

An ASQ White Paper  
**Making the Economic Case for Quality**  
by John Ryan

## **Introduction/Summary**

It has been over two decades since business in America and Europe became fired up about quality, largely as a result of competitive pressure from Japan and other emerging Southeast Asian quality powerhouses. Although interest in quality has subsequently ebbed and flowed, through it all there has remained a lingering question: Does quality really pay? Is there a proven bottom-line economic benefit accruing to an organization that becomes adept at deploying quality management principles and practices?

The abundant anecdotal evidence compiled during this time frame makes for a compelling story backing up the contention that quality pays. But this evidence in itself does not provide conclusive proof of the efficacy of quality. For that, we have to look to the empirical evidence that has been slowly and painstakingly assembled. While not large, this body of empirical evidence is conclusive and highly persuasive. Moreover, it is backed up by consensus views of knowledgeable observers of management theory and application, who have examined the economic case for quality and found it to be sound.

Building a solid economic case for quality has taken considerable time, attesting to the difficulties of studying the relationship of quality management and organizational results. Concurrently, the quality movement has proceeded by fits and starts, affording critics opportunity to disparage the quality improvement effort. This paper also briefly addresses these related phenomena.

What follows is a review of current knowledge about the economic impact of an organizational focus on quality/quality improvement.

The review reveals an impact of quality management practice on almost every area of organizational performance, including bottom-line measures, market measures, and internal operating measures. It clearly reinforces the conviction that quality does pay. Handsomely.

## **Early Landmarks**

One of the first solid pieces of evidence linking quality and business results was the groundbreaking PIMS (Profit Impact of Market Strategy) research. Begun in 1972, this program was described in detail in 1987 by Bradley T. Gale of the Strategic Planning Institute and Robert D. Buzzell of Harvard University (1). Over a period of years PIMS amassed a large database documenting the

strategies and financial results of more than 450 companies and nearly 3000 business units in order to study the general relationships between strategy and company performance. Its purpose was not to prove a link between quality and profitability (or between any other particular business strategy and firm performance), but rather to discover those strategic principles most strongly related to performance.

Among all the strategic principles distilled from the PIMS studies, one linkage between strategy and performance stood out above all the rest: quality. “In the

“The 1960s and 1970s brought a dawning realization that market share is key to a company’s growth and profitability. The 1980s have shown just as clearly that one factor above all others—quality—drives market share.”

--Buzzell and Gale, *The PIMS Principles*

long run, the most important factor affecting a business unit’s performance is the quality of its products and services, relative to those of competitors (2).” A quality edge boosts performance in the short run by allowing the firm to charge premium prices and in the long run by enabling growth of the firm through

both market expansion and gains in market share.

PIMS found that businesses offering superior product/service quality are more profitable than those with inferior quality, based on the measures return on sales and return on investment. In addition to these profitability and growth advantages, PIMS revealed other benefits of superior perceived quality: stronger customer loyalty, more repeat purchases, less vulnerability to price wars, and lower marketing costs.

One other frequently-referenced study on the linkages between quality and firm performance is the 1991 review of Baldrige Award applicants by the United States General Accounting Office (3). The GAO was asked by the United States Congress to examine the impact of formal total quality management practices on the performance of U.S. companies. Its report studied twenty companies that were among the highest-scoring applicants in the 1988 and 1989 award cycles of the Malcolm Baldrige National Quality Award—i.e., companies that received site visits.

The principle finding: “Companies that adopted quality management practices experienced an overall improvement in corporate performance. In nearly all cases, companies that used total quality management practices achieved better employee relations, higher productivity, greater customer satisfaction, increased market share, and improved profitability.”

The employee relations result was determined by increased job satisfaction, improved attendance, and decreased employee turnover. Out of 52 employee-relations performance measures reported by 18 companies, 39 showed improvement, 9 declined, and 4 were unchanged.

In addition to productivity—as measured by sales per employee—other operating measures that were examined included reliability, timeliness of delivery, order-processing time, production errors, product lead time, inventory turnover, quality costs, and cost savings. In this area, the researchers obtained a total of 65 observations contributed by all 20 companies. Fifty-nine of the 65 observations showed improvement, 2 became worse, and 4 showed no change.

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--1991 GAO study

GAO researchers looked at consumer perceptions of the companies’ products and services, number of complaints received, and customer retention rates to determine the customer satisfaction result. Twenty-one out of 30 reported customer-service observations showed improvement, 3 became worse, and 6 were unchanged.

Fifteen companies reported a total of 40 observations related to profitability, measured by commonly used financial analysis ratios (such as sales per employee, return on assets, and return on sales). Thirty-four of the 40 increased; 6 declined.

The study also identified six common features contributing to improved performance that appeared consistently among the companies’ quality efforts: customer focus, management leadership, employee involvement, open corporate culture, fact-based decision making, and partnership with suppliers.

A limitation of the GAO study is the size of the sample. The authors acknowledge that the data were not sufficient to conduct a statistically rigorous analysis, but they maintain the data were sufficient to evaluate performance trends that, along with site-visit information, form the basis of their conclusions. Nor does the GAO report compare results from the Baldrige companies with a non-Baldrige control group.

## **Empirical Studies**

Obtaining empirical evidence of the financial effects of quality practices—controlled studies producing results capable of being verified or disproved by experiment or observation—has been a major challenge for the quality field and academia.

George Easton and Sherry Jarrell of Emory University reviewed 394 studies of various aspects of total quality management; from these, they selected for in-depth analysis nine academic studies that used externally available financial data (4). Their 1999 review found that eight of the nine studies show positive quality-related performance effects. "Overall, the vast majority of the studies show positive impact associated with TQM." However, they contend that only three of the nine studies are based on credible research methods. Of these three, two demonstrate a positive financial impact of quality implementation; the third finds no overall effect.

The three studies they refer to are their own 1998 examination that used in-depth interviews to select a sample of firms judged to have made serious efforts to deploy quality practices (5); a study of stock market reaction to quality award announcements by Kevin B. Hendricks of the University of Western Ontario and Vinod R. Singhal of the Georgia Institute of Technology (6); and a study of the effect of ISO 9000 registration on stock returns by S.W. Anderson, J. Daly, and Marilyn F. Johnson (7).

The Easton and Jarrell study used a sample of 108 firms culled from a potential list of more than 500. It assessed the impact of TQM on corporate performance using both accounting and stock return variables, examining performance during a five-year period following the start date of deployment of TQM systems and comparing performance of the firms to performance of a control portfolio of firms well-matched to the TQM firms in terms of non-diversifiable risk. The authors found that the improved performance results were consistent across both the accounting-based variables (such as net income and operating income scaled by sales, assets, and number of employees) and the stock returns. They conclude: "The major finding of this study is clear evidence that the long-term performance of firms that implemented TQM is improved....(8)"

"Total Quality management (TQM) has been one of the most significant management 'movements' in the US during the past 15 years and perhaps one of the most significant management movements since 'management' became an identified professional activity. TQM has been called a fad by many. However, if TQM is a fad, it is one of the longest and most significant fads ever."

-- Easton and Jarrell (1999)

Easton's and Jarrell's interview technique allowed them to subdivide the sample into companies having more advanced TQM systems and those with less advanced TQM systems. This led to further interesting results. The improved performance result is much stronger for the more advanced companies. The subsample of more advanced firms experienced a 32 percent mean excess stock return in the fifth year following TQM implementation, compared to 24 percent for the full sample. "We also view the overall stronger performance of the more advanced TQM firms...as both an important test of the research methodology and compelling

evidence that management methods that constitute TQM are associated with

improved performance (9).” The authors point out that the evidence of improvement for the subsample of less advanced TQM firms is weak, “suggesting that the real benefits of TQM require determined and relatively complete implementation.” Their final conclusion is that even under the most unfavorable interpretation of the data, “the results of this study clearly provide evidence against the proposition that implementation of TQM actually hurts corporate performance.”

The Hendricks and Singhal study is one of a series of related studies undertaken by these two researchers between 1995 and 2001, all of which examine the performance of firms that are the recipients of quality awards. Hendricks and Singhal use the winning of quality awards as a proxy for effective TQM implementation.

The 1996 Hendricks and Singhal empirically investigated the impact of winning a quality award on the market value of companies. They concluded that “the evidence indicates that the stock market reacts positively to winning quality award announcements. The reaction was particularly strong in the case of small firms.” They found a statistically significant positive change in the stock prices on the day of the quality award announcement that they said conveys to the market good news about the effectiveness of firms’ quality improvement programs. They also found a statistically significant decrease in two measures of systematic risk for firms that won quality awards.

A related study published by Hendricks and Singhal in 2001 found mean outperformance in stock price of the quality award-winning companies ranging from 38% to 46% compared to various control groups of companies (10). The authors conclude: “Effective implementation of TQM principles and philosophies does lead to improvement in long-term financial performance. Our results should alleviate some of the concerns regarding the value of quality award systems. Overall, these systems are valuable in terms of recognizing TQM firms, and promoting awareness of TQM.”

Hendricks’s and Singhal’s 1997 study looked at various operating performance measures and found that firms that have won quality awards also outperform on these measures (11). It found a mean change in operating income for the test sample of award-winning firms 79% higher than that of the control sample (and a 30% higher median change) during a ten-year period. Over the ten-year period it also found a 43% higher mean change (18% higher median change) in sales for the test sample compared to the control sample of firms. It also uncovered weaker evidence that the award-winning firms are more successful in controlling costs than firms in the control sample. Firms in the test sample of award winners also increased capital expenditures more than the control firms; these firms show higher growth in employment and total assets.

Hendricks and Singhal also published a non-technical description of the key issues, methodology, results, and implications of their ongoing series of studies (12). Figure 1 shows the extent to which award-winning companies significantly outperformed the controls during the period following TQM implementation. Award-winning companies experienced an average 91% growth in operating compared to 43% for the controls; 69% increase in sales vs. 32%; 79% increase in total assets vs. 37%; 23% increase in number of employees vs. 7%; 8% rise in return on sales vs. no improvement for the controls; and 9% improvement in return assets vs. 6%. They sum up their findings with three guidelines for companies implementing quality practices: 1. TQM is a good investment. (“Don’t give up on TQM. When implemented effectively, it improves financial performance dramatically.”) 2. Be patient. (“The benefits of TQM are achieved over a long period.... Even after effective implementation, it still takes a couple of years before financial performance starts to improve.”) 3. Be realistic. (“Set realistic expectations on the potential impact of TQM. Organizational characteristics such as size, capital intensity, extent of diversification, and the maturity of the TQM implementations influence the gains from TQM. These and other factors should be considered in setting expectations.”)

### **Other studies**

Surveys of managers’ and top executives’ perceptions form a basis for much of the business world’s belief that there are important tangible and intangible benefits to be realized by pursuing a quality strategy. The most recent of these is the 2004 ASQ survey meant to gauge the degree to which quality is believed to make business sense (13). Given a choice between two statements about potential bottom-line effects—that quality contributes to the bottom line/provides a positive financial return, or that quality does not contribute to the bottom line, i.e., quality costs more than the related return—top-executive respondents stated overwhelmingly (99%) that quality contributes to the bottom line. When asked about the nature of the contribution, they most often mentioned increased revenue through repeat business, referrals and customer loyalty; less rework; and savings on labor and materials. Overall, 60% said their organizations measure the economic impacts of business process improvement initiatives. When asked about the most effective method for convincing an executive to adopt or increase the use of a particular business improvement process or technique that might have an economic impact, the most frequently chosen response was a conversation with a peer. A distant second response was use of a testimonial, followed by a case study and, lastly, competitor’s financial results.

Since contemporary quality practice is linked very closely to employee involvement, elements of quality management and employee involvement frequently appear in the same studies. One of the more noteworthy of these studies is “Creating High Performance Organizations” by Edward E. Lawler III, Susan Albers Mohrman, and Gerald E. Ledford, Jr. (14). This 1995 study of

Fortune 1000 firms builds on two previous studies by the same researchers by including more extensive information on who adopts quality management practices and what the results are. It reports on both utilization and effectiveness of employee involvement and quality management practice, and it seeks to determine what combination of quality management and employee involvement programs has a positive impact. The results: "Companies consistently find that employee involvement and total quality management practices have helped improve their internal operations and their financial results. There also is evidence that companies that have better financial performance are more likely to use employee involvement programs."

The strongest impacts of TQM were found to be on work performance outcomes that can be directly impacted by employee behavior—such as productivity, quality of products and services, customer service, and speed of response to customers. Slightly less but still positive impact was found on profitability and competitiveness and on employee satisfaction.

The Lawler, et al., report also concluded that companies that deploy more extensive employee involvement tend to more broadly apply TQM practices and report higher TQM outcomes than those companies that have less highly developed employee involvement. The authors see this finding as an indication of the close interrelationship of employee involvement and quality management. They report managing employee involvement and TQM as an integrated program produces the highest impact.

"The general pattern of relationships shows that TQM is contributing to company outcomes, especially to direct performance outcomes. This finding is supported by the finding that the amount of coverage by TQM practices is strongly related to company performance."  
-- Lawler et al. (1995), p.78.

Another study looking at innovation in work practices was carried out in 1994 for the United States Department of Labor's Office of the American Workplace. The study, by Sarah C. Mavrinc and Neil R. Jones, presented data from 632 companies showing that higher levels of product quality were significantly associated with higher levels of financial performance in three of six industry groups (15).

A 1993 study by the Conference Board (16) reached the following conclusion: "On the question of whether or not TQM works, the data support a 'yes' answer—but with qualifications. The majority of survey respondents attribute improvements in business performance, on a wide range of internal, market, and bottom-line measures, to their company's TQM process. However, a minority of respondents in some surveys report that their firms have not experienced significant improvements as a result of TQM. Given that most of the studies reviewed in this report deal with management perceptions, the author offers an alternate answer to the question as to whether TQM works: "Most managers at companies using TQM say it does work, but some say it hasn't been very

helpful.” Even so, the report states, “...the studies suggest TQM is having a widespread, generally positive impact on organizational performance, that non-financial measures of performance are affected first (and therefore reported by more TQM adopters), followed by a variable but often substantial impact on financial measures of performance.”

The evidence gathered in this Conference Board report consists of 20 TQM surveys whose findings were reviewed and summarized to identify the following cross-study patterns:

- Quality improvement activities are on the rise.
- A long and variable list of changes in management practices and corporate culture is associated with TQM.
- TQM is not, as sometimes stated, a short-term fad or waste of money.
- TQM efforts are often, but not always, considered by executives to have a beneficial effect on their firm’s performance.
- The specific combination of techniques defined as TQM varies from study to study and company to company, and these variations in approach appear related to the success of TQM efforts.
- None of the studies reviewed provides any substantial evidence that TQM is having a negative impact on company performance.

What makes quality the touchstone of competitive strategy is that it creates choices and opportunities not available to an organization’s competitors. Quality provides a different perspective and the *potential* to put an organization on a different competitive plane than its competitors. From a strategic perspective, the company determines whether and in what manner the quality advantage it has created will be used. Thus, the link between quality and corporate strategy is simply that quality creates the ability for an organization to take actions that are literally impossible for its competitors.”

-- James A. Belohlav (21)

One of the studies reported in the Conference Board review is the 1992 ASQC/Gallup survey of executives and corporate board members (17). This survey dealt with issues such as who is responsible for setting the quality agenda in American businesses and satisfaction with the results of quality improvement activities within the firm. The corporate executives in this survey held the very firm belief that management—not the board of directors—has responsibility for

determining quality policy. Outside directors of corporations generally expressed the same viewpoint, although they were not so strong in their assessment.

This survey also asked corporate executives and directors to assess the results of quality improvement efforts in their firms. A substantial majority of executives said either that they had achieved significant results in terms of increasing profitability or market share (23%) or that there was a quality program in place and they were generally pleased with its results (39%). The proportion of directors reporting they were pleased with results was 35%. And the directors

were significantly more likely than executives to say that their companies have realized significant increases in profitability or market share. Compared to an earlier, 1989 ASQC/Gallup survey of executives (18), a higher proportion of executives said they have a quality program in place and are pleased with the results. However, there was no significant change from 1989 to 1992 in the proportion of executives who said their companies had experienced significant increases in profitability or market share.

There have been several attempts to construct either hypothetical or real portfolios of stocks of companies that are highly involved in using total quality management practices.

The most widely known of these is the “Baldrige Index,” a hypothetical index composed of publicly traded common stocks of Baldrige-winning companies (including whole- company winners and parent companies of subsidiary winners) (19). The index has been compiled annually since 1995 by the Baldrige National Quality Program at the National Institute of Standards and Technology. In its first nine years, the index consistently outperformed the benchmark S&P 500 index—by as much as 6 to 1. In its most recent two years, however, it has underperformed the S&P 500.

***Baldrige Index Performance (% change)***

<b>Cumulative Results thru Year</b>	<b>Baldrige Index</b>	<b>S&amp;P 500</b>
10	-28.01	57.74
9	-23.74	45.16
8	322.78	109.68
7	685.26	163.11
6	841.29	221.55
5	425.63	173.27
4	362.30	148.30
3	324.90	111.80
2	248.70	58.50
1	92.00	33.00
Source: NIST		

Another index of companies that use total quality management is the Q-100, an enhanced index fund assembled by Robinson Capital Management. (20) The Q-100 mimics both the sectors and the weighting of the S&P 500 in order to minimize tracking error (a measure of volatility). During the period Sept. 30, 1998, through Dec. 31, 2001, the Q-100 returned 26.97% compared with a return

of 17.59% for the S&P 500. In advancing markets (seven positive quarters) the Q-100 outperformed the S&P six times. In down markets the Q-100 performed better half the time. The managers of the fund say that the real-world scrutiny of the SEC and investors validates their belief that quality improvement efforts positively impact stock performance.

The Baldrige Award program represents a source of information ripe with documentation in support of the economic case for quality. In addition to data contained in applicants' formal applications, there is a rich source of information contained in the public documentation and sharing of information that is required of every Baldrige recipient. The award criteria provide a consistent basis on which to evaluate not only results but also processes and practices across a wide range of company types and sizes spanning for-profit manufacturing and service firms as well as education and health care institutions. Application reviews and site visit evaluations by an experienced, highly knowledgeable corps of examiners and judges further increase confidence in the consistency of what is being evaluated. A case study review of recent recipients reveals many performance results reported by these organizations:

- St. Louis-based SSM Health Care has increased its share of the St. Louis market over the past three years to 18 percent while three of its competitors have lost market share. For four consecutive years the organization has maintained a AA investment rating, a rating that is maintained by fewer than 1 percent of all U.S. hospitals.
- At Community Consolidated School District 15 in Palatine, IL, in the 2002-03 school year 84 percent of second-grade students were reading at or above grade level, nearly 35 points above the national average. The turnover rate for certified staff was 11.7 percent, compared to the national average of 20 percent. The cost per percentage point of student performance on state learning standards tests was \$111.93---below three comparison districts whose costs ranged from \$118.57 - \$122.36.
- Boeing Aerospace Support, a \$4 billion sales company with 13,000 employees, provides products and services to clients within three days of request, while competitors take up to 40 days. From 1999 to 2002 the company's earnings have grown at a double-digit average cumulative rate while annual revenue has more than doubled.
- One of the key objectives of the Pearl River School District in Rockland County, NY, was to increase the percentage of graduates who earn a Regent's diploma; the rate increased from 63 percent in 1996 to 86 percent in 2001. Student satisfaction increased from 70 percent in 1998 to 92 percent in 2001, while parent satisfaction increased from 62 percent to 96 percent in the same period. Seventy-five percent of the district's special education students take the SAT exams, compared to 2 percent nationwide.
- Clarke American Checks implemented more than 20,000 ideas from associates in 2001, realizing cost savings of approximately \$10 million.

Over the past five years its market share has increased by more than 50 percent.

- The KARLEE company of Garland, TX, is organized as a team of teams whose business is to manufacture precision sheet metal and machined components for the telecomm, semiconductor, and medical equipment industries. Labor productivity at this 550-person firm has nearly doubled in the last year, and waste has been reduced from 1.5% of sales to 0.5%. Number of inventory turns improved from 9.2 to 15.7 over the last five years.
- Saint Luke's Hospital of Kansas claims its quality practices are paying off in client satisfaction. In 2002 Consumer's Checkbook, a consumer education organization, ranked Saint Luke's 35th in the nation out of 4,500 hospitals evaluated.
- Caterpillar Financial Services Corporation U.S. has increased its total contribution to the parent company from 5.6% in 1998 to more than 25% in 2003. Productivity improvements have boosted its current level of performance to nearly 35% higher than the industry's top 100. Customer satisfaction levels exceed industry and American Customer Satisfaction Index world-class benchmarks.

### **Anecdotal Results Reported by Organizations**

Although there may be a limited body of solid empirical evidence, there is no scarcity of anecdotal evidence in support of the economic case for quality. Numerous organizations and individuals routinely step forward to give testimony to benefits they see as a result of their quality efforts. And for every account questioning the value of quality, there are many more accounts of positive results (bottom-line and other) that organizations attribute to their quality efforts.

"Whatever the particular labels in fashion, the important point to understand is that quality as a competitive factor is now well established in American economic life and the bar is continually being raised in industry after industry. Firms disregard this fact at their peril."

-- Robert E. Cole (22)

### **A Note About the American Customer Satisfaction Index**

Since it was first released in October 1994, the American Customer Satisfaction Index (ACSI) has been gathering data on customer satisfaction with the goods and services purchased in the United States from hundreds of companies representing a significant share of the total gross domestic product. Quarterly surveys of thousands of consumers take into account factors of customer expectations, perceived quality, and perceived value to give a reliable indicator of how well the economy—and the individual firms that make up the economy—satisfy their customers. These years of ACSI experience have led to the amassing of a significant body of evidence linking customer satisfaction and economic performance. According to Claes Fornell, chief architect of the ACSI methodology, “Year after year and quarter after quarter, the ACSI demonstrates a definite link between customer satisfaction and financial metrics such as market value added (MVA), stock price, and return on investment. Since 1994, changes in ACSI have correlated with change in the Dow Jones Industrial Average. In the most recent year for which ACSI and MVA data are available, companies with the top 50% of ACSI scores generated an average of about \$42 billion in shareholder wealth, while companies with the bottom 50% of scores created only about \$23 billion. Even more significant, we’ve found that one ACSI unit corresponds to a market value of \$898 million. That is, one point of customer satisfaction is worth almost \$1 billion for the average company in the index. Since the average ACSI firm has a market capitalization of \$27 billion, one point of customer satisfaction translates into 3% of market value increase. ... The ACSI demonstrates that, overall, the statistical relationship between customer satisfaction and market valuation is very strong.”(23)

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## COST SAVINGS & OPERATING EFFICIENCY

The most frequently mentioned bottom-line benefits of quality management strategies include cost savings and increased operating efficiency.

2002 Baldrige winner Motorola Commercial, Government and Industrial Solutions Sector demonstrated that the systematic application of performance excellence principles leads to superior results that exceed those of competitors on a sustained basis. These results include:

- 33% improvement in cycle time for customer issue resolution from 1999 to 2002;
- 88% improvement in speed of answering technical calls from 2000 to 2001;
- 48% reduction in manufacturing cycle time (book to ship) from 1998 to 2002;
- 60% improvement in cycle time for service repair from 1999 to 2002;
- 67% improvement in employee injury and illness rate from 1998 to 2002, with worker compensation dollars per employee less than half the rate experienced by other electronic companies and less than 25% of that across all industries.(24)

Another Baldrige recipient that credits its superior business results to the Baldrige process is medical imaging equipment manufacturer Medrad, Inc. The 2003 Baldrige winner has experienced annual revenue growth of 15%, and its operating income as a percentage of revenue increased from 16% in 1999 to 20% in 2002. Medrad enjoys a worldwide reputation for the highest quality products, customer satisfaction ratings well above those of its nearest competitor, and best-in-class employee satisfaction rates. (25)

“I am often asked what the return on investment is for implementing the Baldrige criteria,” states Medrad President John P. Friel. “My answer is simple: quality products, happy customers, energized employees and market leadership. If you want returns like these, then Baldrige is for you.”(26)

Cost savings and operational efficiency improvements are not limited to manufacturing firms. GE Capital Card Service used the design of experiments statistical tools to increase effectiveness and timeliness in credit card collections. After a six-month trial, the project documented \$1.45 million in actual savings. The benefits of the collections project were not believed by management until they hit the bottom line.(27)

The business excellence program at Texas Instruments resulted in significant improvements in the order fulfillment process at the company’s Semiconductor Group. On-time delivery increased to more than 95 percent, and some cycle times decreased from 180 days to less than 60 days. Business excellence is the name given by the company to its organization-wide total quality management effort.(28)

Eastman Chemical used a root cause analysis methodology to nearly cut in half the level of customer complaints between 1997 and 2000. The bottom-line result was more than \$2 million in savings from reducing complaint handling costs and cutting expenses associated with problems such as waste and rework. The company sees as an added benefit the enhancement of its reputation in the eyes of its customers.(29)

Hong Kong and China Gas Co., Ltd., (also known as Towngas) overhauled its culture and strategy in order to meet the needs of its customers. In 1994, prior to the overhaul, Towngas received 144 customer complaints. In 1998, a year after the effort went into effect, complaints had dropped to fewer than 50, and compliments rose by 266 percent. Employee turnover dropped subsequent to the implementation of the strategic changes, and the firm received recognition from industry and business organizations in the form of awards.(30)

A key to the success of United Technologies Corporation has been its ability to derive continuing incremental gains in quality, efficiency, and technology in its various manufacturing businesses. Chairman George David describes these “process disciplines,” carried out under the banner of the Achieving Competitive Excellence (ACE) quality program, as the company’s greatest strength. In the decade that David has been chairman, total returns to investors have risen about 600%. (31)

Under the ACE program, supply management improvements have trimmed almost \$1 billion from annual procurement costs. Other gains include faster time to market and reduced inventory. A work redesign project in the Otis elevator business is expected to yield \$26.4 million in savings this year. Redesign of work layout at the UTC Carrier plant in Tyler, Texas, resulted in square-footage reductions in one area of 50% and 71% more production with 8% fewer employees than on the previous conveyor line.

“When I came to this job, UTC had great franchises, but it didn’t have returns consummate [sic] with those businesses,” said David. “The first thing we worked on was improving those margins from 4% to 14%. This is all a factor of doing things better—with higher productivity, lower costs, and better products and services.”(32)

## COMPETITIVE ADVANTAGE & MARKET SHARE GAINS

With all the recent concern in the United States about domestic jobs going overseas, some companies have been outspoken about relying on quality as a competitive strategy for keeping jobs at home.

The Allen-Edmonds Shoe Company steadfastly bucks the trend in the American shoe industry by maintaining shoe manufacturing at its domestic factory rather than exporting work overseas. President, CEO and owner John Stollenwerk believes the company can make shoes better and serve its customers better by maintaining its manufacturing in the United States. He has said, "It's nothing for or against foreign manufacturing. It's about the quality." (33) The company's recently transformed manufacturing process is poised to cut the cost of each pair of shoes by 5%. In contrast, moving to China could reduce the cost of making a pair of shoes by 60%, but Allen-Edmonds's chief operating officer has said such a move would probably be shortsighted. (34)

Richard E. Dauch, the co-founder, chairman and chief executive of American Axle & Manufacturing in Detroit, believes in the power of a quality advantage. He claims that his growing and money-making company is a low-cost producer in spite of the \$22-25 hourly wages (\$43 with benefits) that it pays to its unionized workers, who are represented by the United Auto Workers. He says it is because the workers are more productive and build higher-quality products than their competitors in low-wage countries. American Axle, which was spun off from General Motors, today generates \$1,000 of revenue with 3.8 labor hours, compared to 10 labor hours a decade ago. It ships 4,600 axles a day in the same production space that it used to produce 1,900 daily when it was an unprofitable division of GM. And the parts are of far better quality. Since Dauch took over in 1994, American Axle's work force has grown 60% and its productivity has more than doubled. (35)

The Kinetic Company, a 60-year old Greendale, WI, maker of cutting supplies for the steel and paper industries, "relies on high quality to compete with cheaper foreign manufacturers." (36) Vice President Jared Masters, grandson of the company's founder, attributes the machine shop's growth to the quality of its products, which overcomes lower prices of competitors. "Quality pays in the end," says Masters. "It's been hard, but we've been taking business away from some of our competitors, especially foreign." (37)

## INTANGIBLES

ATC, a firm based in Oak Brook, IL, that manages transportation systems for schools, hospitals and municipalities, realized first-year savings in 2002 of more than \$3.5 million from team-based activities that actively engaged more than 700 of its 6,000 employees in quality initiatives. Seventy-two teams were launched during the year; the 70 teams that completed their tasks sustained an average cycle time to completion of 48 days. Teams worked on projects such as reducing costs related to drivers' accidents and overtime expense reduction. Key to the company's success was overcoming an "engagement gap" that hobbles many quality improvement efforts—namely, the lack of strong feelings of ownership and enthusiasm for improvement by the people who do the work every day. A

second wave of activity involving 50 teams in 2003 resulted in an additional \$2 million in savings.(38)

The Records and Identification Bureau of the Phoenix Police Department credits its successful effort to achieve ISO 9001 registration with a number of practical benefits, such as: improved departmental credibility, increased responsiveness, reduced mistakes, improved efficiency and safety, reduced backlog, and improved employee interaction and communication.(39)

Some firms have quantified the effects of raising customer satisfaction. “At Johnson Controls, a one-point increase in customer satisfaction equals \$13 million of additional revenue,” according to Steve Hoisington, vice president for quality.(40)

## SIX SIGMA

Practitioners of the Six Sigma methodology have provided a particularly good recent source of quality success stories. That is because of Six Sigma’s laser-like focus on demonstrating bottom-line results.

The most well known example is General Electric Company under its former chairman Jack Welch, whose Six Sigma program has been called “the largest corporate quality initiative ever undertaken.”(41) Welch made Six Sigma a foundation of GE strategy—a fundamental element of the company’s business approach.

Begun in 1995 with 200 projects and no financial benefit to the company, GE’s Six Sigma initiative expanded within two years to 6,000 projects delivering \$320 million in productivity gains and profits.(42) By 1999, GE was publicly claiming \$2 billion in annual benefits,(43) and by 2001 the company reported that 500,000 Six Sigma projects had been completed since the start of the initiative.(44)

The initial focus was on improving efficiency and reducing variance in internal operations—including both factory operations and services. For example, at the industrial diamonds business, management believes they have eliminated the need for investment in plant and equipment for a decade due to the efficiencies that Six Sigma has wrung out of the existing plant.(45) In the Power Systems division, Six Sigma process improvements have resulted in significant reduction in span—which GE defines as the variance customers feel in GE’s response to their requests for delivery, service, or financing.(46)

Welch’s successor as chairman at GE, Jeffrey Immelt, has stated that Six Sigma “has become a permanent initiative—Six Sigma is the way we work. During the last year we completed more than 50,000 projects, focused primarily in three areas: working with our customers on their issues; improving our internal

processes to improve our customer interfaces and generate cash; and improving the flow of high-technology products and services to the marketplace.” (47)

As Six Sigma became the common language of GE and “spread like wildfire across the company, ... transforming everything we do,”(48) its application was extended to the product design process and then to a focus on customers' profitability.

The Medical Systems division used the Design for Six Sigma approach “to open up a commanding technology lead in several diagnostic platforms and has achieved dramatic sales increases and customer satisfaction improvements. Every GE product business and financial service activity is using Six Sigma in its product design and fulfillment processes.”(49)

According to Welch, “We took GE resources and applied them to our customers' biggest needs, using Six Sigma as a foundation. The focus has been totally inside our customers' operations. The wins have been significant: improving locomotive reliability, reducing medical CT scan wait times and improving airline operations.”(50) In the airline industry alone, in the year 2000 GE had 3,000 Six Sigma projects underway that were expected to achieve \$400 million in savings for these customers.(51)

General Electric's Six Sigma mentors were Motorola Inc., which developed the concept, and AlliedSignal Corp., which was aggressively applying Six Sigma for about four years before its chairman, Lawrence Bossidy, convinced GE of the benefits of this approach.

AlliedSignal, which merged with Honeywell in 1999, has claimed Six Sigma savings in excess of \$500 million in 1998,(52) \$600 million in 1999,(53) and more than \$2 billion in the decade from 1991 through 2000.(54)

According to Bossidy: “We've taken the difficult but basic Six Sigma skill of reducing defects and applied it to every business process, from inventing and commercializing a new product all 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.”(55)

Here is a sampling of Six Sigma results from AlliedSignal and Honeywell businesses around the world: customer returns cut nearly in half at the FRAM plant in Utah; inventory reductions of \$2 million at Holt-Lloyd facilities in Europe; savings of \$800,000 at Industry Solutions in Vancouver, Canada, through product redesign and reduction in rework, production steps, and assembly costs;

\$8 million in additional revenue at Specialty Materials in Louisiana by increasing HFC-125 gas production rates by 15%.(56)

The *Financial Times* of London had this to say about AlliedSignal's successes and the wider implications for U.S. manufacturing in general: "The passion with which Mr. Bossidy has embraced Six Sigma, which AlliedSignal says has saved it \$1.5 billion (£937) since 1991, provides one clue as to why US manufacturers are thriving again."(57)

Ford Motor Company stated in 2003 that it had saved \$1 billion through waste elimination since the start of its Six Sigma effort in 2000. During this time, the company says it experienced record improvement in its "Things Gone Wrong" measure—half of which reduction was the result of its Consumer Driven 6 Sigma activities.(58) A little more than a year later, its corporate director for Six Sigma updated the savings figure to \$2 billion. That figure, which does not include cost avoidance, results primarily from waste reduction and process improvements integrated into plants and product development activities.(59)

Samsung Electronics Company, which launched a Six Sigma initiative in 2000, projected cumulative financial benefits of \$1.5 billion through the end of 2002. These benefits include cost savings and increased profits from sales and new product development. Its Six Sigma projects also are credited with an average of 50% reduction in defects.(60)

Six Sigma is finding application in places other than large multinational manufacturing companies. At Quadrant Engineering Plastics Products, teams in production, the main warehouse, inside sales and other departments completed Six Sigma projects to increase yields and bring annual savings of \$50,000 to more than \$100,000 per project.(61) At Bank of America, application of Six Sigma tools and skills resulted in improvements in processing of 22% for same-day payments and 35% for same-day deposits.(62) Southside Hospital in Bay Shore, NY, part of the North Shore-Long Island Jewish Health System, used Six Sigma methods to reduce test turnaround times in its nuclear medicine department from 68 hours to an average of 32 hours. For patients, reduced test time means timelier treatment and reduced length of stay; for the nuclear medicine department, it means the ability to increase capacity without increasing costs.(63)

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