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Productivity and total quality management: Application in Maine manufacturing

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By John M. Joseph, Thomas College

Total quality management is among the best known of the new management practice theories that are being tried in and adapted to business organizations. In the following article, former Maine State Economist and current Thomas College Associate Professor of Finance and Economics, John M. Joseph, Jr., examines the implications of total quality management approaches for Maine manufacturers. Dr. Joseph's research, which analyzed several TQM surveys, including one he conducted with associates at Thomas College, suggests that although quality management initiatives are not easy to undertake, they are worthwhile.

Introduction

Following World War II, through the early 1970s, the economy of the United States dominated global markets and American efficiency and prosperity were the envy of the world. In 1973 three major events took place that signaled a changing tide. In March, after a number of monetary crises, the major European countries and Japan met and abandoned the dollar standard. Then, in the fall of the same year, the OPEC oil embargo, with its resulting shortages and price increases, shocked the American economy. Also in 1973, the U.S. economy began to experience a decrease in real wages. These events marked the new global inter-dependence and were clear signs of vulnerability and emerging international competition.

Throughout the 1980s and into the 1990s, the U.S. economy experienced persistent trade deficits and has been transformed from international creditor status to debtor status. The U.S. will need to make important changes to prevent further erosion. International competition demands that U.S. business improve its ability to meet customer needs through stringent cost containment, efficient management practices, and enhanced productivity. As Thurow (1992) has argued, these competitive strategies will separate the winners from the losers.

I have in the past viewed these developments through the eyes of an economist who considers traditional competitive factors, including wages, cost of capital, exchange rates, natural resources, international investment, public policy and institutions. As a faculty member at Thomas College, I have become increasingly aware of another side of competitiveness; business organization and management practices. Conditions of modern business and study of global trends have led me to conclude that management practices and the attendant labor relations are critical and essential elements of economic success. There is little argument that management practices are changing. After all, the world they manage has changed.

While there are numerous management theories and various formulas of evolving practices, this report focuses on the system called "total quality management" (TQM). TQM is perhaps the best known and most comprehensive of the emerging management practices. At its best, it combines

the application of rigorous objective quantitative measurement with a genuine respect for and understanding of human motivation. This is no small feat.

The foundation of the modern quality movement can be traced to the work of W. Edwards Deming (1900-1993). Deming is perhaps best known for his work in Japan where, starting in 1950, he taught top management and engineering staff the methods of quality management. His ideas dramatically altered the economy of Japan and changed the perception of "made in Japan" from a derogatory declaration to synonymous with quality and value. Deming, who received his doctorate in mathematical physics from Yale in 1928, is widely acknowledged for his achievements in Japan and has received the highest imperial honors that Japan's emperor is able to bestow on a foreigner. However, leading American corporations and their managements did not heed his advice until the problem reached current crisis levels.

Though Deming is viewed by many as the founder of the quality movement, the practice has evolved and numerous other people have contributed. The successful application of the TQM principles can vary significantly from location to location, and the techniques need to be customized to the culture of each organization. A recent book by Michael Kearns, *Prophets in the Dark*, about the Xerox turnaround makes the case for this need to customize. Indeed, many companies use principles and practices of TQM but do not call them TQM and may even actively avoid the acronym. For this reason, the project reported here refers to "quality initiatives" rather than TQM practices.

An increasing number of American businesses are adopting changes in management practices to improve effectiveness and efficiency. On September 14, 1993, Mr. Preston Townley, President of the Conference Board, Inc., spoke at the annual meeting of the Maine Development Foundation. He stated, "The Conference Board has recently taken a broad look at TQM - at the organizations using it and what the impact has been. We've analyzed 20 different TQM surveys, our own and those conducted by others. One bottom-line finding: While TQM is a long, difficult journey, it's worth the trip. More companies, of all sizes, are developing quality improvement initiatives. Why? It is common sense. It is responsive to and driven by customer requirements. TQM is also spreading to schools, the health care sector and of course, to states. Yes, these folks are recognizing they have customers too. Our study of studies shows that companies that have adopted TQM have made large investments in training, reorganization and work-flow design. One result: Management layers have been reduced, giving more discretion to front line employees. TQM is no one-shot cure-all and it's not backed by all executives. But the evidence we studied suggests that TQM can improve such major measure as market share customer satisfaction, employee performance, process costs and cycle times."

The survey approach

The quality movement has received considerable attention nationally and internationally. For example, in 1992, the American Quality Foundation and Ernst Young conducted a major international research project detailing the application and resultant performance of quality management practices in over 580 organizations in four countries. They assessed 945 management practices. However, little work has been done to survey this management practice at the state or regional level.

The aim of the research reported here was to provide basic data characterizing the application of the quality management movement in Maine's manufacturing sector. The objectives are threefold.

First, to determine the degree to which the quality movement has penetrated Maine manufacturers. Second, to profile the utilization of the various tools and techniques of the quality movement; that is, to see how it has been customized in the manufacturing sector in Maine. Third, to evaluate results in terms of business performance.

Information was gathered through a written questionnaire sent to the chief executive officers (CEO's) of 50 manufacturing firms located in the state of Maine, during the summer of 1993. The total population of 300 firms with 100 or more employees was surveyed. And a 10 percent random sample of the 2000 firms with less than 100 employees was surveyed. Total responses were 83, of which 34 reported 100 employees or more, 40 reported less than 100 employees and 9 did not report employment levels. Approximately half of the respondents were either CEO's or owners, 30 percent were vice presidents and 10 percent used the word "quality" in their title.

It is important to recognize the limitations in attempting certain statistical inferences from the sample data. In particular, attempting to infer total penetration of the quality movement from the sample could lead to a biased estimate. The reasons for this bias are: First, those who have a quality initiative are more likely to answer the survey and second, large firms are more likely to have quality initiatives. This bias is a concern only for inferences regarding penetration of the quality movement in the total population.

Market penetration

Over 60 percent of all respondents indicated that they had a quality initiative in place at the time of the survey. The average program duration is 4.8 years, but ranges from two months to 15 years. In the vast majority of cases the quality initiative originated with upper level management ([Figure 1](#)).

In characterizing the level of commitment to quality at various levels of the organization, we notice it closely mirrors the point of origin; that is, commitment was highest for upper management. Ninety-five percent of the respondents rated CEO commitment as "high" ([Figure 2](#)). In contrast, non-supervisory employee commitment was rated "high" by only 30 percent of the respondents, the lowest proportion of any category. The data clearly indicate that quality initiatives start at the top and the commitment is strongest at the top. This finding is consistent with the Deming (1993) philosophy, "Quality is determined by top management. It cannot be delegated."

When the respondents were asked to identify the factors that led to their adoption of a quality initiative ([Figure 3](#)), 85 percent responded "to improve customer satisfaction"; 80 percent "to be more competitive"; and 68 percent "to improve worker efficiency." Fifty percent indicated that customer requirements had led to adoption. Interestingly, one respondent stated that the U.S. Navy required the program. Thirty-two percent noted that international competition had been a factor leading to adoption.

Ninety percent of those companies with a quality initiative also had created a mission statement for their organization. Of the companies who had a mission statement in place prior to the quality initiative, 80 percent revisited that mission statement to make sure the goals were consistent with the quality initiative. This procedure is also consistent with Deming (1993), who states, "A system must have an aim. Without an aim there is no system. The aim of the system (business) must be clear to everyone in the system. The aim is a value judgment."

When asked to indicate which quality experts were influential in the development and implementation of the quality initiative, over 50 percent identified W. Edwards Deming followed by Philip Crosby and Joseph Juran.

The reasoning of respondents without a quality initiative is revealing ([Figure 4](#)). Well over half indicated they were not fully aware of the benefits or did not know how best to go about introducing the program. Furthermore, approximately 60 percent of those without quality initiatives at the time of the survey expressed an interest in receiving a copy of the results, suggesting an interest to learn more.

The data strongly indicate the larger the firms are more likely to have a quality initiative in place. The average employment level of companies with quality programs was 709, while the average for companies without programs was 56. Of those respondents with less than 100 employees, 41 percent had a quality initiative in place. However, of those respondents with 100 or more employees, 78 percent had a quality initiative in place.

Best practices

This section describes the methods and techniques used by the respondents in implementing their quality initiatives. Of those with a quality program, 70 percent have a person in charge of maintaining the program. Within that group, 83 percent are full-time program managers and 17 percent are part-time.

[Table 1](#) summarizes the degree of utilization of the various quality tools. Measurement of external customer satisfaction, employee involvement and team building were the most highly utilized tools among respondents.

Eighty percent of the respondents with quality initiatives reported they have attempted to integrate the process in all areas of the business. [Figure 5](#) summarizes the areas which were included in the quality initiatives. The highest level of application was in production, where 80 percent of the respondents initiated a program. However, 60 percent of the respondents indicated they had initiated a program in each of the four primary areas of business organization presented in [Figure 5](#).

Having assessed the scope of application throughout the organization, the next step was to determine the degree of integration between the organization's components. To help determine the degree of interdependence and interaction, respondents were asked if their employees were engaged in the team related activities illustrated in [Figure 6](#). Emphasis on the importance of employee involvement and team building emerges throughout the survey. Seventy percent of the respondents reported having employees engaged in department level teams, 70 percent reported employees engaged in cross-functional teams, 68 percent reported having suggestion systems, and 68 percent have employees engaged in problem solving training. Of the five areas investigated, the quality circle was the least utilized. This, perhaps, reflects the need to get away from management concepts imported from Japan and the need to develop an American way.

When asked, in an open-ended question, to identify the most difficult elements in efforts to establish and implement a quality initiative, the emergent themes related to sustaining employee involvement and maintaining commitment. Nevertheless, these concepts, which reflect team building, cross-functional communications, interdependence between components, employee

involvement, and training, are being broadly utilized throughout the sample of respondents. The results illustrated in Figure 6 are consistent with the Deming philosophy as expressed in his statement, "An important job of management is to recognize and manage interdependence between components. Resolution of conflicts, and removal of barriers to cooperation, are responsibilities of management."

The analysis also sought to determine if financial incentives had been put in place to help sustain employee commitment to the quality initiative. Approximately 36 percent of total respondents reported financial incentive programs in place. Interestingly, only 20 percent of those respondents without a quality initiative reported implementing a financial incentive program for employees. In contrast, 46 percent of respondents with quality initiatives have financial incentives in place. As illustrated in [Figure 7](#), the most widely applied incentive programs among respondents were the profit-sharing plans and production incentive programs.

The concept of "gain-sharing" was a major theme at the July 26, 1993 Conference on the Future of the American Workplace sponsored by the Labor and Commerce Departments. In a special to the New York Times, Louis Uchitelle (1993) reported, "Rather than raising hourly wages, the companies at the conference favored profit-sharing or gain-sharing to give workers a share of the improved performance." In the same article, he stated, "The conferees recognize that a relatively small number of American companies have attempted to make their workers partners in running the companies."

Following a similar line of reasoning, John Case (1993) reported on the Conference on Open Book Management, held in Atlanta in June 1993. Case summarizes the theme of the conference, "Teaching everyone the numbers, by contrast - and giving everyone a stake in the outcome, through profit-sharing or stock ownership - changes the whole game. This is the open-book approach, and it turns employees into business partners."

Finally, the survey inquired into the adoption of international quality standards. None of the respondents reported being ISO 9000 Certified at the time of the survey. (ISO 9000 is the overview document of the International Standards Organization's quality manufacturing standards. An increasing number of global firms will only purchase from companies in compliance with ISO 9000.) However, 20 percent of those companies with quality initiatives in place were in the process of becoming certified and 30 percent reported they were planning to become certified in the future. Thirty percent were not acquainted with ISO 9000.

When asked to rate the importance of staff development in the areas presented in [Figure 8](#), employee involvement was rated the highest, followed by teambuilding and measurement of customer satisfaction.

Approximately 50 percent of the respondents reported utilizing outside consultants as part of their quality initiatives. [Figure 9](#) indicates that internal and external seminars are the most widely used methods of staff development with approximately 80 percent of the respondents using these methods. Networking both inside and outside the industry was also utilized.

Performance

This section begins to assess the performance of the quality initiatives in terms of commonly accepted business measurements, such as revenue, cost, and profit.

When asked if they had formally measured the cost of implementing the quality initiative, less than one quarter reported that they had. However, approximately 60 percent indicated they had been able to measurably lower their costs through the quality initiative. [Figure 10](#) indicates one half of the respondents reported a measurable increase in profitability attributed to the quality initiative.

As illustrated in [Figure 11](#), slightly less than half of the respondents indicated that the quality initiative resulted in their "sustaining business in a mature market." This response reflects the current business environment for Maine manufacturing companies. Thirty-five percent reported a "moderate increase in business" as a result of the quality effort and 12 percent reported a "significant increase in business." Less than 10 percent indicated "no increase in business" as a result of the quality initiative.

When asked to rank the role of quality initiatives ([Figure 12](#)) as a management tool to improve American industrial competitiveness in the global economy, more than three quarters of the respondents ranked it "critically important," 18 percent ranked it "moderately important," and two percent ranked it "not important".

Implications for research and policy

One of the more interesting implications of the research relates to involving non-supervisory employees in the quality effort. We observed that only 30 percent of the respondents ranked non-supervisory commitment as "high," clearly the lowest of all groups. However, respondents gave "employee involvement" and "teambuilding" the highest ratings in terms of the level of utilization of quality tools. Consequently, 70 percent rated employee involvement and team building as highest priority areas for training and staff development. These findings identify an area of need for education and training services and are consistent with the theme of the recent "National Conference on the Future of the American Workplace," sponsored by the U.S. Department of Labor, where employee empowerment was viewed as key to more jobs. These findings also suggest incentive programs and "gain-sharing" should be considered as important means to achieving continued commitment.

Another implication relates to those respondents who do not have a quality initiative. Reasons given for not implementing a quality initiative focus primarily on a lack of knowledge. More than half of those respondents without a quality initiative gave as a reason that they were "not fully aware of the benefits" or "didn't know how best to go about introducing the program." In light of the reported success of quality initiatives for practicing firms, this finding suggests a strong need for information, education and training.

A 40 percent participation rate among small firms (less than 100 employees) compared to an 80 percent participation rate for larger firms suggests areas of inquiry. Perhaps it indicates a need for additional information and training for small firms. Or, perhaps, it is useful to consider how the application of a quality program might take a different form for small business. A recent Wall Street Journal article "Small Firms Struggle With Latest Management Trends" (Fuchsberg 1993) beg to explore some of the difficulties small firms have adopting management practices that may not be appropriate for them. This question of applicability to small business is important, since the major new job sector is considered to be small and medium-sized.

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