Management of New Technologies for Global Competitiveness

Christian N. Madu

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Preface

Management of new technologies is a critical issue facing the corporate world today. We have in the recent times witnessed the proliferation of new technologies and, also, a shorter life cycle for these technologies. Increasingly, many executives believe that capital investment in new or advanced technologies is necessary in order to improve productivity. As the United States responds to its declining rate of growth in productivity, automation has assumed a critical role. The importance of advanced and new technologies in enhancing productivity, and in improving quality and competitiveness, is widely accepted. The pressure to manufacture high-quality products or provide high-quality services that meet the specifications and demands of consumers has led to a systemic approach to the management of technology. Many companies today rely on advanced technologies to achieve high precision, maintain tolerance, and provide high value-ended services and products.

Advanced technologies are widely applied in both the manufacturing and the service sectors, significantly influencing the quality of services delivered. For instance, many service institutions such as banks, insurance, and health care have drastically improved the quality of their services by making effective use of technology. Imagine what it would be like to conduct today's financial transactions in a bank that is not computerized. Obviously, the waiting time for a basic transaction would be high, turnout would be low, cash flow would be limited, and customer goodwill would be lost as they developed negative perceptions of the services rendered by that bank. Clearly, these factors would negatively influence the productivity, quality, and competitiveness of the bank. Technology is, therefore, instrumental in the survival of modern corporations.

Today's environment is dynamic and complex. Corporations have to be cognizant of both their operating and their external environments. Hardly a day passes without mention of the competition U.S. companies face, especially from the Japanese. Total quality management has become critical to understanding why American companies are losing their competitive edge. This book tackles this important problem through a holistic approach to the management of new technologies. It considers both manufacturing and service sectors, and looks at different aspects of process technology to determine how it can help achieve global competitiveness.

The book is divided into five *parts*. *Part 1*, Total Quality Management, features

articles that offer pragmatic approaches to the management of quality. The role of expert systems in quality assurance is also presented. Furthermore, a distinction is made between Japanese and American production management systems, and the role of notable quality-management philosophers is described. The articles in *Part 2*, Selection and Implementation of New Technologies, demonstrate the shortcomings of cost-accounting techniques in justifying the use of new technologies. The authors identify the strategic functions of new technologies that may not be easily captured by traditional cost-accounting techniques, and provide procedures to effectively consider tactical and strategic factors in selecting such new technologies. A project-management approach to implementation and adoption of new technologies is also provided. *Part 3*, Strategic Management, demonstrates the role of top management and technology in improving organizational performance. Emphasis is on specific applications—manufacturing, health care, and information systems. *Part 4*, Knowledge-based Techniques, deals with the role of artificial intelligence and expert systems in management of new technologies. The articles in this section show how knowledge-based systems can improve the quality of decision making at different levels in the organization. Also, effective use of knowledge to meet organizational challenges is demonstrated. *Part 5*, Product Design and Inventory Management, deals with performance evaluation of specific technologies, such as flexible manufacturing systems, robotics, and computer-integrated enterprises. Procedures are provided to reduce set-up time in order to effectively manage inventory via a just-in-time system. Product design is also discussed as an emerging competitive factor.

Finally, this comprehensive approach reveals the different approaches to managing new technologies in order to achieve global competitiveness. The systemic approach of this book makes it an important reference book, useful as a basis for courses in new technology management or as a supplementary text for production and operations management classes.

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Total Quality Management

Chapter 1

Strategic Total Quality Management (STQM)

Christian N. Madu and Chu-hua Kuei

Recently, there has been a significant shift in the quality movement from traditional quality-assurance practice to total quality management (TQM). Total quality management is a customer-driven approach to quality, emphasizing the involvement and commitment of every employee in an organization to provide quality products and services. Customers are increasingly sophisticated, with increasingly more complex demands to be satisfied. The increase in international competition also suggests that only quality-driven companies will survive. Therefore, for a company to achieve quality, customer needs, expectations, and aspirations must be satisfied. Mercer (1991) (project director, European Council on Quality, The Conference Board, Europe) identifies key quality issues. If TQM is achieved, the company is able to improve productivity, competitiveness, and market share. Although total quality management is today's fashionable management practice, the literature has failed to indicate how to further improve quality. van Ham (secretary general, European Foundation for Quality Management) points out that "Executives who believe in only applying the existing body of knowledge are missing the point—using existing standards and systems will only give at best, an average result" (1991). In Deming's "Profound Knowledge," he points out that (1) experience teaches nothing unless studied with the aid of a theory; and (2) an example teaches nothing unless studied with the aid of a theory (1986). Therefore, our intention here is to offer a strategy for quality management.

To begin, we broadly define or clarify some of TQM concepts.

- *Quality*. Quality is seen from the perspective of the customer. Products and services must be produced to conform to customer specifications. Thus, tight specifications must be maintained, and performance standards should ensure that customer requirements are met. With TQM, the attempt is to prevent rather than detect errors.
- *Cost of Quality*. The cost of quality is based on Juran's cost-of-quality accounting system. This method shows top management the cost of not producing products or services that are "fit for use." As March (1990) notes, money is the language that top management understands. Once they see what quality costs, they listen. Juran has identified four types of costs: internal and external failure costs and prevention and appraisal costs.
- *Organizational Culture*. Organizational culture must change to embrace the new focus on customer-driven quality. A flexible, horizontal management approach can effectively implement TQM. Every employee, from top to bottom, must be committed to TQM as a business strategy. A never-ending commitment to continuous improvement must be

maintained if TQM is to be achieved.

- *Process of Change.* Change is inevitable in a "new" organization if total quality management is emphasized. The change may include new processes to adopt more precise technologies; flexible and efficient human resource development through education, training, and retraining; shifts in communication patterns and information flow; increased power sharing through teamwork and greater responsibilities for workers; top management commitment to and participation in total quality management; a heightened understanding of customer need. These new directions necessitate management of change in a proactive manner to achieve organizational goals and mission, and accomplish the vision set by the organization.
- *Quality Improvements.* Quality is improved only if potential problem areas can be isolated and measures adopted to prevent rather than cure quality problems later. Obviously, quality improvement starts with clear and concise organizational objectives that are customer focused. The process technology and human resources should target specific outcomes rather than outputs. To effectively achieve this, customer requirements must be fully understood. Improving quality also requires maintaining quality from suppliers. They should not be selected simply on the basis of cost, but rather also on their ability to meet quality guidelines.

In this chapter, we introduce a new approach, Strategic Total Quality Management (STQM). STQM can serve as an extension of TQM.

THE PHILOSOPHY OF STRATEGIC TOTAL QUALITY MANAGEMENT

Our Strategic Total Quality Management philosophy is based on developing a systemic view of quality. This approach views quality as the driving force to ensuring the survivability and competitiveness of a company. However, rather than view quality only from the standpoint of direct products and services, we see quality as a reflection of *overall performance.* In other words, the performance of a company in its immediate and extended environment in all matters—even those that may not be related directly to the product—is assessed as an attribute of quality. For example, the claim by a major fast-food chain such as McDonald's that its paper bags are "made with recycled paper" is intended to convey the message that the company is socially responsible and environmentally conscious. The McDonald's package further states the most obvious, "Please put litter in its place." Clearly, these messages are a response to growing concerns of consumers about degradation of the environment by manufacturers who do not care about pollution or that are not socially conscious.

Also, banks with holdings in South Africa during the divestment period of the 1980s lost a share of their business from municipal councils, major pension funds, and private individuals who disagreed with apartheid policies. Fur manufacturers have been the target of negative campaigns and have seen a subsequent drop in sales revenue as a result of activities by animal rights groups. Corporations like Exxon, Petroba, and Union Carbide have been involved in serious environmental accidents and have suffered from a bad reputation and a poor public image that oftentimes implies the quality of products and services are secondary.

Thus STQM integrates socially responsible and environmentally sensitive decisions into total quality management in order to improve global competitiveness. It does this by strengthening and enhancing the company's quality objectives. These issues have become so critical that special government agencies have been set up in the United States to deal with them. For example, the Office of Technology Assessment (OTA),