensions are set for parts and purity standards for materials. These specifications are normally expressed as a target or "center"; deviance from the center is permitted within a specified range. Because this approach to conformance equates good quality with operating inside a tolerance band, there is little interest in whether specifications have been met exactly. For the most part, dispersion within specification limits is ignored.

One drawback of this approach is the problem of "tolerance stack-up": when two or more parts are to be fit together, the size of their tolerances often determines how well they will match. Should one part fall at a lower limit of its specification, and a matching part at its upper limit, a tight fit is unlikely. Even if the parts are rated acceptable initially, the link between them is likely to wear more quickly than one made from parts whose dimensions have been centered more exactly.

To address this problem, a more imaginative approach to conformance has emerged. It is closely associated with Japanese manufacturers and the work of Genichi Taguchi, a prizewinning Japanese statistician. Taguchi begins with the idea of "loss function," a measure of losses from the time a product is shipped. (These losses include warranty costs, nonrepeating customers, and other problems resulting from performance failure.) Taguchi then compares such losses to two alternative approaches to quality: on the one hand, simple conformance to specifications, and on the other, a measure of the degree to which parts or products diverge from the ideal target or center.

He demonstrates that "tolerance stack-up" will be worse—more costly—when the dimensions of parts are more distant from the center than when they cluster around it, even if some parts fall outside the tolerance band entirely. According to Taguchi's approach, production process 1 in the *Exhibit* is better even though some items fall beyond specification limits. Traditional approaches favor production process 2. The challenge for quality managers is obvious.

Incidentally, the two most common measures of failure in conformance—for Taguchi and everyone else—are defect rates in the factory and, once a product is in the hands of the customer, the incidence of service calls. But these measures neglect other deviations from standard, like misspelled labels or shoddy construction, that do not lead to service or repair. In service businesses, measures of conformance normally focus on accuracy and timeliness and include counts of processing errors, unanticipated delays, and other frequent mistakes.

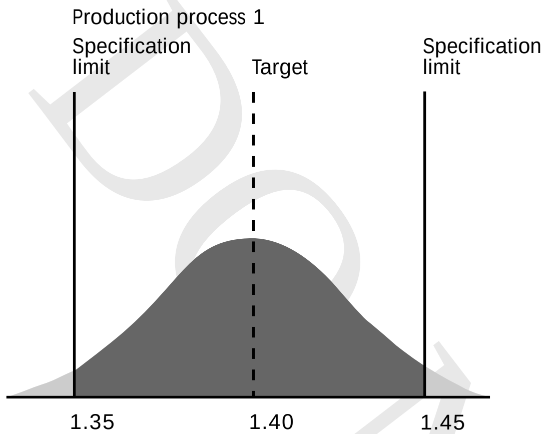
5 Durability

A measure of product life, durability has both economic and technical dimensions. Technically, durability can be defined as the amount of use one gets from a product before it deteriorates. After so many hours of use, the filament of a light bulb burns up and the bulb must be replaced. Repair is impossible. Economists call such products "one-hoss shays" (after the carriage in the Oliver Wendell Holmes poem that was designed by the deacon to last a hundred years, and whose parts broke down simultaneously at the end of the century).

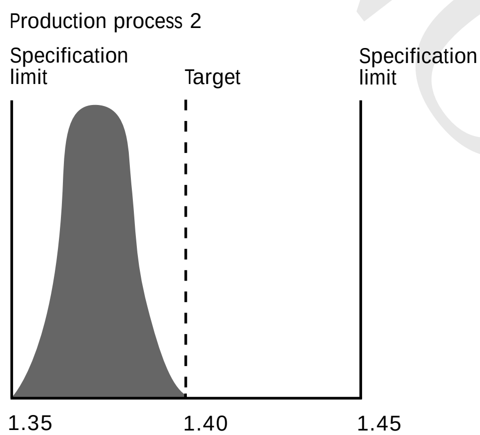
In other cases, consumers must weigh the expected cost, in both dollars and personal inconvenience, of future repairs against the investment and operating expenses of a newer, more reliable model. Durability, then, may be defined as the amount of use one gets from a product before it breaks down and replacement is preferable to continued repair.

Exhibit Two approaches to conformance

In the following graphs, shaded areas under the curves indicate items whose measurements meet specifications. White areas indicate items not meeting specifications.



In production process 1 (favored by Taguchi), items distribute closely around the target, although some items fall outside specifications.



In production process 2 (favored in traditional approaches), items all distribute within specifications, but not tightly around the target.

Source: L.P. Sullivan, "Reducing Variability: A New Approach to Quality," *Quality Progress,* July 1984, p. 16.

This approach to durability has two important implications. First, it suggests that durability and reliability are closely linked. A product that often fails is likely to be scrapped earlier than one that is more reliable; repair costs will be correspondingly higher and the purchase of a competitive brand will look that much more desirable. Because of this linkage, companies sometimes try to reassure customers by offering lifetime guarantees on their products, as 3M has done with its videocassettes. Second, this approach implies that durability figures should be interpreted with care. An increase in product life may not be the result of technical improvements or the use of longer-lived materials. Rather, the underlying economic environment simply may have changed.

For example, the expected life of an automobile rose during the last decade—it now averages 14 years—mainly because rising gasoline prices and a weak economy reduced the average number of miles driven per year. Still, durability varies widely among brands. In 1981, estimated product lives for major home appliances ranged from 9.9 years (Westinghouse) to 13.2 years (Frigidaire) for refrigerators, 5.8 years (Gibson) to 18 years (Maytag) for clothes washers, 6.6 years (Montgomery Ward) to 13.5 years (Maytag) for dryers, and 6 years (Sears) to 17 years (Kirby) for vacuum cleaners.[3] This wide dispersion suggests that durability is a potentially fertile area for further quality differentiation.

6 Serviceability

A sixth dimension of quality is serviceability, or the speed, courtesy, competence, and ease of repair. Consumers are concerned not only about a product breaking down but also about the time before service is restored, the timeliness with which service appointments are kept, the nature of dealings with service personnel, and the frequency with which service calls or repairs fail to correct outstanding problems. In those cases where problems are not immediately resolved and complaints are filed, a company's complaint-handling procedures are also likely to affect customers' ultimate evaluation of product and service quality.

Some of these variables reflect differing personal standards of acceptable service. Others can be measured quite objectively. Responsiveness is typically measured by the mean time to repair, while technical competence is reflected in the incidence of multiple service calls required to correct a particular problem. Because most consumers equate rapid repair and reduced downtime with higher quality, these elements of serviceability are less subject to personal interpretation than are those involving evaluations of courtesy or standards of professional behavior.

Even reactions to downtime, however, can be quite complex. In certain environments, rapid response becomes critical only after certain thresholds have been reached. During harvest season, farmers generally accept downtime of one to six hours on harvesting equipment, such as combines, with little resistance. As downtime increases, they become anxious; beyond eight hours of downtime they become frantic

3. Roger B. Yepsen, Jr., ed., *The Durability Factor* (Emmaus, Penn: Rodale Press, 1982), p. 190.

and frequently go to great lengths to continue harvesting even if it means purchasing or leasing additional equipment. In markets like this, superior service can be a powerful selling tool. Caterpillar guarantees delivery of repair parts anywhere in the world within 48 hours; a competitor offers the free loan of farm equipment during critical periods should its customers' machines break down.

Customers may remain dissatisfied even after completion of repairs. How these complaints are handled is important to a company's reputation for quality and service. Eventually, profitability is likely to be affected as well. A 1976 consumer survey found that among households that initiated complaints to resolve problems, more than 40% were not satisfied with the results. Understandably, the degree of satisfaction with complaint resolution closely correlated with consumers' willingness to repurchase the offending brands.[4]

Companies differ widely in their approaches to complaint handling and in the importance they attach to this element of serviceability. Some do their best to resolve complaints; others use legal gimmicks, the silent treatment, and similar ploys to rebuff dissatisfied customers. Recently, General Electric, Pillsbury, Procter & Gamble, Polaroid, Whirlpool, Johnson & Johnson, and other companies have sought to preempt consumer dissatisfaction by installing toll-free telephone hot lines to their customer relations departments.

7 Aesthetics

The final two dimensions of quality are the most subjective. Aesthetics—how a product looks, feels, sounds, tastes, or smells—is clearly a matter of personal judgment and a reflection of individual preference. Nevertheless, there appear to be some patterns in consumers' rankings of products on the basis of taste. A recent study of quality in 33 food categories, for example, found that high quality was most often associated with "rich and full flavor, tastes natural, tastes fresh, good aroma, and looks appetizing."[5]

The aesthetics dimension differs from subjective criteria pertaining to "performance"—the quiet car engine, say—in that aesthetic choices are not nearly universal. Not all people prefer "rich and full" flavor or even agree on what it means. Companies therefore have to search for a niche. On this dimension of quality, it is impossible to please everyone.

8 Perceived Quality

Consumers do not always have complete information about a product's or service's attributes; indirect measures may be their only basis for comparing brands. A product's durability, for example, can seldom be observed directly; it usually must be inferred from various tangible and intangible aspects of the product. In such circumstances, images, advertising, and brand names—inferences about quality rather than the reality itself—can be critical. For this reason, both Honda—which makes cars in Marysville, Ohio—and Sony—which builds color televisions in San Diego—have been reluctant to publicize that their products are "made in America."

Reputation is the primary stuff of perceived quality. Its power comes from an unstated analogy: that the quality of products today is similar to the quality of products yesterday, or the quality of goods in a new product line is similar to the quality of a company's established products. In the early 1980s, Maytag introduced a new line of dishwashers. Needless to say, salespeople immediately emphasized the product's reliability—not yet proven—because of the reputation of Maytag's clothes washers and dryers.

Competing on Quality

This completes the list of the eight dimensions of quality. The most traditional notions—conformance and reliability—remain important, but they are subsumed within a broader strategic framework. A company's first challenge is to use this framework to explore the opportunities it has to distinguish its products from another company's wares.

The quality of an automobile tire may reflect its tread-wear rate, handling, traction in dangerous driving conditions, rolling resistance (i.e., impact on gas mileage), noise levels, resistance to punctures, or appearance. High-quality furniture may be distinguished by its uniform finish, an absence of surface flaws, reinforced frames, comfort, or superior design. Even the quality of a less tangible product like computer software can be evaluated in multiple dimensions. These dimensions include reliability, ease of maintenance, match with users' needs, integrity (the extent to which unauthorized access can be controlled), and portability (the ease with which a pro-

4. TARP, *Consumer Complaint Handling in America: Final Report* (Springfield, Va.: National Technical Information Service, U.S. Department of Commerce, 1979).

5. P. Greg Bonner and Richard Nelson, "Product Attributes and Perceived Quality: Foods," in *Perceived Quality,* ed. Jacob Jacoby and Jerry C. Olson (Lexington, Mass.: Lexington Books, D.C. Heath, 1985), p. 71.

gram can be transferred from one hardware or software environment to another).

A company need not pursue all eight dimensions simultaneously. In fact, that is seldom possible unless it intends to charge unreasonably high prices. Technological limitations may impose a further constraint. In some cases, a product or service can be improved in one dimension of quality only if it becomes worse in another. Cray Research, a manufacturer of supercomputers, has faced particularly difficult choices of this sort. According to the company's chairman, if a supercomputer doesn't fail every month or so, it probably wasn't built for maximum speed; in pursuit of higher speed, Cray has deliberately sacrificed reliability.

There are other trade-offs. Consider the following:

□ In entering U.S. markets, Japanese manufacturers often emphasize their products' reliability and conformance while downplaying options and features. The superior "fits and finishes" and low repair rates of Japanese cars are well known; less often recognized are their poor safety records and low resistance to corrosion.

□ Tandem Computers has based its business on superior reliability. For computer users that find downtime intolerable, like telephone companies and utilities, Tandem has devised a fail-safe system: two processors working in parallel and linked by software that shifts responsibility between the two if an important component or subsystem fails. The result, in an industry already well-known for quality products, has been spectacular corporate growth. In 1984, after less than 10 years in business, Tandem's annual sales topped $500 million.

□ Not long ago, New York's Chemical Bank upgraded its services for collecting payments for corporations. Managers had first conducted a user survey indicating that what customers wanted most was rapid response to queries about account status. After it installed a computerized system to answer customers' calls, Chemical, which banking consumers had ranked fourth in quality in the industry, jumped to first.

□ In the piano business, Steinway & Sons has long been the quality leader. Its instruments are known for their even voicing (the evenness of character and timbre in each of the 88 notes on the keyboard), the sweetness of their registers, the duration of their tone, their long lives, and even their fine cabinet work. Each piano is built by hand and is distinctive in sound and style. Despite these advantages, Steinway recently has been challenged by Yamaha, a Japanese manufacturer that has built a strong reputation for quality in a relatively short time. Yamaha has done so by emphasizing reliability and conformance, two quality dimensions that *are* low on Steinway's list.

These examples confirm that companies can pursue a selective quality niche. In fact, they may have no other choice, especially if competitors have established reputations for a certain kind of excellence. Few products rank high on all eight dimensions of quality. Those that do—Cross pens, Rolex watches, Rolls-Royce automobiles—require consumers to pay the cost of skilled workmanship.

Strategic Errors

A final word, not about strategic opportunities, but about the worst strategic mistakes. The first is direct confrontation with an industry's leader. As with Yamaha vs. Steinway, it is far preferable to nullify the leader's advantage in a particular niche while avoiding the risk of retaliation. Moreover, a common error is to introduce dimensions of quality that are unimportant to consumers. When deregulation unlocked the market for residential telephones, a number of manufacturers, including AT&T, assumed that customers equated quality with a wide range of expensive features. They were soon proven wrong. Fancy telephones sold poorly while durable, reliable, and easy-to-operate sets gained large market shares.

Shoddy market research often results in neglect of quality dimensions that *are* critical to consumers. Using outdated surveys, car companies overlooked how important reliability and conformance were becoming in the 1970s; ironically, these companies failed consumers on the very dimensions that were key targets of traditional approaches to quality control.

It is often a mistake to stick with old quality measures when the external environment has changed. A major telecommunications company had always evaluated its quality by measuring timeliness—the amount of time it took to provide a dial tone, to connect a call, or to be connected to an operator. On these measures it performed well. More sophisticated market surveys, conducted in anticipation of the industry's deregulation, found that consumers were not really concerned about call connection time; consumers assumed that this would be more or less acceptable. They were more concerned with the clarity of transmission and the degree of static on the line. On these measures, the company found it was well behind its competitors.

In an industry like semiconductor manufacturing equipment, Japanese machines generally require less set-up time; they break down less often and have few problems meeting their specified performance levels. These are precisely the traits desired by most buyers. Still, U.S. equipment can *do* more. As one U.S. plant manager put it: "Our equipment is more advanced, but Japanese equipment is more developed."

Quality measures may be inadequate in less obvious ways. Some measures are too limited; they fail to capture aspects of quality that are important for competitive success. Singapore International Airlines, a carrier with a reputation for excellent service, saw its market share decline in the early 1980s. The company dismissed quality problems as the cause of its difficulties because data on service complaints showed steady improvement during the period. Only later, after SIA solicited consumer responses, did managers see the weakness of their former measures. Relative declines in service had indeed been responsible for the loss of market share. Complaint counts had failed to register problems because the proportion of passengers who wrote complaint letters was small—they were primarily Europeans and U.S. citizens rather than Asians, the largest percentage of SIA passengers. SIA also had failed to capture data about its competitors' service improvements.

The pervasiveness of these errors is difficult to determine. Anecdotal evidence suggests that many U.S. companies lack hard data and are thus more vulnerable than they need be. One survey found that 65% of executives thought that consumers could readily name—without help—a good quality brand in a big-ticket category like major home appliances. But when the question was actually posed to consumers, only 16% could name a brand for small appliances, and only 23% for large appliances.[6] Are U.S. executives that ill-informed about consumers' perceptions? The answer is not likely to be reassuring.

Managers have to stop thinking about quality merely as a narrow effort to gain control of the production process, and start thinking more rigorously about consumers' needs and preferences. Quality is not simply a problem to be solved; it is a competitive opportunity.

6. Consumer Network, Inc., *Brand Quality Perceptions* (Philadelphia: Consumer Network, August 1983), p. 17 ad 50–51.