Improving Theory and Research on Quality Enhancement in Organizations: Report of a Workshop

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Report of a Workshop

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Commission on Behavioral and Social Sciences and Education

National Research Council

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WORKSHOP PARTICIPANTS

W. RICHARD SCOTT (*Cochair*), Department of Sociology, Stanford University
ROBERT COLE (*Cochair*), Haas School of Business, University of California, Berkeley
META BABA, Transformations to Quality Organizations Program, National Science Foundation
SØREN BISGAARD-FRANTZEN, College of Engineering, University of Wisconsin-Madison
WILLIAM BUTZ, Social, Behavioral, and Economic Research Program, National Science Foundation
KIM CAMERON, Marriott School of Management, Brigham Young University
JAMES DEAN, Transformations to Quality Organizations Program, National Science Foundation
DANIEL DRUCKMAN, Division on Education, Labor, and Human Performance, Commission on Behavioral and Social Sciences and Education
GEORGE EASTON, Goizueta School of Business, Emory University
KATHLEEN EISENHARDT, Terman Engineering Center, Stanford University
HILLEARY EVERIST, Social, Behavioral, and Economic Research Program, National Science Foundation
BARBARA FLYNN, Department of Management, Iowa State University
RICHARD HACKMAN, Department of Psychology, Harvard University
TOMOKO HAMADA, Department of Anthropology, College of William and Mary
JANET HANSEN, Division on Education, Labor, and Human Performance, Commission on Behavioral and Social Sciences and Education
RACHELLE HOLLANDER, Ethics Program, National Science Foundation
GARRY HUYSSE, Global Quality Improvement, Procter & Gamble
THOMAS KOCHAN, Sloan School of Management, Massachusetts Institute of Technology
DAVID LEVINE, Haas School of Business, University of California, Berkeley

CORA MARRETT, College of Education, University of Wisconsin-Madison
NELSON REPENNING, Sloan School of Management, Massachusetts Institute of Technology
STANLEY SETTLES, Department of Industrial and Systems Engineering, University of Southern California
KATHRYN SHAW, Graduate School of Industrial Administration, Carnegie Mellon University
SIM SITKIN, Fuqua School of Business, Duke University
JOHN STERMAN, Sloan School of Management, Massachusetts Institute of Technology
KATHLEEN SUTCLIFFE, School of Business, University of Michigan
KARL WEICK, School of Business Administration, University of Michigan
SIDNEY WINTER, Wharton School, University of Pennsylvania

Staff

MIRON STRAF, *Director,* Committee on National Statistics, Commission on Behavioral and Social Sciences and Education
TRACY WELLENS, *Research Associate,* Committee on National Statistics, Commission on Behavioral and Social Sciences and Education
KAREN HUIE, *Research Assistant,* Committee on National Statistics, Commission on Behavioral and Social Sciences and Education

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Neil Smelser, *Chair*
Commission on Behavioral and
Social Sciences and Education

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Introduction

The Workshop on Improving Theory and Research on Quality Enhancement in Organizations was convened by the Commission on Behavioral and Social Sciences and Education of the National Research Council at the request of the National Science Foundation (NSF). This report highlights the issues, problems, and major themes addressed at the workshop.

NSF's Transformations to Quality Organizations (TQO) Program is an ambitious new program to support research on quality management principles and approaches. It requires partnerships between academic researchers and researchers and practitioners in business and the public sector. It is intended to serve as a catalyst for multidisciplinary investigations aimed at helping organizations understand and implement quality improvements more rapidly and successfully.

However, the research funded by NSF in its TQO program involves a broad range of disciplines, with only modest depth in any given substantive area. Advisers have suggested that future research should forge stronger links between relevant social science theory and organizational quality principles and objectives. Larger scale and more systematic studies using comparable concepts and measures are required in order to understand what techniques are effective in achieving specified goals under varying conditions. A recent National Research Council report, *Enhancing Organizational Performance* (National Research Council, 1997), also discussed the need to bridge the gap between theory and practice in this area.

The workshop provided an opportunity to bring together researchers from a range of disciplinary perspectives—sociology, anthropology, psychology, management, engineering, economics, statistics, and operations research—to discuss several aspects of quality improvement and assessment in organizations. The topics included making explicit quality principles for organizations, developing connections to organizational theory, pursuing implications for organizational training, and conceptualizing and measuring organizational performance. The goal of the workshop was to build connections between research and theory to help expand and improve both theory and practice; to begin to develop a framework to guide

future research; and to identify broader social science issues that can contribute to the study of quality in organizations.

The workshop was successful in beginning this dialogue between researchers who study the issue of quality and social science theorists. The current research in this area is somewhat disjointed: it could clearly benefit from a delineation of key principles and more systematic tests to evaluate desired change across a broad range of organizations. The workshop was able to identify areas where relevant social science theory could be applied, but it did not succeed in beginning the development of a unifying framework. Participants emphasized the necessity of such an enterprise for future research and for scientifically rigorous research in this field.

Eight papers, covering a range of perspectives and interests, were prepared for the workshop and served as the basis for discussion over the course of the 2-day meeting. The papers were not representative of all research being conducted in the field, but were selected to represent some of the more interesting, theory-driven, and careful research being done (see list in the Appendix). The authors of each paper made a short presentation of their material and then designated commentators made brief remarks before opening the floor for general questions and comments.

Following a brief section on practice and theory, this report presents summaries of the papers. The next sections summarize the workshop discussions by topic. The last sections note promising directions for future research and for the TQO program at NSF.

Bridging the Gap Between Practice and Theory

As explained by Baba (1998) and by Dean and Bowen (1994), the development of quality enhancement and quality transformation has been more driven by application than by theory. Industry practitioners in Japan attempted to develop methods to transform their devastated industrial system to be globally competitive. By direct observation and experimentation inside individual Japanese firms, they sought approaches to improve organizational processes and products. As their work spread to the United States, a more generalized set of concepts and methods were articulated, some inspired by Japanese models and others drawing on related prescriptions from American managers. These concepts and meth-

ods are generally referred to under the rubric of total quality management (TQM).

As would be expected, practitioners have not used their inductively generated insights to create an explicit theory of organizational quality. They are not connected to the organizational research community in academia and have neither the interest nor the background knowledge to support theory building (Baba, in press). Practitioners have attempted and introduced a great many changes in organizational practices, but they have done so in ways that do not allow for systematic learning about the levers of organizational change that relate to quality improvement.

Although scientific understanding sometimes leads the way to improved practice, workshop participants agreed that TQM developments clearly represent an instance in which practice has been ahead of scientific knowledge. Questions were raised as to why organization theorists have been slow to study the new practices that are being applied. It was observed that many scientists have been put off by the exaggerated claims of management gurus and by the overly enthusiastic accounts of committed practitioners. Most of the writing to date on this phenomena consists either of prescriptive principles promoted by "experts" on organizational reform or anecdotal accounts of the vast improvements in companies adopting particular practices. This is not the sort of territory that most scientists find appealing.

Yet it is clear that important changes are occurring in both manufacturing and service companies and organizations as many of them adopt and implement some version of TQM ideas and practices. Workshop participants agreed that it is time to take a more careful look at those changes. As with any scientific undertaking, it is essential to develop a systematic approach tied to theory. Although much of the early work on TQM consisted of a few well-known case studies in industrial settings, there are some general lessons that can be learned from the existing research. More broadly, there is a need to develop a conceptual framework, with links to social science theory, that can then guide future research in the field.

Research Perspectives: Paper Summaries

Market Pressures and Institutional Forces: The Early Years of the Quality Movement

Robert E. Cole, *Haas School of Business, University of California, Berkeley*

The author concentrates on the early years of the U.S. quality movement, roughly 1980-1985, a period in which the Japanese had shown great improvement in product quality across a broad range of manufacturing industries, but the Americans had yet to embrace quality improvement as a corporate objective. The Japanese market-based approach to quality focused on enhancing customer satisfaction, eliminating waste, and promoting efficiency. The Japanese methods proved effective, and they contributed to larger shares for Japanese companies in foreign markets. Despite the strong economic pressures, a broad range of institutional factors made American companies reluctant to abandon existing practices and learn from the Japanese. There was, in particular, a significant cognitive gap: the idea that costs could be lowered and quality could be raised simultaneously challenged the dominant American viewpoint. It was not until the late 1980s and early 1990s that American companies were able in any significant way to integrate adapted versions of quality practices into their own structures.

Achieving Organizational Quality: An Empirical Investigation of Quality Culture, Processes, and Outcomes

Kim Cameron, *Marriott School of Management, Brigham Young University*
Carole Barnett, *University of New Hampshire*

Although an extensive literature exists on quality techniques and procedures, the relationship between quality at the organizational level and actual organizational performance is still poorly understood. The literature on quality has focused almost exclusively on the *process* of producing goods or services, the nature of the goods or services themselves, the expectations and levels of satisfaction of customers, and the problems

with implementing quality programs in organizations. Although attention to quality and increased productivity, market share, and profitability seem to be linked, no real empirical evidence has established the basis for this claim. More important, it is necessary to distinguish between the adoption of one or another specific practice or technique and changes in the way in which problems are defined and solutions sought. In short, it is necessary to determine the extent to which an organization has embraced a quality "culture."

The authors attempt to conceptualize and quantify quality culture, a subset of overall organizational culture. Their model outlines three types of quality cultures: error detection, error prevention, and perpetual creative quality; these types represent a progression from a less to a more advanced culture. The model was empirically evaluated in a study of 68 strategic business units over 3 years. Business officials rated various scenarios, which typified each of the quality cultures, to characterize their own organization. The approach focuses on three major issues: (1) identifying the major predictors of quality culture differences; (2) examining the relationships between quality culture and organizational effectiveness; and (3) identifying the major predictors of changes in quality culture and organization effectiveness over time. Effectiveness measures included comparisons to industry averages, the performance of best competitor, customer expectations, and past performance. The overall findings suggest that advanced quality cultures are associated with organizational effectiveness and quality achievement.

Team-Based Incentive Pay and Worker Performance

Brent Boning, *Graduate School of Industrial Administration, Carnegie Mellon University*
Casey Ichniowski, *Graduate School of Business, Columbia University*
Kathryn Shaw, *Graduate School of Industrial Administration, Carnegie Mellon University*

In many manufacturing firms and increasingly in service-based firms, the output of the firm is a function of the team efforts of employees. Team-based incentive pay has been used by some firms as a means of improving worker performance, but this also introduces the "free rider" problem: as the size of a team increases, the return to individual effort

diminishes, and each employee has an incentive to depend on the efforts of other members of the team. The authors use data from production lines in the mini-mill segment of the steel industry to estimate whether team-based incentive pay does in fact raise the workers' performance levels. They examined one particular process in the steel industry that is comparable across different plants and companies and assess whether it is more productive when workers receive incentive pay. They also propose a theoretical framework that emphasizes the importance of positive peer pressure. They find that incentive pay works better when workers pay attention to each other's efforts and informally penalize those who do not perform to a certain standard, thus eliminating the "free rider" problem.

Agency Problems in Process Improvement Efforts

Nelson P. Repenning, *Sloan School of Management, Massachusetts Institute of Technology*

The author studies the problem faced by a firm that tries to induce its workers to reveal information leading to productivity improvements that may in turn lead to layoffs or "downsizing." He investigates the effect of different contractual and institutional assumptions on a firm's ability to implement quality programs. He proposes two hypotheses: (1) employees' ability to participate in binding side agreements—to write contracts with each other or to join a union—is a critical determinant of a firm's costs of implementing new programs; and (2) the program's perceived effect on the firm's survival strongly influences the firm's cost and the ability of employees to cooperate profitably. A firm's financial health has a large effect on its ability to successfully implement a total quality management (TQM) program: TQM is easiest to implement when a firm is either growing very quickly and can absorb the excess capacity generated by productivity improvements (providing job security) or when is it doing very poorly and may be forced to shut down. For a firm between the two extreme points, the timing and pace of improvement efforts are important. By matching the rate of productivity improvement with the rates of natural attrition and growth of demand, a firm can credibly be committed to job security and not face a decision to lay people off.

Misperceptions of Feedback and Self-Confirming Attributions in the Dynamics of Process Improvement Programs

Nelson P. Repenning, *Sloan School of Management, Massachusetts Institute of Technology*
John D. Sterman, *Sloan School of Management, Massachusetts Institute of Technology*

Although TQM and other process-oriented improvement techniques have increased the effectiveness and productivity of many organizations in the short run, they often fail in the longer run. Existing theory appears inadequate in explaining many of these failures, in part because operations research and management science focus on the technical aspects of process improvement and organization theorists focus on the behavioral issues. The authors develop a model that integrates the basic technical structure of process improvement with established theories on human cognition, learning, and organizational behavior to explain the dynamics of process improvement efforts. Through the development of stock-flow and feedback diagrams, they develop a representation of both the technical and organizational structures of improvement. They find that failures result from errors of attribution by managers in assessing the causes of inefficient processes or low outputs: if managers attribute low performance to the attitudes and disposition of the workers, they react in a manner that makes such an attribution self-fulfilling. Improvement is difficult since a large portion of the available resources are dedicated to correction efforts, and production pressure prevents the experimentation and adaptation needed for improvement. The authors' theory is grounded and validated in detailed, intensive field research of improvement programs at a large global manufacturing firm.

Research on Control and Experimentation in Total Quality Management: Theoretical and Applied Implications

Sim B. Sitkin, *Fuqua School of Business, Duke University*
Kathleen M. Sutcliffe, *School of Business Administration, University of Michigan*
Larry D. Browning, *College of Communication, University of Texas*

The singular emphasis on control that has characterized traditional approaches to TQM implementation is not well suited to conditions of high task uncertainty. A broader, more theory-driven perspective on TQM is needed in order to distinguish control from learning goals and to address limitations in the way TQM has been conceptualized and put into practice. Sitkin, Sutcliffe, and Schroeder (1994) examine the principles and practices that underlie TQM and offer a basis for predicting the conditions under which the use of different aspects of TQM should be more or less effective. Preliminary analysis based on several case studies of work groups that confront uncertain or nonroutine tasks suggest the importance of employing a contingency model that takes into account the nature of the work performed. Under conditions of higher uncertainty, learning goals that emphasize experimentation and allow for mistakes and failures are appropriate. Control models are appropriate only under conditions of routinized and stable tasks.

The authors also presented the results from an empirical study that provides support for this general contingency theory. The study was of a series of project-level quality efforts in which the task or problem was coded in terms of its level of uncertainty and the quality methods that were used. The authors found that traditional, control-oriented quality approaches were effective for routine, certain problems, and learning-oriented approaches were effective for nonroutine, uncertain problems. Mismatches between type of approach and type of problem resulted in lower levels of effectiveness.

Empirical Foundation for Examination of the Relationship Between Quality and Product Innovation Speed

Barbara B. Flynn, *Department of Management, Wake Forest University*
Roger G. Schroeder, *Carlson School of Management, University of Minnesota*
E. James Flynn, *Department of Management, Wake Forest University*
Susan D. Amundson, *School of Business, Arizona State University*

Traditional product development literature suggests that there is a tradeoff between innovation speed and product quality—that reducing time to market implies taking short-cuts in terms of attention to quality. Yet more recent quality management literature indicates that there may be a substantial amount of overlap between the practices associated with fast product innovation and those associated with quality management. It is reasonable to assume that this overlap may make it possible to improve both product innovation speed and product quality. The authors have examined eight projects, two in each of four firms in the electronics industry. On the basis of these cases, they propose a model that suggests that the majority of the practices associated with product quality are quite similar to those associated with fast product innovation. They plan to empirically test the model, using a questionnaire that will be distributed to a much larger sample of firms in several industries. Analysis of the data from this work will use causal modeling approaches.

Patterns in the Deployment of Total Quality Management: A Preliminary Analysis of Interviews with Twenty-Five Leading Companies

George S. Easton, *Goizueta Business School, Emory University*
Sherry L. Jarrell, *Goizueta Business School, Emory University*

The authors interviewed the senior quality executives of 25 companies that have implemented advanced TQM systems (as identified through

an earlier study conducted by the authors) in order to create a time-line of the development of a company's TQM systems; to determine what key approaches were used, and to assess the actual extent of implementation. Four areas were covered in the interviews: production, customer satisfaction, supplier management, and new product development and design. The results of the analysis confirm many expected patterns in the implementation of TQM: for example, the emphasis in TQM on training and employee involvement is clearly reflected in approaches and programs described in the interviews. Other results are more surprising: for example, there is evidence that of the early gurus of TQM (Philip Crosby, W. Edwards Deming, Kaoru Ishikawa, Joseph Juran), Crosby had the most significant effect in the early phases of the quality management movement. His approach fit with U.S. management culture and so could serve as a starting point from which more mature TQM systems could be developed.

Historical Perspective

As summarized above, Cole explored the history of the adoption of TQM principles in U.S. companies. The paper linked historical conditions with theoretical arguments to explain why U.S. industries were slow in learning about and adopting TQM. Participants pointed out that the academic community was also slow to embrace TQM. Research to date consists primarily of descriptive accounts or qualitative case studies, which either make unsupported claims or do not permit generalization.

Cole also outlined the discontinuity between the old and new quality paradigms in terms of focus and organizational change. In the old paradigm, there is an internal-process orientation that views quality as "conformance to specifications" and sees it as the specialized function of inspectors who monitor performance in order to detect and eliminate defective outputs. By contrast, the new paradigm stresses "market-in" criteria that emphasizes the customer's orientation and sees quality as involving all organizational participants, not simply specialists, and as requiring "up-stream" prevention, not last-minute detection.

In linking history to theory, Cole suggested several psychological factors that may have limited the ability for U.S. top management to learn from the Japanese example. They include cognitive challenges—the belief that there was inevitably a cost-quality tradeoff—social psychological

defenses such as denial, and even racism. Learning was also inhibited by language and cultural barriers, the logistics of long-distance learning, efforts necessary to unearth tacit knowledge and the costs of separating out universal from peculiarly Japanese features.

Cole also calls attention to the "Crosby phenomenon": managers in the quality movement learned relatively quickly to speak the revolutionary rhetoric of TQM, but they acted in ways that were profoundly conservative. For example, U.S. firms relied heavily on error-detection rather than on error-prevention approaches. Mitigating negative outcomes after they occur is much more costly in the long run than eliminating the conditions that lead to errors. It was also suggested that the adoption of methods of "trial without error" rather than "trial with error" may have impeded the adoption and effective use of TQM methods.

Participants identified several interesting areas for exploration. They questioned whether a TQM program is most effective if it is implemented as a top-down or as a bottom-up process. There seems to be evidence that both approaches can effect organizational change, but in different ways. They also noted the complications when organizations are downsizing or when TQM is viewed as a last resort effort to save a company, although these factors present a fertile area for research.

Other avenues for future exploration include asking who exactly were the early adopters of TQM and determining whether they reinvented or simply adopted innovations. Were there differences between early and later adopters and were there differences among industries? Most of the research has examined industrial settings; more work needs to be carried out on service and public-sector organizations. What role do wider environmental actors—such as industrial trade associations, trade unions, and governmental agencies—play in providing a more or less supportive infrastructure for TQM adoption? The effect of the Malcolm Baldrige National Quality Awards in encouraging the diffusion of TQM practice provides an interesting instance of such forces.

Definitions

QUALITY

A recurrent theme throughout the workshop discussions centered on defining quality. Practitioners, change agents, theorists, and researchers

use a wide range of definitions (for a review of definitions, see Reeves and Bednar (1994). Some use a relatively narrow definition, focusing on the characteristics of outcomes related to reliability or performance attributes (e.g., "tonnage off the line," speed, and accuracy), but even then there is the issue of whose criteria—inside participants' or customers'—are to be used. Most students of TQM embrace a wider definition, which includes both process and outcome measures, to assess the effectiveness of the entire management system. Such definitions are encouraged by the Malcolm Baldrige National Quality Award, for example, which stresses the importance of a "widespread systematic organizational focus on quality improvement." An even broader definition would take into account the effects of organizational activities on employee well-being. Finally, some advocates would insist that an organization must be assessed in terms of its effect on an every wider range of individuals—often termed "stakeholders"—who are affected by the organization. Such views would take into account important "externalities" associated with the operation of an organization, particularly its effect on the welfare of the wider community and the general public. These latter views have not been widely embraced either by practitioners or researchers.

The primary effect of the TQM movement on quality criteria is to stress the orientation of the customer rather than that of the producer and to emphasize that all participants in a work process have an effect on—and therefore should be asked to take responsibility for—the quality of the goods and services being produced. Although this emphasis places great importance on human resources management systems, most of the attention—both managerial and research—to date has been placed on changes in technical production and information systems. This aspect of TQM research could benefit from better grounding in theory on organizational behavior and group processes.

TOTAL QUALITY MANAGEMENT

A discussion about how to define TQM began early during the workshop. Workshop participants agreed that TQM is not a theory; rather, it consists of a set of prescriptive principles that are intended to improve organizational performance. These principles are sometimes grounded in, but more often they are independent of, organizational theories. Moreover, there have been to date relatively few attempts to systematically and objectively evaluate the accuracy and the potency of the prescriptions. An

important task confronting the research community is to carry out studies that will systematically test and evaluate the major TQM principles.

Concerns were raised about the fad-like character of the TQM movement. The rhetoric of TQM is engaging and appealing and often substitutes for substance. Often, only some semblance of the TQM rhetoric is in place in the organization, not firmly linked to practice, making it difficult for researchers to evaluate the effectiveness of the principles. Also, a great variety of different management ideas and techniques that were not a part of the original conception of TQM are often paraded under its banner. At best, TQM is not one set of ideas of practices; at worst, it means whatever its advocates and converts choose it to mean.

One suggestion to reduce the fad-like features of the movement was to eliminate the term "total" so that the quality management principles would not be viewed as having to satisfy all parties and all criteria. Others suggested that TQM might be viewed primarily as a human resources strategy for organizing and motivating employees. However, most participants favored the view that TQM goes beyond human resource management to take into account new technologies, the reorganization of work, new statistical measures, etc. Participants also agreed that it would be very useful to identify the particular aspects of TQM strategies that affect organizational change, both directly and indirectly.

In order to identify these aspects it is necessary to first have an overall understanding of TQM. The description of TQM provided as background reading (Hackman and Wageman, 1995) provides a good basis for such an understanding. The authors describe the practices of TQM in the context of this movement's early gurus: it encompasses assumptions about quality, people, organizations, and the role of senior management and it is a comprehensive strategy that is reflected in all levels of the organization. The strategy assumes that the costs of poor quality are far greater than the costs of developing processes that produce high-quality products and services. People are viewed as motivated to care about the quality of the work they perform and to take the initiatives to improve it as long as they are provided with the appropriate tools and skills necessary to do so. The organizations themselves are viewed as systems with highly interdependent parts in which cross-functional problems can only be addressed collectively by representatives from all relevant units. Thus, TQM is characterized by the use of teams at all levels of organizational functioning. Moreover, in TQM, quality is viewed ultimately as the responsibility of top management. Employees' work effectiveness and productivity are

viewed as a direct function of the systems created by top management. In the TQM paradigm, if things are not functioning effectively, it is viewed as a direct result of top management's not providing the structure necessary for accomplishing the specified goals.

Hackman and Wageman outline four principles to guide organizational strategies to improve quality performance. First, it is important to focus on work processes: the quality of products and services can be directly linked to the processes that produce them. Second, it is important to analyze variability: front-line employees should analyze and control variability in both processes and outcomes. Until sources of variability are identified, appropriate steps to improve work processes cannot be identified. Third is the principle of management by fact. The quality improvement program calls for the systematic collection of data, the use of statistics, and the necessity of testing solutions experimentally. The final principle involves learning and continuous improvement— a commitment to a never-ending cycle of quality enhancement. In many ways TQM requires a highly empirical approach.

Based on their review of the ideas of the early founders, Hackman and Wageman identify five core features of TQM that can serve as criteria for determining if the method has been installed in the organization. Each is represented by a question:

(1) Are organizational members assessing customer requirements and measuring performance against those requirements continuously?

(2) Are suppliers chosen on the basis of quality, rather than on the basis of cost, and are organization members working with suppliers to improve suppliers' quality practices?

(3) Are members operating interdependently, as teams, across traditional organizational functions, rather than independently or in ways that maintain functional separateness?

(4) Are members using statistics and scientific reasoning to formulate and test hypotheses about work processes and strategies for performance improvement?

(5) Are members using process management heuristics (i.e., brainstorming, flow charts, cost and effect diagrams) to enhance team problem solving and decision making?

These questions provide one basis for empirically determining whether TQM is in place in the organization. Workshop participants

emphasized the necessity of determining whether TQM is actually functioning in the organization, rather than focusing on the intentions or plans of managers. It would be desirable to have criteria that would allow a researcher to determine the degree to which each principle was present. In order to advance scientific understanding of TQM approaches, it is essential to begin to develop a conceptual framework for making predictions about the interdependence and the importance of each TQM principle in terms of quality. Research needs to focus then on how these various practices relate to a variety of performance measures.

THE CULTURE OF QUALITY

The topics discussed above focused on the various practices and outcomes that are associated with TQM, such as the processes used in the production of goods and services, the quality of those products, and the resulting customer satisfaction. In the literature, these have been referred to as the small "q" in quality research as compared to the big "Q" in quality research, which encompasses organizational quality and the overall functioning of the organization. Specifically, the "Q" approach takes into account an organization's orientation toward quality, its "culture" of quality, and the extent to which quality principles have become a part of the operational values and mind-set of managers and workers. In their workshop paper, Cameron and Barnett discuss the importance of evaluating organizational culture variables in the context of TQM research. They note that organizational culture and its links to organizational effectiveness have largely been ignored in the empirical literature. They propose methods for measuring the extent to which organizations have developed a quality culture, a subset of overall organizational culture.

It is often difficult for researchers to determine how managers and workers are actually behaving as opposed to how informants describe their behavior. In his work on the implementation of TQM systems, George Easton has found it useful to ask managers what was learned when TQM was introduced. He did this as a way to determine what was actually done because executives tend to talk about things as though they had already happened and to talk about what is going on in a certain level or unit as having occurred everywhere in the organization. Echoing this view, Tomoko Hamada suggested that to assess quality culture it is essential to determine whether upper-level management is "walking the walk" or simply "talking the talk." She argued that in terms of evaluating and understanding the culture or climate of an organization, it is very useful to

have input from all levels. It may be that upper-level management waves the TQM banner but that in practice lower-level employees do not feel empowered or affected by the management strategies. Incorporating the use of ethnographic techniques to understand the intricacies of organizational culture and climate is a research technique that deserves further attention. More generally, researchers must use careful sampling and survey methodologies to accurately assess existing practices.

Research Issues

MEASUREMENT

As with any careful scientific undertaking to evaluate impact, it is essential to identify both the nature of the intervention and the targeted outcomes. There are measurement issues on a variety of levels that plague research on quality. One has to identify the prescriptive principles of TQM and determine if they are in place within the organization, to assess the overall organizational culture and climate, and to identify the outcome variables for empirical study that cross all areas of the organization. As with any empirical research program, the use of multiple indicators is essential and should be identified for all levels of organizational structure and performance.

In terms of research, the first part of this task requires being able to identify the prescriptive principles of TQM. Hackman and Wageman (1995) provide a useful starting point in identifying and delineating the central concepts of TQM. They also make some basic suggestions for obtaining behavioral data to examine these concepts. Next, it is important to determine whether TQM principles are actually in place. To assess these matters empirically requires that systematic data be obtained on the work activities at numerous sites in the organization.

Research to date has used a more qualitative approach to determine if the TQM model was functioning in an organization, with case studies and anecdotal evidence, which has made the generalizability of findings difficult and suspect. To incorporate a more focused and systematic research agenda it is essential to identify operational indicators to determine whether TQM is in place in an organization. Thus, workshop participants addressed the necessity of defining various types of variables at various levels in the organization (i.e., those which are related to outcome, pro-

cess, and the work environment). Since TQM is a total management strategy, it is necessary to evaluate its effects at various levels within the organization.[1] Hackman noted that the work by Easton and Jarrell addresses many of these issues through its systematic assessments of the adoption of TQM.

TOPICS AND QUESTIONS

There were a variety of interesting issues that were briefly touched on by workshop participants that deserve further consideration. This section presents these ideas with the explicit caveat that these issues are not yet fully developed but are seen as promising ideas.

Several different general topic areas for research were articulated by participants: to design more empirical research based on existing organizational theory; to include organizational cultural variables; to evaluate organizational change and a more human component; to expand current research to include small businesses; and to compare varying approaches to quality improvement (e.g., TQM versus the International Standards Organization ISO9000).

In addition, there was a brief discussion by workshop participants about the relationship between speed, a productivity measure, and accuracy, a quality measure. The notion that there does not have to be a negative association between these two variables was proposed by Kathryn Shaw. She argued that the traditional approach suggests that there was a tradeoff between quality and speed but that the newer paradigms attempt to understand why people are slow. There may be emotional (i.e., procrastination) and social-political reasons that go beyond the simple cognitive ones proposed by the earlier paradigms (i.e., people have too much to think about). She also suggested that there are multiple ways to be fast and that it depends on how you define the construct. When defined in comparison to relative expectations, she argues it is possible to have improvements in both speed and accuracy. Several workshop participants who primarily measure quality as "the number shipped without needing reworking" and speed as "parts per million" differed with her, proposing that it is merely a difference in defining quality. Overall, the prospect of not having to sacrifice accuracy with increases in speed is both appealing

[1]One topic not discussed at the workshop but of interest to some researchers is the possibility of NSF's TQO program supporting impartial, critical investigations of organizational initiatives that are like TQM, but not limited to TQM.

and intriguing and should be explored further. It would appear that mass-production manufacturers have indeed mastered the practice of producing high volumes with low error rates.

The effects of different types of motivation in a TQM system were also discussed by participants. There were varying opinions on the effectiveness of group pay, incentive pay, and public recognition (e.g., Malcolm Baldrige National Quality Awards). Shaw discussed her research with mini-mill sector data and suggested that with group pay you may expect a free rider effect; however, it will not always influence overall productivity because while some members may not do their share, the group as a whole accomplishes the task. Moreover, pressure from peers can often eliminate problems of free riding. David Levine suggested that using money as a motivator has the problem of both not really working and working too well. He suggested that it has a ratchet effect when it restricts productivity; in order to combat that effect, an organization should not simply reward the level of productivity, but the change in that level over time. Others suggested that job security plays a major role in productivity. It would be interesting to evaluate these variables in situations of downsizing.

At various times during the workshop participants touched on the distinction between exogenous and endogenous approaches. The difficulties in quantifying and understanding the differences between these approaches were noted. This is another fruitful area for further discussion and research.

NSF'S TQO PROGRAM

The TQO program at NSF is less than 2 years old and has been funded primarily by industry. Industry proponents wanted to influence the academic curricula so that students would be trained in quality issues. However, experts advised NSF that because the quality field was starved for theory and a literature base, there was not much at present to teach in an academic setting. Thus, NSF was advised to fund research to help stimulate development of a body of literature in the area of quality issues.

The NSF program originally used the Malcolm Baldrige National Quality Award core concepts as a framework for funding projects in their research program. NSF staff acknowledges that this may not have been the best concept to use because it does not contain criteria for linking separate research pieces. This strategy led to funding an eclectic group of projects. The goals of this workshop and in many ways of NSF's research

program in general is to bring theorists and researchers together to address issues related to improving the science of TQM and developing a cross-disciplinary paradigm. It was expected that this merging of various fields, all interested in quality, would generate the basis for a theoretical framework to study quality issues. This theoretical perspective was expected to guide the decisions about what types of research to fund. Yet it is often difficult to connect practical issues with basic science. Generally, questions in basic science are generated from the efforts of scientists to develop theoretical systems to explain a set of phenomena while the question about how a particular type of management program functions does not necessarily come from those efforts. There are general issues in TQM research that can be framed as basic social science questions, and there are probably general issues in social science that could be informed by studies of TQM. However, delineating these links to forge common ground would take some additional work that proved to be beyond the scope of the workshop. Participants suggested that this line of work would be both productive and useful, and they encouraged NSF to fund projects leading toward this goal. However, the requirement that all of the NSF-funded projects must be conducted in a corporate setting may ironically encourage the kind of case-study research that has proved so limiting in the past.

In general, workshop participants urged the funding of careful, systematic, experimental research, the type of research that starts to combine qualitative and quantitative perspectives to develop a strong theoretical framework for this area. Such research should include efforts to rigorously define current concepts of organizational quality, how they came to be formulated this way, and how they actually function in corporations. NSF's research program offers an opportunity to compare different types of approaches to improving organizational performance. This would be helpful not only to industry, but also to such areas as education and services, in which the quality management ideas that companies have pioneered are spreading. Theoretically based research would help explicate why various aspects of TQM work and under what conditions, making it easier to determine which aspects may generalize to other industry and non-industry settings.

References

Baba, M.L.
1998 Fundamental research and the American quality movement. In M. Stahl, ed., *Handbook for Total Quality Management*. Cambridge, MA: Blackwell Publishers.

Dean, J.W., and D. Bowen
1994 Management theory and total quality: Improving research and practice through theory development. *Academy of Management Review* 19(3):392-418.

Hackman, J.R., and R. Wageman
1995 Total quality management: empirical, conceptual and practical issues. *Administrative Science Quarterly* 40:309-342.

National Research Council
1997 *Enhancing Organizational Performance*. Daniel Druckman, Jerome E. Singer, and Harold Van Cott, eds. Committee on Techniques for the Enhancement of Human Performance, Commission on Behavioral and Social Sciences and Education. Washington, D.C.: National Academy Press.

Reeves, C.A., and D.A. Bednar
1994 Defining quality: Alternatives and implications. *Academy of Management Review* 19(3):419-445.

Sitkin, S.B., K.M. Sutcliffe, and R.G. Schroeder
1994 Distinguishing control from learning in total quality management: A contingency perspective. *Academy of Management Review* 19(3):537-564.

Appendix: Workshop Papers

Boning, B., C. Ichniowski, and K. Shaw
1996 Team-Based Incentive Pay and Worker Performance. Graduate School of Industrial Administration, Carnegie Mellon University.

Cameron, K., and C. Barnett
1996 Achieving Organizational Quality: An Empirical Investigation of Quality Culture, Processes and Outcomes. Marriott School of Management, Brigham Young University.

Cole, R.E.
1996 Market Pressures and Institutional Forces: The Early Years of the Quality Movement. Haas School of Business, University of California, Berkeley.

Easton, G.S., and S.L. Jarrell
1996 Analysis of Interviews with Twenty-Five Leading Companies. Goizueta Business School, Emory University.

Flynn, B.B., R.G. Schroeder, E.J. Flynn, and S.D. Amundson
1996 Empirical Foundation for Examination of the Relationship Between Quality and Product Innovation Speed. Department of Management, Wake Forest University.

Repenning, N.P.
1996 Agency Problems in Process Improvement Efforts. Sloan School of Management, Massachusetts Institute of Technology.

Repenning, N.P., and J.D. Sterman
1996 Misperceptions of Feedback and Self-Confirming Attributions in the Dynamics of Process Improvement Programs. Sloan School of Management, Massachusetts Institute of Technology.

Sitkin, S.B., K.M. Sutcliffe, and L.D. Browning
1996 Research on Control and Experimentation in Total Quality Management: Theoretical and Applied Implications. Fuqua School of Business, Duke University.