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WHAT'S THE BOTTOM LINE PAYBACK FOR TQM?

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INTRODUCTION

With increasing competition, U.S. corporations have been forced to make major changes in the way they operate, and many organizations have implemented improvement strategies based on the philosophy and principles of Total Quality Management (TQM).

While TQM's popularity has increased over the past decade to become the "in" management philosophy, very little research has been done to determine whether organizations implementing TQM efforts have improved their performance and competitive position in the marketplace. This lack of evidence about the benefits of implementing an organization improvement strategy based on TQM principles is a critical gap in what is known about TQM. Another major gap in knowledge about TQM is how various organizations have implemented diverse TQM strategies and integrated these efforts into existing organization cultures, systems and processes.

What is TQM? TQM seeks to improve product or service quality and increase customer satisfaction by systematically evaluating an organization's culture, systems and processes and continuously making improvements. TQM is a positive organization improvement strategy which involves the following: (1) a focus on systemic rather than individual causes of poor quality, (2) the use of statistical evidence as the basis for quality improvement actions and for the assessment of their impact, (3) an emphasis on intra- and inter-departmental communication in solving and preventing problems, and (4) removal of defects through process improvement rather than inspection.

What differentiates TQM from other organization improvement strategies? We believe that TQM, or what we'd rather call Total Management, differs from past organization improvement strategies in two ways. First, TQM is a much broader organization management philosophy than other past improvement approaches such as management-by-objectives, quality of work life, or employee involvement. TQM encompasses all organization functions and disciplines and for the first time provides an operational framework that aligns these functions and disciplines toward the same goals--continuously improving customer service and quality. Second, a national standard or set of criteria has been established for TQM, the Malcolm Baldrige National Quality Award, and this Award provides organizations with a path they can follow to design, implement and evaluate their TQM strategies.

PURPOSE OF ARTICLE

The purpose of this article is to explore in detail TQM's impact on improving organization performance and how effective TQM strategies are designed and implemented. Both of these issues will be addressed primarily by a discussion of a recent study of TQM efforts conducted by the U.S. General Accounting Office (GAO), with Brian Usilaner as project leader.¹ A number of other studies will also be used to expand upon the GAO data.

GAO STUDY

The GAO study examines the impact of formal TQM improvement strategies on the performance of selected U.S. companies. The study grew out of a concern by a number of U.S. Congressmen that little is known about the impact of various quality-related efforts many companies have adopted to remain viable and profitable in an increasingly competitive world marketplace. Specifically, the study addresses: (1) what has been the performance impact of adopting TQM improvement strategies, (2) how has improved quality been achieved, and (3) what lessons may be applicable to U.S. companies in general.

Companies Participating in GAO's Study

Corning, Inc., Telecommunications Products Division, Corning, NY
Digital Equipment Corporation, Maynard, MA
Eastman Kodak Company, Eastman Chemicals Division, Kingsport, TN
Ford Motor Company, North American Auto Division, Dearborn, MI
General Motors Corp., Allison Transmission Division, Indianapolis, IN
General Motors Corp., Cadillac Motor Car Division, Detroit, MI
Globe Metallurgical, Inc., Beverly, OH
Goodyear Tire and Rubber Company, Akron, OH
GTE Corp., Telephone Operations, Irving, TX
Hoechst Celanese Corp., Chemical Group, Dallas, TX
International Business Machines Corp., Rochester, MN
International Business Machines Corp, Endicott, NY
L.L. Bean, Inc., Freeport, ME
Milliken & Co., Spartanburg, SC
Motorola, Inc., Schaumburg, IL
Paul Revere Insurance Group, Worcester, MA
Seagate Technology, Small Disk Division, Oklahoma City, OK
Timken Company, Bearing Division, Canton, OH
USAA Insurance Company, Property and Casualty Div., San Antonio, TX
Westinghouse Electric Corp., Commercial Nuclear Fuel Div., Pittsburgh, PA
Westinghouse Electric Corp., Westinghouse Furniture Sys., Grand Rapids, MI
Xerox Corp., Business Products and Services, Fairport, NY

Study Approach/Methodology

GAO conducted its study between June 1990 and February 1991. GAO first interviewed experts from industry, professional and trade associations, universities, and government agencies to develop its study methodology. GAO also conducted a comprehensive review of the literature on quality and analyzed existing studies that relate to TQM. Based on this analysis, GAO decided to use the Malcolm Baldrige National Quality Award criteria as the basis for defining quality and determining whether a company had implemented a well-designed TQM strategy. Once this was decided, GAO put together a list of companies that had scored highest on the written portion of the Baldrige examination since the Award's inception in 1988.

Basically, the approach to the study was to measure whether the companies identified by the Baldrige evaluation had improved their performance since implementing TQM improvement strategies. Additionally, the study examined how improved quality was achieved and what lessons might be applicable to U.S. companies in general.

While GAO understood that this approach had its methodological shortcomings, it decided that this approach was best given the relatively short amount of time allocated for the study.

To determine the impact of TQM strategies on corporate performance, GAO analyzed empirical data in four broad categories:

- (1) employee relations,
- (2) operating procedures,
- (3) customer satisfaction,
- (4) financial performance.

The first three data categories are required by the Baldrige application. The fourth was added since it gets at the fundamental question about TQM's impact on economic performance which was asked by Congress when requesting the study.

GAO identified 22 companies that had received Baldrige site visits during 1988 and 1989 and contacted these companies to request participation in the study. Twenty companies agreed to be part of the study after it was agreed that any data which could be identified with a particular company was to remain confidential--only aggregate data would be published.

Companies shared data with GAO to varying degrees. Many companies provided detailed data on their quality efforts and the four measures of performance while others provided data more in summary form. To ensure that the data GAO analyzed was reliable, study staff visited each company to validate the data. Only data that were verifiable--where an audit trail existed--were analyzed by GAO. Therefore, the number of companies on which a particular analysis was performed was often less than the universe of 20.

Existing Studies on TQM

Five studies were identified by GAO that relate to the question about whether implementing a TQM effort improves a company's performance. These studies are:

- * JUSE Study of Deming Prize Winners²
- * PIMS (Strategic Planning Institute) Research³
- * Conference Board Survey of TQM Efforts in U.S. Companies⁴
- * ASQC Quality Study⁵
- * University of Michigan Study on Corporate Culture⁶

Each study points to the fact that organization improvement strategies encompassing many of the elements of quality can lead to substantial improvements in performance. The methodologies used by these studies are very different, and some are more scientifically rigorous than others, but together they lend support to the premise that the GAO study attempted to test: whether well-designed and implemented quality improvement strategies have a positive impact on company performance.

Summary of GAO Study Results

As noted, GAO gathered and analyzed data on four measurable areas that could demonstrate the impact of TQM strategies on company performance. These areas were employee relations, operating procedures, customer satisfaction, and financial performance.

Overall, the data from the 20 companies studied suggest that TQM strategies, if properly designed and implemented, can significantly improve company performance on the four factors measured. The degree of performance impact among four factors varies, but undeniably points in a very positive direction. For example, the companies studied had an average annual improvement in market share of 13.7 percent, had an 11.6 percent drop in customer complaints, recorded a 12 percent reduction in order-processing time, and measured a 10.3 percent decline in defects.

RESULTS IN DETAIL

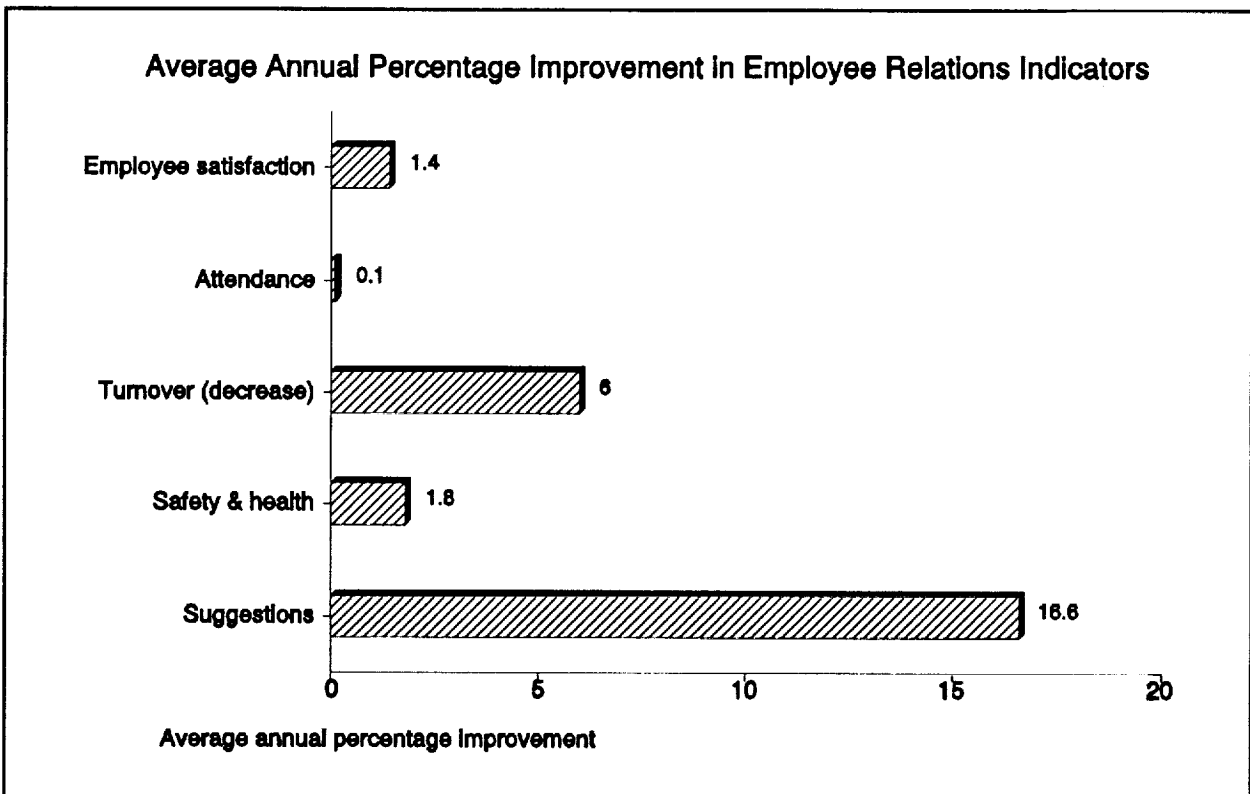
Employee Relations

As identified by the Baldrige criteria, a very important TQM element is employee involvement in all aspects of a quality effort. Improvements in employee morale and satisfaction are indicators of whether employees are fully involved in a company's TQM efforts, as are other employee relations indicators such as attendance, turnover, safety/health, and effectiveness of an employee suggestion system. As the following table indicates, many of the companies providing reliable data show improvements in all employee relations indicators of performance. While turnover and safety/health indicators displayed the least improvement, these indicators were above industry average at the study companies. *Figure 1.1* provides a graph of the specific employee relations results achieved by companies expressed as an annual rate of improvement.

Table 2.1: Employee Relations Indicators

Performance indicator	Number of responding companies	Direction of indicator		
		Positive (favorable)	Negative (unfavorable)	No change
Employee satisfaction	9	8	1	0
Attendance	11	8	0	3
Turnover	11	7	3	1
Safety/health	14	11	3	0
Suggestions received	7	5	2	0
Total	18	39	9	4

Figure 1.1: Average Annual Percentage Improvement in Employee Relations Indicators



One other employee relations indicator, training, was investigated, but GAO did not publish this data in its report because it had difficulty auditing the data. However, some of the training data is worth noting. First, training activity increased in 18 of the 20 companies studied. Second, training as a percent of employee time ranged from 1.8% to 4.2%, and specific quality training averaged 28 hours per year. And third, expenditures on employee training ranged from .7% to 5% of sales and averaged 2.7%.

Operating Procedures

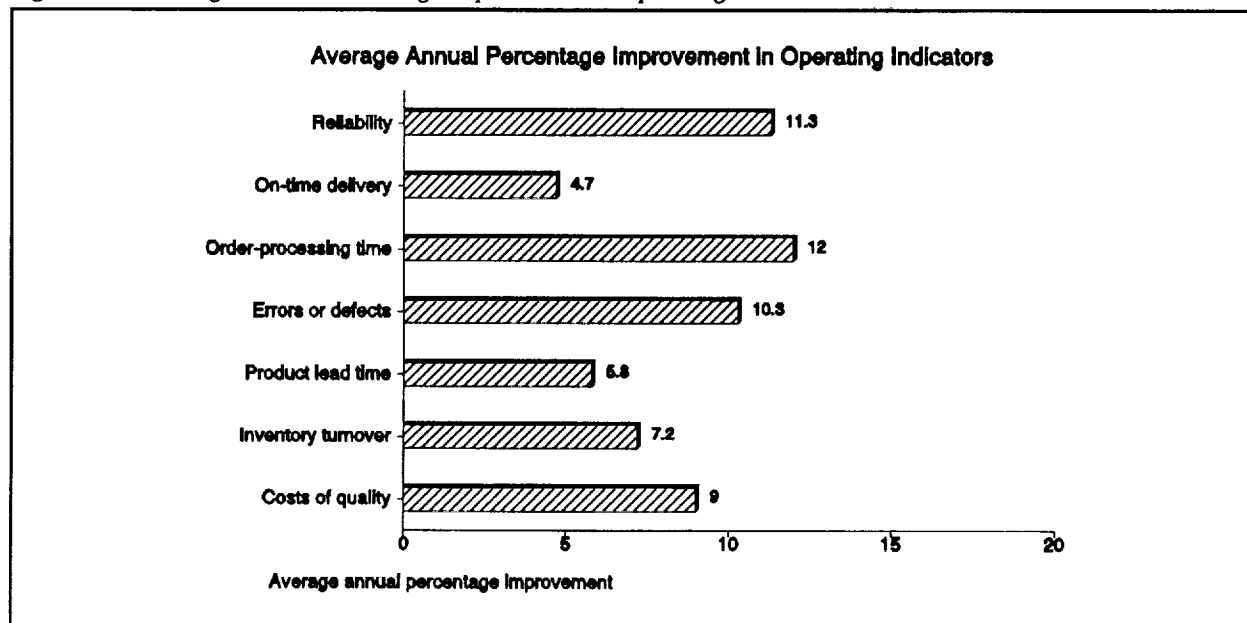
Indicators of the effectiveness of operating procedures measure the quality and cost of a company's products and services. These indicators are: (1) reliability, (2) timeliness of delivery, (3) order processing time, (4) production errors, (5) product lead time, (6) inventory turnover, (7) quality costs, and (8) cost savings. All twenty companies provided data on their operations and each stressed the importance of analyzing time-related measures which are indicators of customer responsiveness. A few companies have developed a "cost of quality" indicator, however, most lack this capability in their accounting systems.

Over ninety percent of the studied companies report positive improvements in all the operating indicators listed above. These data are summarized in *Table 3.1*. *Figure 2.1* provides a graph of the average annual percentage improvement in operating indicators.

Table 3.1: Operating Indicators

Performance indicator	Number of responding companies	Direction of indicator		
		Positive (favorable)	Negative (unfavorable)	No change
Reliability	12	12	0	0
Timeliness of delivery	9	8	1	0
Order-processing time	6	6	0	0
Errors or defects	8	7	0	1
Product lead time	7	6	0	1
Inventory turnover	9	6	1	2
Costs of quality	5	5	0	0
Cost savings	9	9	0	0
Total	20	59	2	4

Figure 2.1: Average Annual Percentage Improvement in Operating Indicators



Customer Satisfaction

Customer satisfaction is a key element of TQM. The definition of customer satisfaction has evolved greatly during the past decade from one of meeting the minimal requirements of customers to one of attempting to surpass customer requirements. Product and service quality is now defined by the customer, instead of the company, and today companies spend significant resources both measuring customer needs, requirements and expectations and continuously trying to exceed their customer's wishes.

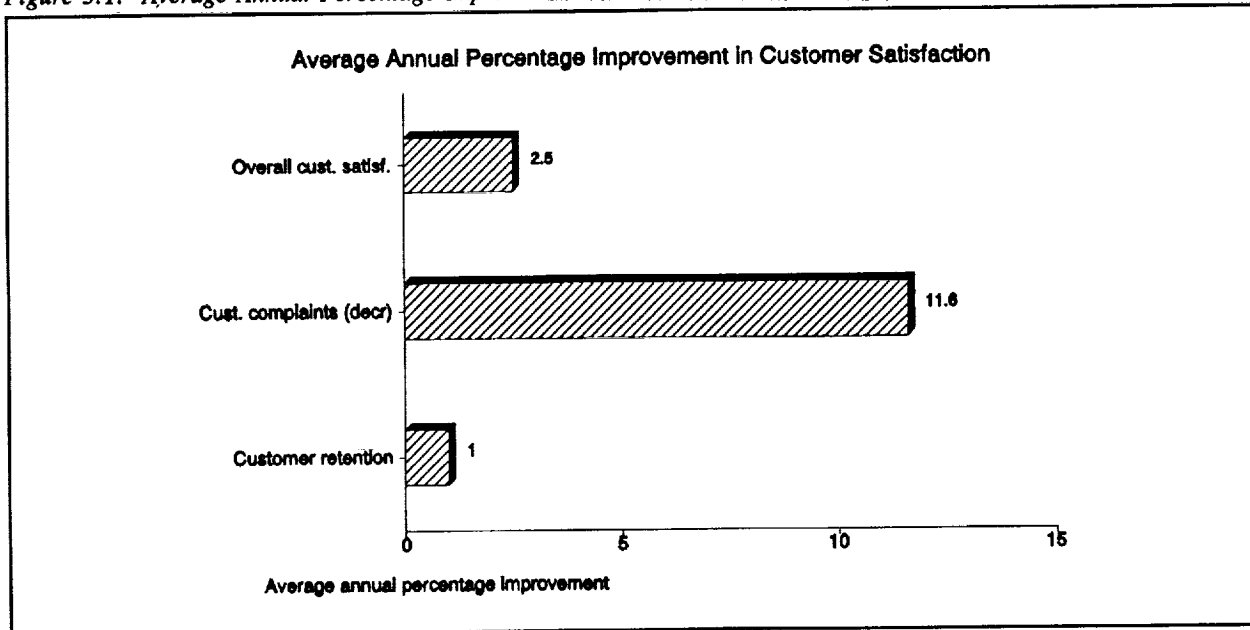
Customer satisfaction in the GAO study was measured by (1) overall satisfaction, (2) customer complaints, and (3) customer retention.

Overall customer satisfaction increased for 12 of the 14 reporting companies. Customer complaints declined in 5 of 6 reporting companies. Customer retention improved in 4 of 10 reporting companies, remained unchanged at 4 companies, and slightly decreased at 2 companies.

Table 4.1: Customer Service Indicators

Performance indicator	Number of responding companies	Direction of indicator		
		Positive (favorable)	Negative (unfavorable)	No change
Overall customer satisfaction	14	12	0	2
Customer complaints	6	5	1	0
Customer retention	10	4	2	4
Total	17	21	3	6

Figure 3.1: Average Annual Percentage Improvement in Customer Service Indicators



Financial Performance Indicators

Improved financial performance is at the heart of all TQM efforts. The degree to which companies believe there is a strong relationship between implementing TQM strategies and improvements in financial performance usually determines the seriousness of and resources spent on TQM efforts.

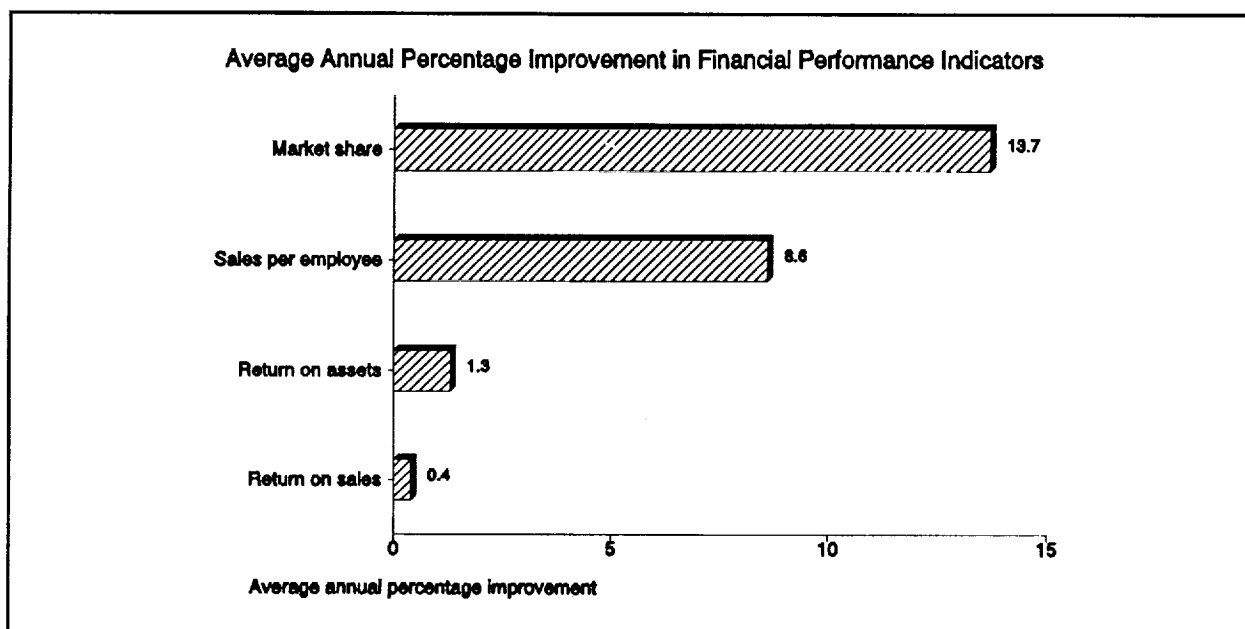
The indicators used by GAO to measure financial performance improvement were: (1) market share, (2) sales per employee, (3) return on assets, and (4) return on sales. As Table 5.1 shows, financial performance significantly improved for all indicators. Sales per employee was the most positive indicator, with the others having almost an equal positive performance direction.

The two companies that reported an unfavorable direction in performance cited increased foreign competition for this decline. But these two companies claimed that their negative direction in performance was ameliorated by their TQM efforts. Obviously, financial indicators of performance are subject to a wide range of external factors such as the general condition of the economy and supply and demand conditions in a particular industry. However, financial ratios increased for 13 out of the 15 companies with accurate data, providing support for a positive relationship between implementing TQM strategies and improved economic performance.

Table 5.1: Financial Performance Indicators

Performance indicator	Number of responding companies	Direction of indicator		
		Positive (favorable)	Negative (unfavorable)	No change
Market share	11	9	2	0
Sales per employee	12	12	0	0
Return on assets	9	7	2	0
Return on sales	8	6	2	0
Total	15	34	6	0

Figure 4.1: Average Annual Percentage Improvement in Financial Performance Indicators

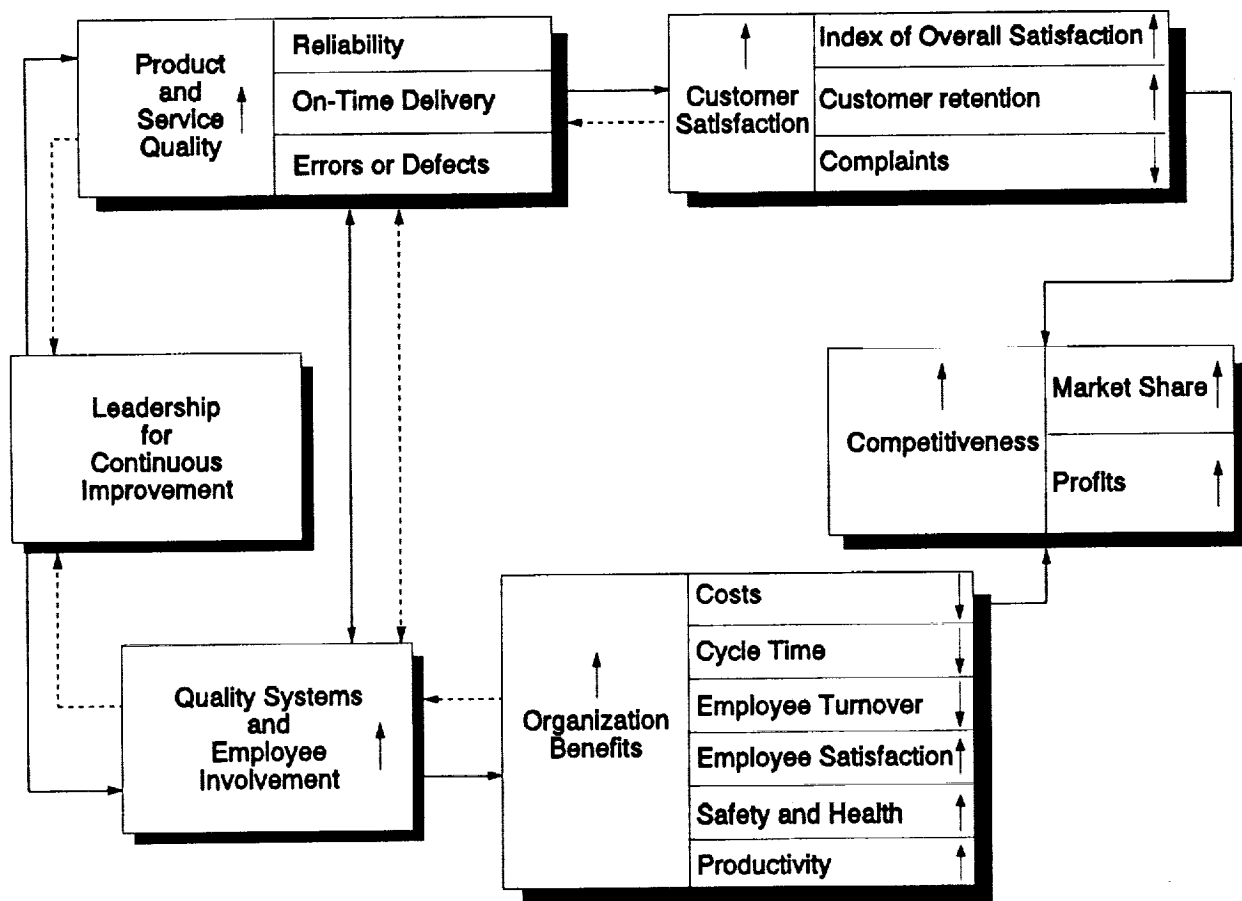


TQM MODEL

Based on the information and data collected by the GAO study, a TQM model was developed. This model shows the interrelationships among the major elements of a TQM strategy. It starts with leadership and concurrently focuses an organization on improving (1) product and service quality and (2) operating and human resource systems. The model stresses the need to integrate the activities aimed at these two areas. It is important to realize that changes in one area impact the other areas. For example, changes in work flow can directly impact employee reward systems.

The model indicates that once changes are made in an organization's systems based on TQM principles, results occur which lead to improvements in customer satisfaction and internal measures of performance such as productivity and employee satisfaction. These incremental improvements over time lead to an increase in market share and profits, and ultimately strengthen a company's competitive position. This model, which we call the **Total Quality Measurement and Management System**, is purposely depicted as circular, representing the continuous nature of quality improvement. Since a company's operating environment is constantly in flux, TQM strategies must remain flexible to react to these myriad changes.

Figure 5.1: TQM Model



GAP CLOSURE SHEET

Prepared By: _____ Date: _____

Gap Identification

Short Description of Gap from Application Team: _____

_____ Gap ID No.: _____

Gap Closure Plan

Reconciled Gap Description: _____

Senior Staff Owner: _____

Approach: _____

Comments: _____

Closure Method

Team Individual Combine with Gap _____ Other

_____ Existing CICCIP Team _____ (Gap No.)

_____ New CICCIP Team _____ (Team Name)

_____ Existing Project Team _____

_____ New Project Team _____ (Team Name)

Schedule

Closure Plan Date: _____

Closure Date Target: _____

Estimated (ROM) Cost

Indirect Hours: _____

Direct Hours: _____

\$ Capital: _____

GAP DESCRIPTION SHEET

Prepared By: G. Sperber, J. Botellio Date: April 2, 1992

Gap Identification

Business Impact: H M L Cost: H M L Gap ID No.: VIII.3

Short Description of Gap from Application Team: No process for involving suppliers in our training activities. Subcontractor personnel are not treated as full team members by all S&SS programs.

What NASA Would Like to See

Guidelines Reference: 1.2.2.5 Supplement Reference: 1.2.2.5

Guidelines Criterion: Document that vendor/subcontractor personnel are commensurately involved in teaming activities, including but not limited to: training opportunities, awards/recognition, goal setting and measurement processes.

Supplement Information: Document the level of involvement as specified in the sub-criteria element against the number of eligible subcontractor personnel.

What We See in Place Today in S&SS

Items Covered in Application Report: Teaming with multi-program suppliers, Training and certification in special processes, cleaning and NASA soldering, Supplier Tailored Enhancement Process (STEP I and II), and Supplier of the Quarter Awards.

Other Things We Did Not Write About: Technical Interchange Meetings.

Full Description of Gap:

Same as above.

GAP CLOSURE SHEET

Prepared By: L. Smith, M. Ziarnik, M. Allen, C. Rackliffe

Date: August 1992

Gap Identification

Short Description of Gap from Application Team: No process for involving suppliers in our training activities. Subcontractor personnel are not treated as full team members by all S&SS programs. Gap ID No.: VIII.3

Gap Closure Plan

Short Description of Gap from Application Team: The process for involving our suppliers in training activities is administered inconsistently. Key subcontractor personnel are not treated as full team members by all S&SS personnel.

Senior Staff Owner: P. Barkett

Approach: A) Pre-quotation Technical Interchange Meetings (In Process). B) Statistical Process Control and Total Quality Management Supplier Training (2nd Qtr. '93). C) Establish Integrated Product Development guidelines for all commodities and train all S&SS program teams and key suppliers in their use (2nd Qtr. '93). D) Supplier Reward and Recognition Program (2nd Qtr. '93). E) Establish Supplier Alliance Guidelines through our Certification Process (1st Qtr. '93). F) Special Process Certification (Completed).

Comments: _____

Closure Method

Team Individual Combine with Gap _____ Other
_____ Existing CICCIP Team _____ (Gap No.)
_____ New CICCIP Team _____ (Team Name)
 Existing Project Team Supplier Tailored Enhancement Process Team
_____ New Project Team _____ (Team Name)

Schedule

Closure Plan Date: _____
Closure Date Target: 1st Qtr. '94

Estimated (ROM) Cost

Indirect Hours: _____
Direct Hours: _____
\$ Capital: _____

NASA CRITERIA GAP CLOSURE PROCESS

