

WHAT THE BUSINESS WORLD IS SAYING ABOUT SIX SIGMA

"Six Sigma is the most important initiative ever undertaken. As part of the global drive for business leadership." —JACK WELCH, CEO, GE

"We at AlliedSignal and IBM are proud to be early adopters and pioneers of Six Sigma. It has allowed us to streamline our processes and improve the way to billing and collections after the product is delivered. Just as we think we've generated the last dollar of profit out of a business, we uncover new ways to harvest cash as we reduce cycle times, lower inventories, increase output, and reduce scrap. The results are better and more competitively priced products, more satisfied customers who give us more business, and improved cash flow."

—LARRY BOSSIDY, CEO, ALLIEDSIGNAL

"The [Six Sigma] Breakthrough Strategy gives new structure to the tools we already had. Structure has been the key element missing in Polaroid's drive for quality. I keep telling my people that the Breakthrough Strategy cookbook tells us how to use time-tested ingredients in new ways... For us, the results from the Breakthrough Strategy have been quick and powerful." —MIKE HART, BLACK BEET ENGINEER, POLAROID

"Mikel Harry's innovation of Breakthrough Strategy has taken quality into America's boardrooms. While Dr. Deming's theory of profound knowledge built management awareness and Dr. Juran's trilogy helped to establish the foundation of a solid quality 'science,' Dr. Harry has demonstrated how to make theory become practice at companies like Motorola, ABB, AlliedSignal, and GE."

—GREGORY WATSON, PRESIDENT, AMERICAN SOCIETY FOR QUALITY

SIX SIGMA

MIKEL HARRY, PH.D., AND
RICHARD SCHROEDER

SIX

THE
BREAKTHROUGH
MANAGEMENT
STRATEGY
REVOLUTIONIZING
THE WORLD'S TOP
CORPORATIONS

SIGMA

US \$27.50 / \$42.00 CAN

PRICE

\$27.50

SIX SIGMA



201

CHAPTER ONE

Why Six Sigma?



Why Companies Are Embracing Six Sigma

What drives companies to implement Six Sigma? Contrary to what some believe, the goal of Six Sigma is not to achieve six sigma levels of quality. Six Sigma is about improving profitability, although improved quality and efficiency are immediate by-products of Six Sigma. Companies that implement Six Sigma do so with the goal of improving their margins. Prior to Six Sigma, improvements brought about by quality programs usually had no visible impact on a company's net income. Organizations that can't track the effect of quality improvements on profitability don't know what changes need to be made to improve their profit margins.

To date, every company that has implemented Six Sigma under our guidance has seen profit margins grow 20 percent year after year for each sigma shift (up to 4.8 to 5 sigma). Companies ranging from AlliedSignal to Dupont Chemical have come to us because despite improvements they made in quality, their profit margins were stagnating, if not shrinking. These companies could no longer afford to reduce prices to increase market share, and market competition would not allow them to raise prices to improve profit margins. They found themselves boxed into a corner. When they offered products and services with new features at no extra charge to the consumer, market share might increase but profit margins would shrink.

What Six Sigma Can Do for Your Company

While Six Sigma is a long-term, forward-thinking initiative designed to fundamentally change the way corporations do business, it is first and foremost designed to generate immediate improvements to profit margins. Instead of projecting three or more years into the future, Six Sigma focuses on achieving financial targets in twelve-month increments. Once those targets are met, companies will find that changes in the market and Six Sigma's impact on their own financial landscape have changed their internal dynamics so extensively that new financial targets must be set to keep the company moving forward. Companies operating at a three sigma level that marshal all their resources around Six Sigma can expect to make one sigma shift improvement each year. These companies will experience:

- a 20 percent margin improvement
- a 12 to 18 percent increase in capacity
- a 12 percent reduction in the number of employees
- a 10 to 30 percent capital reduction

Companies can expect to make one sigma shift improvement per year up to 4.7 sigma, meaning that a three sigma company that focuses all its resources on Six Sigma can expect to move to four sigma during the first year of implementation. Companies already at four sigma can expect to improve to 4.7 sigma during the first year of implementation and deployment. The financial benefits of progressing from 3 to 4 to 4.7 to Six Sigma are exponential, and experience has shown that companies can achieve a sigma level as high as 4.7 sigma without large capital outlays. In the second year, such companies can expect to move from 4.7 sigma to 5 sigma, and in the third year they will progress from 5 to 5.1. The closer companies come to achieving Six Sigma, the more demanding the improvements become. At 4.8 sigma companies hit a "wall" that requires a redesigning of processes,

known as "Design for Six Sigma." However, the profit-margin increases between a 3 sigma level company and 4.8 sigma company are so dramatic, making these companies so much more profitable than their competitors, that they can selectively pick what plant, product, operation, or process they need to improve to attain five sigma or higher.

Companies often ask if Six Sigma savings are as significant in small companies as they are in larger companies. The answer is unequivocally yes. Larger companies are composed of smaller businesses or divisions, often with their own presidents, making them similar to stand-alone companies of comparable size. A large company with thirty business units may have fifteen business units with sales of \$500 million or less. Whether a smaller business unit within a large corporation or a small-size stand-alone company, we have found that improved profitability depends far more on how rigorously Six Sigma is applied than on the size of the company's revenue.

Many companies ask if, as they improve their sigma level, subsequent projects will be as profitable as earlier projects. Since most companies start at roughly three sigma, virtually each employee trained in the Six Sigma Breakthrough Strategy will return on average \$230,000 per project to the bottom line until the company reaches 4.7 sigma. After a company reaches 4.7 sigma, the cost savings are not as dramatic. However, improved profit margins allow companies to create products and services with added features and functions that result in greater market share. So while Six Sigma improves the quality of a company's products and services and, in some cases, catapults a company ahead of its competition, the overwhelming and most visible impact of Six Sigma is the immediate benefit to any company's profit margins.

Six Sigma Is About Making Money

As the business world has become intensely aware, Six Sigma has helped some of the nation's best-run Fortune 100 companies achieve

dramatic financial results. How were the results achieved? What is the key to their success? The answer lies in human nature. As we pointed out in the preface, human beings measure what they value. Virtually everyone, for example, values money. Evidence of this value resides in everything from our nation's economic system to what we enter in our personal checkbook record—most of us write down and track our financial debits and credits religiously so that we can remain financially solvent. We track these "measurements" because we value financial solvency. Based on the numbers, we make decisions and take action. Measurements create a link between philosophy and action.

Companies, too, measure what they value. If we want to understand a corporation's values, we only have to find out what it measures, records, analyzes, reports, and takes action on. We would expect that an organization claiming to value growth would show the importance of this value in a measurement—such as by tracking and analyzing market share data, and sharing that information throughout the company.

Almost all organizations claim to be customer focused. But when there is no system of measurements in place to gauge customer satisfaction, can an organization genuinely say that its customers are a top priority? A company's business metrics can show if it values profitability over customer satisfaction. Organizations that do not measure what they profess to value don't know much about what they value. More important, they cannot control the outcomes of the things they value. Companies cannot improve what they don't measure.

Six Sigma starts with metrics—measuring the things that matter. Companies that value profitability will measure, report on, and react to escalating or falling profits. But do those same companies measure, report on, and react to the quality of their manufacturing and service processes, and how they affect customer satisfaction and profitability?

To Jack Welch, GE is not about numbers; it's about values. These values include employee satisfaction, customer satisfaction, and cash flow. GE knows that employee satisfaction translates into productivity; that high customer satisfaction means strong market share; and that cash flow means that employees have maintained the company's

customer-focused vision, its passion for excellence, and its desire to push forward with energy and enthusiasm. GE backs up its values with performance-based metrics, complete with goals linked to executive incentive pay.

GE's values clearly show its determination to maintain a reality-based, customer-focused company. Commercial Finance, a division within GE Capital Services, uses Six Sigma to better understand customer requirements and thereby win more deals. The result has been a 160 percent increase in new transactions. Another division within GE Capital Services, Mortgage Insurance, developed a flexible new billing system that contributed to customer retention and was instrumental in winning \$60 million in new insurance from just a single customer. In Japan, GE's Global Consumer Finance division helped customers overcome payment difficulties associated with limited banking hours, and saved money by establishing an alternate payment method through a network of 25,000 convenience stores, now used by 40 percent of its customers. Clearly, GE Capital Services knows what it means to value customer satisfaction, and it works steadily to measure how well it satisfies that value.

The New Definition of Quality

Past definitions of quality focused on *conformance to standards*, as companies strived to create products and services that fell within certain specification limits. Such definitions of quality assumed that if companies produced quality products and services, their performance standards were correct regardless of how those standards were met. In other words, performance standards may have been achieved after considerable rework of a specific part or service. In addition, previous definitions of quality often overlooked the fact that products or services rarely consist of a single element. Even a product or service made up of as few as five different elements that individually conform to standard may not work properly when put together. We call this concept "interacting standards."

The Six Sigma Breakthrough Strategy broadens the definition of quality to include economic value and practical utility to both the company and the consumer. We say that *quality is a state in which value entitlement is realized for the customer and provider in every aspect of the business relationship.* This new definition of quality focuses on achieving "value entitlement." In the world of Six Sigma, "entitlement" means that companies have a rightful level of expectation to produce quality products at the highest possible profits; for customers, "entitlement" means that they have a rightful level of expectation to buy high-quality products at the lowest possible cost. "Value" represents economic worth, practical utility, and availability for both the consumer and the company that creates the product or service. Economic worth refers to the fact that customers want to purchase products and services at the lowest possible cost, just as companies want to produce high-quality goods and services at the lowest possible cost. In addition, customers have every right to expect that the products and services that they purchase will be available when they need them and in the volume required. Providers have the same rightful expectation within their own businesses. Companies that produce products or services that do not conform to such standards are not achieving their economic and value entitlement.

Practical utility, as it applies to the customer, refers to the three areas of a finished product—form, fit, and function. All must meet the customer's needs. For example, new-car buyers look for "form"—they want an automobile that pleases the eye. They also look for "fit"—they expect the trunk lid to align with the body of the car, that there are no air or water leaks, rattles, or squeaks, and that engine noise be held to a minimum. Finally, car buyers look for "function," which means they are concerned with such things as gas mileage, automatic versus manual transmission, and the amount of horsepower the engine has.

While practical utility for consumers means that the product or service must possess a certain value, practical utility for companies refers to the fact that their processes must create value for the company. In other words, companies focus on process quality and consumers focus on the final product or service quality.

In the past, quality programs adopted by corporations focused on meeting the customer's needs at virtually any cost; many companies, despite poor internal processes, managed to produce high-quality goods and services. Even today, four sigma companies can produce six sigma products through enormous amounts of rework. However, they can't raise their prices to recapture these costs because they must price their products competitively. As a result, they suffer tremendous profit losses.

Business quality is highest when costs are at the absolute lowest for both the producer and the consumer. Six Sigma provides maximum value to companies—in the form of increased profits and maximum value to the consumer with high-quality products or services at the lowest possible cost. It is a business strategy and philosophy built around the concept that companies can gain a competitive edge by reducing defects in their industrial and commercial processes. Classically speaking, a defect is anything that fails to meet the customer's expectations or requirements. Again, Six Sigma takes a much broader view of defects. Within the framework of Six Sigma, a defect is anything that blocks or inhibits a process or service. For example, when a machine operator fails to change a gear during maintenance, it adversely influences the operation of a process, although it may not result in a defective product.

Within the Six Sigma Breakthrough Strategy that we developed over the last fifteen years are a series of established steps that (a) reveal how well products perform and how well services are delivered, and (b) show companies how to improve their processes and maintain the gains they achieve. The improvement process we have developed uses mathematical measurements to systematically reduce defects that occur in producing a product or service.

The sigma concept of measuring defects was created in the early 1980s as a way to develop a universal quality metric that applied regardless of product complexity or dissimilarities between different products. Higher sigma values indicate better products and lower sigma values represent less desirable products, regardless of what the product is. In short, the higher the sigma level, the fewer the number

of defects per unit of product or service. The lower the sigma level, the greater the number of defects per unit. Products produced at a six sigma level of quality operate virtually defect-free—by definition, with only 3.4 defects per million opportunities (DPMO). As such, Six Sigma has become recognized as the standard for product and service excellence. This level of quality is in stark contrast to historical standards of what companies strived for, which was four sigma, or 6,210 defects per million opportunities. Six Sigma standards are about 1,800 times more demanding than the old standard. Common sense cannot create a 1,800 times improvement. Such extraordinary improvements occur only when people employ extraordinary reasoning—reasoning that results only from new questions being asked about how a product or service is created. As new questions emerge, new measurements are instituted. When the opportunities for non-conformance—defects—are brought to six sigma levels—whether in manufacturing, engineering, administration, sales, or service—companies can then take valuable resources once spent on anticipating, detecting, and fixing defects to perform activities that add value for customers and ultimately the company. Every time we produce a defect in a process, time, labor, capital equipment, overhead, and material have to be used to detect, analyze, and fix that defect. This cycle of detection, analysis, and correction ties directly back to the three elements of customer satisfaction—delivering the highest-quality product (defect-free products and services), on time (reduced cycle time), and at the right price (which impacts manufacturing costs). When the probability of a defect becomes so low that a company rarely encounters one, maintaining systems to detect, analyze, and fix defects are virtually unnecessary. Expenses drop dramatically. This is the ultimate goal of Six Sigma.

In today's competitive world, a great many companies conscientiously make improvements in product lines and delivery cycles, yet are unable to stay ahead of complex technological changes and escalating customer expectations. At best, these companies are just keeping pace. This explains why corporations, both in Europe and the United States, that operated at 3.5 to 4 sigma thirty years ago are still

operating at that level today. Despite improvements, the evolution of technology, the complexity of product features, and more sophisticated customer demands have thwarted significant advances in how industrial and commercial processes are created, leaving the relative capability of organizations unchanged. History has shown that standards lag behind technology. Significant breakthroughs in technology, such as those we have seen in the past two decades, force companies to find new ways to meet customers' expectations.

As the phrase "six sigma quality" has increased in popularity, and more and more companies that have embraced Six Sigma have begun to achieve significant financial benefits, an increasing number of companies have become eager to jump on the bandwagon.

The Origins of Six Sigma

The quest to achieve Six Sigma had its birth at Motorola in 1979 when executive Art Sundry stood up at a management meeting and proclaimed, "The real problem at Motorola is that our quality stinks!" Sundry's proclamation sparked a new era within Motorola and led to the discovery of the crucial correlation between higher quality and lower development costs in manufacturing products of all kinds.

At a time when most American companies believed that quality cost money, Motorola realized that done right, improving quality would actually reduce costs. They believed that high-quality products should cost less to produce, not more. They reasoned that the highest-quality producer should be the lowest-cost producer. At the time, Motorola was spending 5 to 10 percent of annual revenues, and in some cases as much as 20 percent of revenues, correcting poor quality. That translated into a whopping \$800 million to \$900 million each year, money that, with higher-quality processes, could be returned directly to the bottom line. (Motorola's belief that high-quality products should cost less to produce has since been proven over and over again to be true.)

As Motorola executives began looking for ways to cut waste, Bill

Smith, an engineer at Motorola's Communications Sector, was quietly working behind the scenes studying the correlation between a product's field life and how often that product had been repaired during the manufacturing process. In 1985, Smith presented a paper that concluded that if a product was found defective and corrected during the production process, other defects were bound to be missed and found later by the customer during early use of the product. However, when the product was manufactured error-free, it rarely failed during early use by the consumer.

Although Smith's findings were initially greeted with skepticism, customer dissatisfaction with a product that failed shortly after it had been purchased was very real. As a result, Smith's finding ignited a fierce debate within Motorola. Was the effort to achieve quality really dependent on detecting and fixing defects? Or could quality be achieved by preventing defects in the first place through manufacturing controls and product design? Later data would show that a concerted effort at detecting and fixing defects would lead Motorola only to four sigma—placing it only slightly ahead of the average American company. At the same time, the company was finding that foreign competitors were making products that required no repair or rework during the manufacturing process.

Others at Motorola began to take a second look at Smith's work. If hidden defects caused a product to fail shortly after the customer began using it, something needed to be done to improve the manufacturing process. As a result, Motorola began its quest to improve quality, and simultaneously reduce production time and costs, by focusing on how the product was designed and made.

It was this link between higher quality and lower cost that led to the development of Six Sigma—an initiative that at first focused on improving quality through the use of exact measurements to anticipate problem areas, not just react to them. In other words, Six Sigma would allow a business leader to be *proactive*, rather than *reactive*, to quality issues.

The difference between previous total quality approaches and the

Six Sigma concept was a matter of focus. Total quality management (TQM) programs focus on improvements in individual operations with unrelated processes. The consequence is that with many quality programs, regardless of how comprehensive they are, it takes many years before all the operations within a given process (a process is a series of activities or steps that create a product or service) are improved. The Six Sigma architects at Motorola focused on making improvements in all operations within a process, producing results far more rapidly and effectively.

A quantum leap in manufacturing technology occurred at Motorola when it applied Six Sigma to the development of its Bandit pager—a name the company selected because those involved in the project "borrowed" every good idea they could find from products already on the market. Within eighteen months, and for a price tag of less than \$10 million, Motorola's twenty-three Bandit engineers had designed a pager that could be produced in its automated factory in Boynton Beach, Florida, within seventy-two minutes from the time an order was placed by computer from any Motorola sales office. Pagers could be ordered with various options and could be custom-built for individual customers. Moreover, the Bandit's superior design and manufacturing process resulted in an average life expectancy for its pager of 150 years. The company's pagers were so reliable that product testing was ultimately eliminated; it was much more cost-effective to replace a pager, in the unlikely event that it failed, than to spend time and money testing a product that was virtually defect-free.

As Motorola saw a reduction in defects and in manufacturing time, the company also began to reap financial rewards from the Six Sigma concept. In other words, the company had higher-quality products and happier customers at a cheaper cost. Within four years, Six Sigma had saved the company \$2.2 billion. Motorola's Six Sigma architects had done what most companies thought was impossible. By 1993, Motorola was operating at nearly six sigma in many of its manufacturing operations. Within a short time, Six Sigma began to spread like wildfire to other industries—and beyond manufacturing divisions alone.

What Is a Process?

Almost everything companies do involves a process. A process is any activity or group of activities that takes an input, adds value to it, and provides an output to an internal or external customer. Companies, regardless of their size, utilize thousands of processes every day to create their products and services. An *industrial process* is any process that depends on machinery for its creation and comes into physical contact with materials that will be delivered to an external customer. It does not include shipping, distribution, or billing processes. A *commercial process*, such as ordering materials, payroll, or processing customer orders, supports industrial processes, or may stand on its own as a separate and unique business. When at least 80 percent of a product's or service's value is derived from machinery, we consider this an industrial process. However, when 80 percent or more of a process depends on human activity, we consider this a commercial process. Airlines, employment agencies, accounting firms, fast-food restaurants, and the like are primarily commercial enterprises rather than industrial enterprises. The profitability of banks, insurance companies, brokerage firms, and the like depends primarily on the quality of their commercial process; manufacturing companies profit only when the quality of their industrial (and commercial) processes meets or exceeds their customers' expectations.

Six Sigma Applies to Products and Services, Not the Companies Who Create Them

Recent business history has shown that a company with six sigma products can still be in financial disarray. There is an important distinction between six sigma products and processes, and six sigma companies. The Six Sigma Breakthrough Strategy creates specific improvement goals for every process within an organization, allowing organizations to understand and incorporate technological advances lurking on the horizon. Six Sigma forces organizations to reexamine

the way in which work gets done, rather than tweeking existing systems. It simplifies systems and processes, improves capability, and ultimately finds a way to control systems and processes permanently. Yet even a six sigma product will fail if brought to market late or into a market with no demand. This is why companies must achieve Six Sigma in *everything* they do.

Six Sigma Is a Performance Target

It's important to understand that Six Sigma is a performance target that applies to a single critical-to-quality characteristic (CTQ), not to the total product. When an automobile is described as "six sigma," this does not mean that only 3.4 automobiles out of a million will be defective. Six Sigma means that within a single automobile, the average opportunity for a defect of a critical-to-quality characteristic is only 3.4 defects per million opportunities. The more complex a product is—let's say we are comparing a paper clip with a sophisticated piece of medical equipment with complex subsystems—the greater the likelihood a defect will exist somewhere with the product. While a complex piece of medical equipment may have more defects per unit than the paper clip, at the "opportunity" level the paper clip and the piece of medical equipment can easily have the same sigma capability. So rather than stating that a product is six sigma, we say that the average opportunity for nonconformance within a product is six sigma.

Called on the Carpet

What exactly does Six Sigma—3.4 defects per million opportunities—mean? What is the difference, in practical terms, between, say, three sigma and six sigma? Let us give you an example. If wall-to-wall carpet in a 1,500-square-foot home were cleaned to the three sigma level (the average company operates at about a 3.5 to 4 sigma level), about four square feet of carpet (the carpet area under your average-

size recliner chair) would still be soiled. In other words, a three sigma level would lead to a good number of disgruntled customers. If that same carpet were cleaned to the six sigma level, the soiled area would be the size of a pinhead—virtually invisible. The higher the sigma level, the less likely a process will produce defects. Each sigma creates an exponential reduction in defects. Consequently, as sigma increases, product reliability improves at a disproportionate rate. As a result, the need for testing and inspection diminishes, costs go down, cycle time decreases, and customer satisfaction goes up. Six Sigma is about as perfect as we can get in this world.

When describing Six Sigma and the number of defects that will occur at each sigma level to executives visiting the Six Sigma Academy, we often use this explanation: Each person sitting in the classroom is there because the airlines' record in getting passengers safely from one city to another exceeds six sigma, with less than one-half failure per million. However, for those whose bags did not arrive with them, it's because the airline's baggage operations are in the 6,000 to 23,000 defects per million range, or 3.5 to 4 sigma—which is typical of manufacturing and service operations (activities such as calculating restaurant bills, completing bank transactions, and filling medical prescriptions).

Customers are satisfied when they receive the value they expect. When products and services are produced at a six sigma level of quality, companies can be 99.99966 percent certain that each opportunity contained within the product will be created and delivered to the customer's expectation.

Taking Quality Personally

Former Motorola CEO Bob Galvin once told Mike that if a leader is to create true and lasting improvement, he or she must take quality to a personal level. Perhaps the path toward this goal should begin by looking at the chart on page 16. This form will guide you through the process of "sigma-tizing" one or more of your key processes, products, and/or services. The outcome may surprise you. At a minimum, it will

give you a good benchmark of your key processes, products, and services as you progress through this book. It will place quality (and this book) on a more personal level.

To complete a form such as "How to Approximate the Sigma Capability for One of Your Processes," based on your criteria, there is little need for statistics or math of any kind—in fact, all that is required are some basic facts and simple arithmetic. So before reading on, let's find out what your sigma capabilities are.

Building a New Bottom Line

Again, the typical corporation today operates at a three to four sigma level. Companies below three sigma usually don't survive. At three sigma, the cost of quality is roughly 25 to 40 percent of sales revenue. To give you a sense of comparison, at six sigma, the cost of quality declines to less than one percent of sales revenue. Increasing profits by 20 to 30 percent of sales revenues creates massive savings and throws off significant increases to the bottom line. When General Electric reduced its cost of quality from 20 percent to less 10 percent—and raised its overall sigma level from four to five sigma—the company achieved a \$1 billion increase in net income in just two years. This is money that goes directly to the bottom line. This is the reason corporations—and Wall Street—are so high on Six Sigma.

The Cost of Quality

For some companies, the cost to deliver a quality product can account for as much as 40 percent of the sales price. The laser jet printer you bought for \$800 may have cost the manufacturer \$320 in rework costs just to make sure that you took home an average-quality product. For a company whose annual revenues are \$100 million, and whose operating income is \$10 million, the cost of quality is roughly

HOW TO APPROXIMATE THE SIGMA CAPABILITY FOR ONE OF YOUR PROCESSES			
STEP	ACTION	EQUATIONS	YOUR CALCULATIONS
1	What process do you want to consider?		Billing and charging
2	How many units were put through the process?		1,283
3	Of the units that went into the process, how many came out OK?		1,138
4	Compute the yield for the process defined in Step 1	$= (\text{Step 3}) / (\text{Step 2})$.8870
5	Compute the defect rate based on Step 4	$= 1 - (\text{Step 4})$.113
6	Determine the number of potential things that could create a defect	$= N$ number of critical-to-quality characteristics (CTQs)	24
7	Compute the defect rate per CTQ characteristic	$= (\text{Step 5}) / (\text{Step 6})$.0047
8	Compute the defects per million opportunities (DPMO)	$= (\text{Step 7}) \times 1,000,000$	4,709
9	Convert the DPMO (Step 8) into a sigma value, using the Sigma Conversion Chart at the back of the book		4.1
10	Draw conclusions		Slightly-above-average performance

WHY SIX SIGMA?

17

25 percent of the operating revenue, or \$25 million. If this same company could reduce its cost of achieving quality by 20 percent, it would increase its operating income by \$5 million—or 50 percent of the current operating income. The following chart shows the benefits of reaching higher sigma levels.

THE COST OF QUALITY		
SIGMA LEVEL	DEFECTS PER MILLION OPPORTUNITIES	COST OF QUALITY
2	308,537 (<i>Noncompetitive companies</i>)	Not applicable
3	66,807	25 – 40% of sales
4	6,210 (<i>Industry average</i>)	15 – 25% of sales
5	233	5 – 15% of sales
6	3.4 (<i>World class</i>)	< 1% of sales
Each sigma shift provides a 30 percent net income improvement.		

Back to the Future

Why should companies focus on the process rather than the final outcome? Final outcomes or results are dictated by what happens during the process. When businesses create a better process, they eliminate opportunities for defects before they occur. By reducing variation during the creation of products and services, it's possible for any business to achieve six sigma quality. Every aspect of a business can improve its cost and profitability dramatically by using the Six Sigma Breakthrough Strategy.

Keep in mind, however, that Six Sigma and the Breakthrough Strategy are two distinct elements. Six Sigma is the philosophy and goal—3.4 defects per million opportunities. The Breakthrough Strategy provides the means to achieve that goal through a highly focused system of problem solving. Six Sigma is the Land of Oz; the Breakthrough Strategy is the Yellow Brick Road that takes us there.

Although companies pursuing Six Sigma through the Breakthrough Strategy will undoubtedly see a marked improvement in the quality of

their goods and services, the most important impact of the undertaking will be on the bottom line. As one Polaroid executive put it, "Six Sigma gave our company universal tools that could be systematically applied to problems and then be used to gauge the results. In some ways, Six Sigma is one of the most misunderstood strategies ever to hit the business world. The focus is not so much on the number of defects per million opportunities, but a systematic road map to reduce variability in a process through assimilation and organization of information that increases bottom-line dollar savings. Although defects decrease as the process improves, Six Sigma focuses on the process that creates or eliminates the defects rather than the defects themselves."

Achieving Six Sigma is not easy. In fact, GE's Jack Welch calls Six Sigma the most difficult "stretch goal" GE has ever undertaken. But we are confident that Six Sigma will be the biggest, the most personally rewarding, and the most profitable initiative your company will ever undertake. The improved quality that results will translate not only into cost reductions but into increased sales and quantum leaps in profitability. By increasing quality levels, companies not only make more money for shareholders, they also acquire greater market share as a result of increased customer satisfaction. And that is a benefit no other reengineering or quality program can equal.

CHAPTER TWO

The Yellow Brick Road

Motorola had an unusual problem. In 1988, the inaugural year of the Malcolm Baldrige National Quality Award, Motorola was the first large company to win the coveted prize. The award came about, in part, as a result of former Motorola president Robert Galvin's 1981 challenge to the company that it achieve a tenfold improvement in performance over a five-year period. Motorola employees successfully achieved Galvin's goal and went on to win the Baldrige Award. But the company wasn't allowed to compete again for five years. As a result, the award couldn't serve as a driving force for continued improvement.

Four years earlier, Mikel Harry, a senior staff engineer at Motorola's Government Electronics Group (GEG), created a detailed road map for improving product design and reducing production time and costs within GEG. This represented the Yellow Brick Road to Six Sigma. Convinced that the initial concept of Six Sigma was valid, Harry pulled together a group of engineers within GEG to demonstrate its potential. Under his leadership, they began to experiment with problem solving through statistical analysis. Through this teachable methodology, the organization began to show dramatic results—GEG's products were being designed and produced faster and more cheaply. Subsequently, Harry began to formulate a method for applying Six Sigma throughout the company.

His work culminated in a paper titled "The Strategic Vision for Accelerating Six Sigma Within Motorola." The paper quickly made its way throughout the company, eventually landing on the desk of Robert Galvin. Galvin believed that achieving six sigma within Motorola was

the incentive the company needed to raise the bar for quality. Moreover, Galvin recognized the practical applications of applying statistical analysis to business problems.

In 1990, Galvin asked Harry to leave the company's Government Electronics Group in order to start up and lead Motorola's Six Sigma Research Institute in Schaumburg, Illinois. Other companies, such as IBM, Texas Instruments Defense Group, Digital Electronics, Asen Brown Boveri, and Kodak, would participate as well. The mission of the Institute was to develop Six Sigma implementation strategies, deployment guidelines, and advanced statistical tools that would work in a variety of companies and industries.

The Institute presented opportunities for further development of the Six Sigma Breakthrough Strategy that the actual factories could not. A real factory or work area is noisy and hectic. Moreover, many types of problems don't arise very often in the actual production of a product or service. The Institute did not have to worry about slowing down or stopping a manufacturing line or delivery of service to check or correct defects. The Institute allowed researchers to run simulations to show the effects of potentially costly mistakes. It created an environment where production problems from the factory floor could be translated into statistical problems to which the Six Sigma Breakthrough Strategy could be applied to find the cause of the problem and a solution.

Meanwhile, Richard Schroeder, vice president and general manager of customer service for Motorola's Codex subsidiary, heard about Harry and his accomplishments at the Government Electronics Group using Six Sigma. He decided to apply the methodology within Codex. Schroeder used Six Sigma to achieve a 58 percent reduction in cost of quality within the division, a 40 percent reduction in errors, and a 60 percent reduction in the time it took to design a product.

Excited by the potential to apply Six Sigma to other businesses, Schroeder convinced Harry to leave Motorola in 1993 and join him at Asen Brown Boveri's (ABB) transformer business, where they would help rebuild the Swiss manufacturing giant. While at ABB, they worked in tandem to shift the focus of Six Sigma from controlling

defects to reducing costs, allowing for further refinement of the Breakthrough Strategy. By focusing the strategy on increasing ABB's net profits through improving product quality, performance, productivity, and costs, ABB achieved a 68 percent reduction in defect levels and a 30 percent reduction in product costs, resulting in an \$898 million savings/cost reduction each year over a two-year period. Schroeder also helped many of ABB's suppliers apply the Breakthrough Strategy to their own products, ultimately reducing ABB's material cost purchases by \$87 million. The two decided to join forces and henceforth be a team.

In 1994, Dr. Harry opened the doors to the Six Sigma Academy in Scottsdale, Arizona, taking on General Electric and AlliedSignal as the first clients. As the Breakthrough Strategy became known and applauded on Wall Street and in corporate boardrooms, the Academy has experienced phenomenal growth, attracting attention from Fortune 50 companies in a range of industries.

We are bombarded daily with requests from companies around the world that want more details on how the Six Sigma program works and how it can be applied to their organization. As a result, we developed a comprehensive Six Sigma training curriculum at the Academy to teach companies how to apply the Breakthrough Strategy to the processes that go into creating a product and/or service. At the Academy, and now, for the first time, in this book, we show how the Breakthrough Strategy affects six areas fundamental to improving a company's value:

1. process improvements
2. product and service improvement
3. investor relations
4. design methodology
5. supplier improvement
6. training and recruitment

A Breakthrough Strategy Overview

Six Sigma is a problem-solving venture. Every project has a process or design problem in search of a solution. The Breakthrough Strategy directs people's energies to finding solutions and improving bottom lines. It shows companies how much information (and therefore money) they are leaving on the table.

Using the Six Sigma Breakthrough Strategy to identify problems can be a daunting experience for corporate leaders. The Breakthrough Strategy takes executives through the maze of business, technology, manufacturing, quality, production, and delivery system issues. In doing so, it initially raises even more questions. Identifying a problem is simple compared with defining the underlying causes. Underlying causes are often masked by layers of skewed financial reports, irrelevant data, or a corporation's cultural bias.

There are eight fundamental steps or stages involved in applying the Breakthrough Strategy to achieve Six Sigma quality in a process, division, or company. These eight phases are Recognize, Define, Measure, Analyze, Improve, Control, Standardize, and Integrate. The four core phases (what we call M-A-I-C) of the Breakthrough Strategy—Measure, Analyze, Improve, and Control—are described here; Chapter 7 addresses each of the eight phases in greater detail.

The **Measure** phase includes a review of the types of measurement systems and their key features. Companies must understand the nature and properties of data collection and reporting. They must think about where errors in measurements can occur, as well as the potential impact faulty measurements can have on a project's success. In addition, companies must study the frequency with which defects occur and the process capability that governs the creation of defects.

In the **Analyze** phase, the Breakthrough Strategy offers specific statistical methods and tools to isolate key pieces of information that are critical to explaining the number of defective products. In the Analyze phase, practical business problems are turned into statistical problems. Is the problem sporadic or persistent? Is the problem technology or process related?

In the **Improve** phase, the Breakthrough Strategy focuses on discovering the key variables that cause the problem. The Improve phase encompasses the process known as Design for Six Sigma (DFSS), as well. Using DFSS, the processes that create the products or services are designed from the beginning or reconfigured in such a way that they produce six sigma—quality goods and services, much as Motorola designed a process to produce a virtually defect-free pager.

Finally, in the **Control** phase, the Breakthrough Strategy ensures that the same problems don't reoccur by continually monitoring the processes that create the product or service.

Realizing the full potential of the Breakthrough Strategy requires identifying and training key employees. Highly skilled employees known as Black Belts are trained in the Breakthrough Strategy and its tools. Working full time on Six Sigma projects, Black Belts lead teams through each of the four phases that affect key processes.

Six Sigma's Breakthrough Strategy

The Six Sigma Breakthrough Strategy is a disciplined method of using extremely rigorous data-gathering and statistical analysis to pinpoint sources of errors and ways of eliminating them. Six Sigma's heavy reliance on performance metrics coupled with statistical analysis eliminates the fluff found in other quality programs. Quality-improvement projects using Six Sigma are chosen as a result of customer feedback and potential cost savings, not fuzzy notions of continuous improvement. Improvements that have the largest customer impact—and the biggest impact on revenues—are given the highest priority. In other words, we focus first and foremost on the improvements that will have the biggest impact on your business. Again, unlike other quality programs, Six Sigma does not pursue quality solely for the sake of achieving quality. Six Sigma is about pursuing quality only if it adds value for the customer and the company.

The Breakthrough Strategy's methodology uses specific tools to reduce operating costs, improve capacity, improve margins, shorten

the length of time it takes to bring a new product to market, reduce inventory, and process transactions in shorter time periods with fewer errors. The Breakthrough Strategy applies a laserlike focus to improvement—first, through the short-term strategy of defect removal, and, second, through the long-term strategy of refining the system. Removing critical defects will not only improve your bottom line in the short term, but it will set the stage for eventually refining entire systems for even greater profitability. Improving results requires that the processes that generate the results also improve. When organizations recognize that, they are already well on the way to achieving Six Sigma.

Six Sigma and Statistics

Understandably, most people believe that statistics are boring and complicated. But some of the most interesting phenomena that occur within organizations can be best captured and explained with the simplicity and beauty of statistics. Once people get beyond the symbols, formulas, and charts, they usually find that statistics make problems (and the questions) much clearer and simpler. Statistics can be creative, simple, important, and relevant, yet many people think statistics only muddy the waters. It's just not true. It's really the simplicity of statistics that allows us to measure, improve, and monitor the processes within our organizations. Statistics are a tool that separates commonsense reasoning from extraordinary reasoning.

H. G. Wells wrote in 1925, "Statistical thinking will one day be as necessary for efficient citizenship as the ability to read and write." We believe that statistical knowledge is to the information and technological age what fossil fuel was to the industrial age. In fact, the future of industry depends on an understanding of statistics. Statistics are like a powerful microscope that make visible what has previously been invisible. Without statistics, today's high-density semiconductor chips could not be built. To an extent, statistics allow us to see the future and introduce changes that permit us to redirect or correct the way things develop. Statistics allow companies to solve

problems and form the backdrop for how they educate their employees. They allow companies to collect data, translate that data into information, and then interpret the information so that decisions can be made based on fact, rather than intuition, gut feel, or past experience. Statistics create the foundation for quality, which translates to profitability and market share.

Managers need to become more literate in statistics, but we also realize that statistical knowledge needs to be communicated in a format that makes it usable, so that people can extrapolate key data and apply it to their day-to-day work. But it's also important to recognize that the full benefit of statistics can be achieved only in a culture that looks at data with the right skills—hence, the Breakthrough Strategy. The more knowledgeable an organization becomes, and the more it allows its employees to use that knowledge, the more profitable it will become. Only knowledge put to use can create capital.

Because of the importance of statistics in achieving quality, industry is starting to devote huge amounts of money to training employees in statistical methods for quality improvement, as well as for other efforts. Unfortunately, our college and university curriculums still do not fully reflect the growing relevance of statistics in organizations of all kinds, and therefore give little emphasis to educating students in even some of the most fundamental aspects of how to apply mathematical statistics to everyday life in the workplace. Disciplines such as engineering and business should uniformly require statistical courses in the curriculum, but many do not, and may instead designate these courses as "electives."

Another problem is that many statistics courses are theoretical, and students are not given the opportunity to link theory to practical application. A lack of the right kind of statistical education at the university level is a major stumbling block to U.S. competitiveness in industry. While corporate-based education is certainly a way to overcome this problem, we also believe that our colleges and universities need to relearn the way they teach students so that when they enter the workforce they have the knowledge and skills to link theory to practice. On so many occasions, we have heard employees at organi-

zations, particularly those employees just out of school, describe how their college statistics courses left them confused on how statistical tools apply to the real work world. If H. G. Wells is correct in his prediction about statistics—and we believe he is—the implications of his words for our educational systems and the future of our workforce are enormous.

Learning from Past Mistakes

Since World War II, the proliferation of programs and initiatives designed to improve productivity and increase profits has left much of American industry confused. The world has had enough of improvement programs and management fads based on intellectual models that don't have the tools or strategies to implement the new ideology. Organizations need standardized methods and tools designed to ferret out and exploit opportunities that will result in tangible financial gains. They need initiatives based on repeatable improvement. They need standardized road maps on how to implement and deploy the strategies, tactics, and tools, and the leadership necessary to create and sustain success.

Companies have tried downsizing, outsourcing, activity-based costing, new-product development, reengineering, material requirements planning, Kaizen,* and creating world-class factories. While none of these management methods are inherently bad—they have produced notable results—they are not designed to help companies improve their bottom line and simultaneously improve quality or performance.

Over the past fifteen years, American industry has been besieged by consultants and business books focusing on process improvement.

*Kaizen refers to gradual, unending improvement, doing "little things" better, and continually reaching for higher standards. It is Bombardier's belief that at a certain point the gain from basic Kaizen tools diminishes and the impact of Six Sigma takes off. Organizations that are between 3 and 3.5 sigma will see that some of their projects will look like Kaizen efforts, since Kaizen uses fairly basic tools. But once the Six Sigma methodology starts using tools such as Design of Experiments, companies make quantum leaps in performance not possible through Kaizen-type efforts. The gains from Six Sigma projects will be far greater than what can be achieved through Kaizen, particularly when companies begin to change the design of their products.

While such quality initiatives can have positive effects, none has the potential of Six Sigma and the Breakthrough Strategy.

One reason for this is that for most quality initiatives, people in the organization are not required to "own" the quality of their work. The quality of their products, product design, and industrial processes are so far removed from the financial aspects of the business that they have no reason to link their day-to-day activities to the overall financial state of the company. When design, manufacturing, sales, and quality control work independently, there is a great deal of resistance on the part of people to take responsibility for something that is not part of their job. While many quality programs work effectively within individual departments, they lack the ability to reach across the entire corporation in a unified and focused manner. To create synergy and shared goals and values, a quality initiative needs to infiltrate the mind-set and behavior of every employee in every corner of the organization. *The Six Sigma Breakthrough Strategy is a business initiative*, rather than a quality initiative; every employee throughout the corporation is accountable for understanding and implementing its methodology. When Six Sigma is implemented as a business strategy, the company uses financial measures to select projects for improvement and to determine the results. In other words, Six Sigma aligns the needs of the corporation and the customer with the needs of the individual.

For thousands of employees in hundreds of companies, Six Sigma is the place where science, technology, quality, and profitability meet. Common goals are forged between engineers and marketers, between companies and their customers, and between senior management and those who actually create the product or deliver the service. Six Sigma encourages employees to ask new questions and pursue answers with new and standardized investigative processes. As you learn how others have applied Six Sigma principles, we believe you may be forced to reexamine the ways in which your organization works, as well.

An Introduction to TQM

*A noted business consultant
describes the four basic steps
of a total quality management system*

By Kevin R. Kehoe

This is the first installment in a 10-part series on one of today's biggest workplace trends: total quality management. Kevin Kehoe, vice president of Richard Chang Associates Inc., a management consulting firm in Irvine, CA, has worked extensively with the Associated Landscape Contractors of America on total quality management programs.

This series will focus on topics like sharing the "big picture" with employees, building commitment and excitement, auditing your level of quality, partnering with customers, finding ways to do the job better the first time, getting people to solve problems on their own, setting up a good measurement system, running a quality meeting, and recognizing and rewarding success. This installment provides an overview of TQM and what it can do for your company.

Happy customers and happy employees create profit. Profit makes owners happy. Happy owners put profits back into the business, making customers and employees even happier. And the beat goes on.

This is why you should piece together and expand your total quality effort. "How can I expand my total-quality effort when I never had one to begin

with?" you may ask. As a small to medium-sized company, you may not have a formal TQM program in place, but you may have incorporated the basic principles without even knowing it. Without corporate bureaucracy to tie their hands, many small and medium-sized companies are already living and breathing the techniques, values and philosophies of TQM. Here are some examples:

One landscape company has been getting employees together to solve problems for several years. That's quality in action. Yet the company's managers still feel that they need to do this more effectively.

Another company surveys its customers quarterly to check on their satisfaction. That's quality in action. Yet the company knows there's more that can be done.

Another business has set up a program for keeping equipment in good shape; this company rewards employees by sharing the cost savings. That's quality in action. Yet the rewards never seem to be enough for employees. All these efforts, and still there is an underlying sense that something is missing.

What's missing? If you have ever tried to piece together a puzzle, you know it's almost impossible without using the

picture on the box as a guide. Your company already has some of the pieces of TQM; what you may be missing is the picture on the box.

Starting a TQM effort hardly ever means starting from scratch — discarding all the old methods and embracing all new ones. If that was what starting a total quality effort was all about, then you would run the risk of throwing the baby out with the bath water. Instead starting a TQM program is more like seeing the big picture on the box, looking for the pieces you already have, getting the new pieces you need and putting them together.

Starting and expanding your TQM effort is an ongoing four-step process of solving the equation Customer Satisfaction + Employee Satisfaction = Profit. Here are the four steps:

- Ask and listen.
- Target and analyze.
- Coordinate and improve.
- Learn and celebrate.

These four steps can put you on the path to becoming a quality company.

Ask and listen. Quality is customer- and employee-driven. If customers and employees are happy, you will make money. Ask these people how satisfied they are, and listen to what they say. They will tell you exactly what you need to do to increase their satisfaction. Satisfied customers buy more and pay more. Satisfied employees work harder and smarter.

Survey your customers quarterly. Designate an "action team" to be responsible for designing and distributing the survey, following up on the responses, evaluating the results, and setting up action plans to respond to the feedback.

For example, at one 50-person design/build and maintenance company, an employee action team created a 10-question survey. Customers respond to each of the 10 questions by ranking satisfaction on a scale of one to 10. A perfect satisfaction score is 100. Every quarter, the action team translates the results into a graph and posts it.

This survey yields valuable information that helps the company identify areas of high and low satisfaction, and motivates everyone to make satisfaction his most important job. At first, the company regularly received scores of 85 to 89 points. Customers were satisfied with things like design, price and accuracy of installation but dissatisfied with responsiveness to problems and timeliness of delivery.

Employees realized that, to increase overall satisfaction, they would have to take steps to improve satisfaction in the areas where they were lacking while maintaining satisfaction in each of the

eight other areas. They put together a plan and are now working on these rough spots.

It's equally important to survey employees — preferably twice a year. The first two times you survey your employees, have an outside company conduct the survey. This ensures confidentiality, which in turn ensures honest responses and accurate information.

A good survey provides feedback on several subjects:

- Perceived efficiency of company procedures and processes.
- Clarity of vision, values and objectives.
- Effectiveness of communications.
- Perceived level of employee empowerment.
- Effectiveness of your managers as leaders.
- Effectiveness of reward and recognition methods.

Just like the customer survey, an employee survey can yield valuable information regarding the performance of company leaders (sidebar, right). Sometimes what employees tell you can be painful to hear. You may hear things you don't agree with. Fight the urge to turn a deaf ear. By listening and responding without becoming defensive, you gain trust and commitment and begin to create a dialogue that can lead to higher employee satisfaction.

At one company, a group of managers learned that they were doing an unsatisfactory job recognizing and rewarding good performance. Employees said they heard criticism often enough when things went poorly on the job, yet they never heard praise for their performance and efforts.

Instead of ignoring these comments, the managers listened. They met with employees and acknowledged the feedback. They also showed their commitment by asking the employees to design a recognition and reward process for the company. Three months later, these managers implemented the system the employees had set up. Now satisfaction is up, and so are profits.

But the story didn't end there. An employee action team now conducts the employee survey twice a year. At this company, employees know their voices will be heard.

Target and analyze. Every area of satisfaction or dissatisfaction has its roots in work processes. For example, dissatisfaction with the timeliness of deliveries may begin in the job-scheduling process. After asking and listening, identify the parts of the operation that affect timely deliveries and analyze the process to learn what is

Sample Questions

Subjects are asked to respond to these statements by choosing one of the following: "Strongly disagree," "Disagree," "Neither agree nor disagree," "Agree" or "Strongly agree."

Customer Survey

- Our employees treat you in a courteous and friendly manner.
- Our employees are efficient.
- We make it easy to complain if you are unhappy.
- Our employees ensure that your complaints are resolved promptly.
- Our employees ensure that your complaints are resolved effectively.
- We follow up with you to determine your satisfaction.
- Our paper work is simple and easy to read.
- Our employees answer the phone within three rings.
- Our employees are knowledgeable about their products.
- Our pricing is highly competitive.
- You would recommend us to your friends.

Employee Survey

- The company has clearly stated its vision and values.
- Everyone knows how to perform based upon the vision and values.
- The company has a reputation for high ethical standards.
- Managers are open in communicating with employees.
- The company consistently exceeds customer expectations.
- Management is receptive to ideas and suggestions.
- Employee ideas and suggestions are used for improving the way things get done.
- Managers establish objectives and priorities clearly.
- Employees are encouraged to gain skills to improve their abilities.
- Employees receive recognition when they exceed expectations.
- Managers provide useful feedback on performance.
- Employee performance is evaluated regularly.
- Employees solve problems together.
- Employees are rewarded for teamwork.
- Employees are interested in improving the way work gets done.
- The company provides adequate training.

snarling delivery schedules.

At the design/build company mentioned above, an action team analyzed the scheduling process and realized that it was connected to the purchasing, receiving and estimating processes. In turn, the estimating process was connected to the selling process. After analyzing the selling process, the company discovered that salespeople were establishing unrealistic delivery expectations with customers. The company is now using sales-meeting checklists to communicate more clearly.

This is one way to target and analyze your process-improvement efforts. An-

other way is to perform a self-diagnosis of your operations. Compare your operation to a set of guidelines (I'll provide them in a future column) describing what the "best" quality companies are already doing. These guidelines are the picture on the puzzle box; with them, you can identify the puzzle pieces you already have, as well as the pieces you still need to complete the picture.

This comparison will target areas you can improve to expand your quality effort. The guidelines are based on an audit of six key areas of your business:

- Planning.
- Leadership.

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- Information.
- People.
- Process.
- Customers.

If you compare the way you do certain tasks with the way "quality companies" do them, you can not only set goals but borrow the methods that make these companies the best.

Coordinate and improve. It's not the manager's job to improve process design; it's the employees' job. As a manager, you are responsible for identifying goals for improvement, training team members in problem solving, holding them accountable for achieving results and helping them when they ask.

It is the team's duty to make the decisions on how to improve processes. Look at it this way: When you make all the process-design decisions, you are communicating that you are the owner of the processes. In addition, you are reinforcing the fact that your employees merely "rent" these processes from you every day. People tend to treat rented property as someone else's responsibility. With their own property, they invest their sweat and energy to make it a better place to live.

The owners and partners of one medium-sized design firm created all the forms and processes for managing project installation. The system was a mess, and the employees knew it. Yet the employees made no improvements on their own. They just did the best they could while suffering the problems and inefficiencies of the system.

"Why don't they use some common sense to fix these problems and stop all this wasted effort?" the owners wondered. The answer: The employees didn't own the process. They were just renting it. If you allow employees to own the processes they live with, they will make them better. The owners of the company were persuaded to let the team members redesign the process as they went. The key was that they were doing it together, motivated by a sense of ownership and control.

Learn and celebrate. Document your processes so you learn from them and you don't forget what you have learned. Put together a process-documentation book for all your operations. This book of guidelines is the picture on the puzzle box. Don't just create the book and leave it on the shelf. Select employees as "process champions" for each of your major processes. Make them responsible for working with other employees to continuously improve their areas of responsibility. Encourage them to use the documentation book as a "living blue-

print" to build better and smarter ways of doing business.

When you work on something and improve it, you learn something. The most desirable result of piecing together and expanding your quality effort is the continuous learning and innovation that occurs.

Learning is motivating. It's exciting! Employees like to learn about new ideas and new methods. Think about how your mind works after attending a conference or a workshop. You can hardly wait to try some of the new things you have learned. Application of the four-step process of total quality management has the same effect. A smart company is a profitable company. Company know-how and common sense translates into better service, which translates into happier customers and happier, more motivated workers and managers.

Finally, don't forget to celebrate. The best way to encourage future efforts, learning and success is to reinforce current efforts, learning and success.

I like what one company has done; the management has created a process in which anyone in the company can recognize great performance at any time by handing out "arnies." An "arnie" is a small note stating that the recipient is living the values of quality. More important, it's a token of appreciation and praise. Twice a year, everyone in the company gets together to celebrate by recognizing the "best of the best" at an informal dinner. Recognition of team effort and a little bit of celebration reinforces the message of total quality.

Before you decide to dive into TQM, consider the resources you will need. First, you will have to invest your time and your people's time while continuing to serve customers. In the first year, this may mean that everyone works five more hours a week.

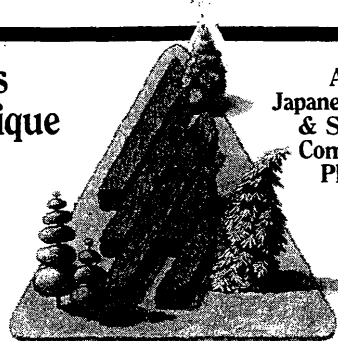
Second, you will have to invest money, although there is no way to say how much. It's probably safe to say that you will want to hire a facilitator to get you going and to train your employees and yourself. You may also need to invest money in upgrading your information systems.

And third, you will need to invest time in looking at the ways you lead and how you are perceived as a leader. When quality doesn't work, it's usually because of a leader who talks one way and acts another. The next nine articles in this series will help you understand what changes you may have to make before you consider starting your quality effort.

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