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# Organizational learning and continuous quality improvement in an automotive manufacturing organization

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# ORGANIZATIONAL LEARNING AND CONTINUOUS QUALITY IMPROVEMENT IN AN AUTOMOTIVE MANUFACTURING ORGANIZATION

by

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Doctoral Committee:

Professor Kim S. Cameron, Chairman
Professor Michael D. Cohen
Assistant Professor Thomas A. Finholt
Professor Noel M. Tichy
Professor Karl E. Weick

A record of research can be written better
as an interpretation of an incomplete tapestry of ideas
than as a description of the curious chaos of its weaving.

James G. March, *Decisions and Organizations* (1988: 1)

To Chaim, Yetta, Marjiam, Etta, Penny, Harry, Andrew, Chris,
and Elizabeth

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My time at Michigan has been a mixed blessing. On the one hand, the people and ideas I discovered in Ann Arbor have provided a valuable opportunity for a meaningful and growthful future. On the other hand, my years in the Midwest have been very cold and sunless--emotionally and financially. What's been fortunate is that the people who have come to influence my path have kept me so busy that most of the time, I didn't notice the hardships. They also forewarned me that five or six years of Michigan doctoral training would not be pretty, but I might be glad to have done them, afterwards. They were right, and it is due in large part to their presence in my life.

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During the last three years, it has been very enlightening and sometimes even fun to work with the members of my dissertation committee. Kim Cameron has been an excellent chairman and has profoundly impacted my thinking about research, scholarship, academia, spirituality, and a life philosophy that values paradox. He has

been extraordinarily generous in his time and energy and I am indebted to him for all that he has contributed to my training and education. It is widely recognized that Kim is a very gifted teacher and although his knowledge has been a cornerstone of my training at Michigan, Kim's values and spirit have been equally potent driving forces in the shaping of my professional identity and destiny. I would also like to recognize at this time that with only one insignificant exception, Kim was never late or absent for any of our meetings. (I hope this confession doesn't ruin his reputation.)

Michael Cohen, who served as the cognate member of my dissertation committee, has been a source of light for me in more ways than I can recount. Even though I stumbled onto organizational learning as a research domain a few months before we met, without Michael's encouragement and intellectual guidance, I would be running around in empty circles by now and probably very far away from completing my degree requirements. Michael has never failed to give me his time and attention when I have needed his help. His theoretical perspective on organizational learning has become the foundation of any and all the work I may do on the topic. I am forever indebted to him. He has also had a profound influence on my life via James March whom I would also like to acknowledge here. Thanks to Jim for his part in Michael's presence in my life, thanks to Michael for recently arranging things so that all of I.C.O.S. and I could spend some time with Jim in person, and thanks to both of you for giving me a puzzle whose investigation makes life meaningful, occasionally fun, and maybe better.

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regarding the value of higher education. My son, Andrew was a steady source of energy and persistence, lending me his own fighting spirit countless times when my personal reserves ran dry. My soon-to-be son, Chris kept a warm and comforting yet cool and level perspective in front of me especially when I was consumed by raging frustrations or disappointments. My daughter, Elizabeth was, is, and ever will be the Light in my life. Thus, in this effort to earn a doctorate as in everything else, she has patiently taught and re-taught me all I ever really need to know: Love is the answer. Above all others, these people have known the good, the bad, and the ugly regarding what my experience at Michigan has been. They kept their faith in me many times--long after mine had become dissociated or exhausted. They forgave me my intense and unrelenting concentration on academic affairs year after year, holiday after holiday. And they are truly happy to see me finish this formidable undertaking--perhaps even more so than I am. There is simply no way I would be writing this page today without their love, compassion, and forgiveness, and so I have dedicated my dissertation to them--with heartfelt thanks, forever.

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# CHAPTER 1
# INTRODUCTION

Embedded in the quality revolution are two basic assumptions: organizations can learn and they can improve their performance. Often overlooked by managers and academics alike, however, is the ironic relationship between learning and improvement. For example, although organizations may learn *and* improve, they may also *improve but not learn* (not know why they improved), or they may *learn without improving* performance (acquire knowledge but not change behaviors). In other words, in organizations, learning and improvement sometimes covary or they may be distinct processes. The empirical connection between these two phenomena is notably underexplored (see Adler & Cole, 1993; Cole, 1989; Garvin, 1993; and Leonard-Barton, 1992 for exceptions), but this has not deterred students and managers of organizational change and development from endorsing a conventional wisdom which states that learning and quality improvement are related and key drivers of successful organizational performance (see Garvin, 1993; and Sitkin, Sutcliffe, & Schroeder, 1994).

The empty result of this inconsistency is that the theoretical link between learning and quality improvement is much debated at the same time that it is insufficiently understood. Moreover, the pragmatic value of an organizational learning and quality improvement framework is unrealized. For example, Garvin (1993: 78) recently argued that "continuous improvement requires a commitment to learning" because an organization cannot improve without first learning something new. But this is not always the case--fortuitous accidents may happen to inadvertently elevate organizational performance (Cohen, 1992; Garvin, 1993). Thus, here is an example of

improvement that is not preceded by learning something new. In addition, learning is not always conscious and it can be based on superstition rather than fact (Cohen, 1992; March & Olsen, 1979)--thus, we may observe improvement for the wrong reasons. Moreover, it is often the case that improvement occurs, followed by learning through a retrospective sensemaking process--in other words, cognition often follows action instead of preceding it (Weick, 1979; Akin, 1987). In sum, the fundamental nature of the relationship between organizational learning and improvement continues to be under-explored. Many crucial questions endure regarding exactly what kinds of improvement activities generate more favorable performance outcomes in organizations and what (if any) linkage the success of these practices may have with the different learning processes that they engage.

To complicate matters theoretically, organizational learning and improvement have been defined with only moderate precision and consensus, and their meanings still tend to be conspicuously blurred. For example, many academic publications that profess to be about organizational learning use the concept not just as a metaphor for organization-level cognitive and/or behavioral change [i.e., *learning as a process*], but also to connote performance improvement or organizational effectiveness [i.e., *learning as an outcome*] (see, for example, Argote & Epple, 1990; Argyris & Schon, 1978; Carley, 1992; Dodgson, 1993; Duncan, 1974; Duncan & Weiss, 1979; Etheredge & Short, 1983; Fiol & Lyles, 1985; Hedberg, 1981; Hirschhorn, 1991; Kochan & Useem, 1992; Lant & Mezias, 1992; Senge & Sterman, 1992; Shrivastava, 1983; Sullivan & Nonaka, 1986; Virany, Tushman, & Romanelli, 1992). Similarly, when practitioners write about organizational learning, they generally focus on better performance [*outcomes*] rather than variations or variability in cognitions and/or behaviors [*processes*] (see, for example, Adler & Cole, 1993; Leonard-Barton, 1992; Kochan & Useem, 1992; Senge, 1990; Schein, 1993). This tendency to jumble terms and meanings has generated two tough problems. The first is that definitions of

"learning" and "improvement" have become conflated. The second is that the primary barrier to advancement of knowledge is not ignorance but the illusion of knowledge itself (Boorstin, 1983 cited in Pruett & Thomas, 1994: 14). Both of these problems represent formidable obstacles to theory development. But careful identification of learning and improvement processes, linkages, and outcomes would allow us to juxtapose the concepts in such a way that their ironic relationship could be illuminated, theoretically developed, and made useful for managerial practice.

Further enriching this research challenge, technology and competition have promoted nonroutine work in U.S. organizations, so that not just results but the processes embodied in such work have become a focal concern of managers and employees. Consequently, companies employ more people who think for a living rather than simply follow directions (Purser & Pasmore, 1992: 38). Concurrently, there has been a surge in companies that emphasize a quality approach which splinters conventional boundaries, restructures constituent groups, transforms knowledge bases, and thus, dramatically alters the way work is done. However, the widespread adoption of traditional quality principles has emphasized control of processes (reliability) with virtually no attention to the nature of the uncertainty facing an organization (nonroutine conditions) (Sitkin, Sutcliffe, & Schroeder, 1994) and the ensuing need for organizational adaptability (variation) (March, 1991; Sitkin, Sutcliffe, & Schroeder, 1994). That is, adaptive systems must maintain an appropriate balance between exploiting present competences and exploring new possibilities (March, 1991) but many traditional U.S. quality approaches emphasize the former to the exclusion of the latter. This is conducive to short-term effectiveness but long-term self-destructiveness (March, 1991).

In sum, there is a lack of both theoretical and empirical distinction between organizational learning and improvement although they are often described as related and key drivers of successful performance. In addition, there has been a conspicuous

lack of discrimination between organizational learning as a process vs. an outcome. As the prevalence of nonroutine work has increased organizational uncertainty, many traditional quality improvement approaches which emphasize process control (reliability) to the exclusion of organizational adaptability (variation) have contributed to short-term effectiveness but not necessarily to long-term viability. In short, a focus on quality improvement has become more prevalent in U.S. organizations over the last ten years (Best Practices Report, 1992; Gehani, 1993; Hart & Bogan, 1992; Krishnan, Shani, Grant, & Baer, 1993; Management Practices Report, 1991; Robson, 1990; Ross, 1993; Sashkin & Kiser, 1993; Schonberger, 1992; Sitkin, Sutcliffe, & Schroeder, 1994) and organizational learning has begun to attract increasing attention as a key component in performance (see Levinthal & March, 1994; Nonaka & Johansson, 1985; Sitkin, Sutcliffe, & Schroeder, 1994; Sterman, 1994; Van de Ven and Grazman, 1994). However, both theory and practice have been short on knowledge regarding the relationships between quality improvement activities (practices) and the more or less beneficial learning processes they engage, as well as how to balance learning and improvement for optimal quality performance. This unavailing circumstance prompted the questions that have guided my research.

## Insights from Prior Research

The initial purpose of this study was to examine how two contrasting subsamples of organizational units differed in their approaches to quality improvement and quality culture. From January 1990 through December 1992 (three years), Professor Kim S. Cameron had been collecting ongoing monthly questionnaire data from upper-middle managers in Pioneer Motor Company, one of the *Big Three* Detroit-based automotive manufacturers. By December 1992, a total of 935 managers had completed questionnaires which focused on quality practices and culture. The surveys

contained 120 items that were based largely on the Malcolm Baldrige National Quality Award criteria.

Preliminary analyses of the survey data indicated that units with overall high quality improvement performance for the entire three year study period differed from units with low quality improvement performance in terms of their quality activities and practices. High performers were characterized by the intensity of their quality planning, training and application, and knowledge acquisition activities. Moving beyond a cross-sectional view of the data, additional analyses were conducted to illuminate major differences among units that showed the most improvement in quality practices and processes over the three-year study period--*regardless of their overall quality score in the survey*. The first set of results showed that compared to units whose performance either deteriorated or held stable, units which consistently improved the most in their survey scores were characterized by the intensity of their knowledge acquisition activities (cognitive development) and their top managers' reinforcing quality as a high priority issue (behavioral development). In other words, learning appeared to play a key role in explaining the favorable quality improvement outcomes we observed.

A second set of results provided some interesting support. When we compared units *with high overall quality scores* that showed the most steady, continuing improvement over time to units *with high overall quality scores* that did not improve over time, we found that the former were characterized by more learning-related activities as well as by cultures that strongly valued quality, its measurement, and its improvement. For example, the steadily improving, units with high overall survey scores emphasized knowledge creation and acquisition in a great variety of ways (assessments of and rewards for quality improvement performance and new ideas for improvement, translating customer expectations into new quality standards, close monitoring of information about competitors' performance, broad sharing of quality

data among all organization members, and constant sharing of quality improvement stories across their organizations). In sum, more, and more kinds, of learning seemed to be going on in these units compared to those described immediately above.

These findings held important insights about continuous quality improvement and the learning processes it can activate. For example, according to institutional theorists (DiMaggio & Powell, 1983; Meyer & Rowan, 1977; Zucker, 1987), imitation is a pervasive practice among organizations, in large part because it minimizes sanctions from various stakeholders (see also Huber, 1991). In addition to its legitimacy value, imitation can be competence enhancing, as reflected in competitive benchmarking, and many U.S. firms have become masterful at copying (with local adaptations) the processes, cultures, and technologies of their global rivals. Indeed, the steadily improving, high performing organizational units in our sample practiced benchmarking for creative, continuous quality improvement, but they also showed a propensity for balancing this imitation mechanism with trial-and-error learning in order to exceed customer expectations. A proper blend of learning from first-hand experience (e.g., innovating, generating new ideas for quality improvement) and learning from the experience of others (e.g., benchmarking, story telling, sharing data) may account for the successful performance outcomes (see Huber, 1991; March, 1991; Sitkin, Sutcliffe, & Schroeder, 1994) that we observed in the steadily improving units with high overall quality scores. Moreover, we know that individual-level learning through the experience of others (*vicarious learning*) is generally more efficient than tedious trial-and-error learning (*direct learning*) (Hilgard & Bower, 1966), but perhaps, not more effective. Integrating all of this, it appeared that one way of developing a framework showing the relationship between continuous quality improvement activities (i.e., practices) and performance might be through a learning perspective.

## Research Questions

In this study, I use the term *organizational learning* to designate a family of descriptive models of how organizational cognitions and behaviors change. In short form, organizational learning is defined as a process through which knowledge about action-outcome relationships develops and may modify collective behavior. The second key concept in this study is *continuous quality improvement* which is a core value or core principle embedded within the larger quality movement that involves consciously maintaining and upgrading performance standards through small, gradual changes (Cameron, 1994; also, see Imai, 1986: 29). In this study, 'continuous quality improvement' designates a normative model of how organizations should advance their results as well as a recommendation of a particular learning process (Cohen, 1993).

Using a learning approach, the primary research question investigated in this study was: "Does learning explain the relationship between quality practices and quality outcomes?" Three specific sub-questions were posed in order to examine this problem:

(1) *Do different types of quality practices engage different kinds of learning*? In general, by quality practices I mean actions directed toward improving an organization's processes, products, and services in terms of their value to customers. Typical quality practices include benchmarking, using cross-functional and/or cross-level teams, systematically collecting data on quality, using statistical process control methods, etc.

(2) *Do particular types of learning processes (vicarious vs. direct) explain differential success in quality improvement performance across organizations*? By quality improvement performance I mean the degree to which an organization advances or upgrades its processes, products, or services in the interest of meeting or exceeding customer satisfaction and/or expectations.

(3) *Do particular learning sequences or patterns (e.g., the balancing of vicarious with direct types of learning) explain differential success in quality performance across organizations?*

To respond to these questions, the initial plan for the present research was to use a survey approach to explore the potential of learning as a mediator of quality activities and performance in two contrasting subsamples of organizational units within Pioneer Motor Company. The term *learning* itself has the status of an intervening, unobserved variable which links two sets of observables--practice (experience) and changes in behavior (see Kimble, 1969). This investigation yielded a great deal of insight about the nature of the relationship between quality activities (practices) and quality improvement (performance). The survey data were augmented with information gathered through interviews in order to elucidate the complex learning processes that each quality activity stimulated. Thus, the second step in the research plan was to conduct interviews of survey respondents in order to examine in finer detail what kinds of learning processes (direct vs. vicarious) might be engaged by different quality practices as well as the sequences or patterns embedded in those learning processes. The intention was to shed light on how quality practices and organizational learning processes were linked to each other and to outcomes such as levels of quality improvement and performance.

To study these types of issues, two bodies of literature were relevant: (1) organizational learning and (2) the continuous quality improvement subarea in the vast quality literature. The scholarly publications on organizational learning, rooted in psychology, define the cognitive and behavioral changes that occur through an entity's direct or vicarious experience. The academic and practitioner-dominated writings on continuous quality improvement, rooted in the quality literature, have emphasized change (cognitive, behavioral, technological, product, and cultural; see Imai, 1986: 32-33) that advances or upgrades organizational performance (outcomes). Process is

important insofar as it facilitates or impedes incremental advances in performance; thus, there is the dual concern for process and results. The next chapter examines the two bodies of literature that are central to this research.

# CHAPTER 2

# LITERATURE REVIEW

The following literature review relates directly to the main interests of this dissertation which are: clearly defining and differentiating the constructs of organizational learning and continuous quality improvement; identifying and describing empirical and theoretical linkages between core learning processes, quality improvement activities, and quality performance; and exploring ways to provide the proper balance between learning and improvement for optimal quality performance. The literature contains many gaps--some I will only discuss, and a few I will endeavor to bridge.

## Organizational Learning

### Background: Psychological Roots of Learning

Notions about learning at the organizational level have their genesis in psychology's earlier elaboration of human learning theory. Some expected questions have been raised about the gains and risks of taking a concept that has a rather clear definition at one level of analysis and transposing it to another (Kahn, 1992). Similar criticisms have been aimed at organizational decision theory which has its roots in behavioral decision theory (March & Shapira, 1982) and at organizational memory, a concept that emerges from research on human memory and information processing (Walsh & Ungson, 1991). Another recent example of cross-level conceptualizing is 'collective mind' (Weick & Roberts, 1994) which extended Ryle's (1949) ideas about individual mind. The present research follows Staw's argument (1991: 817):

> . . . psychological models can be relevant when individual behaviors influence organizational action, when individual-level

> processes mediate organizational actions, and when theories of human behavior serve as a metaphor for the action of organizations.

Organizational learning embodies collective cognitive and behavioral development that originates in individual-level processes which mediate organizational actions. Following Glynn, Lant, and Milliken (1994), I view organizational learning "not as a linear process separable from other organizational processes, but rather as an integrative process that encompasses a variety of organizational dimensions spanning multiple levels of analysis." Furthermore, learning may also arise from interactions embedded in contexts that occur across levels of analysis (Glynn, Lant, & Milliken, 1994: 4). Although methods and emphases of micro- compared to macro-level research are strikingly different, cross-pollination among theorists may prove constructive when they are engaged in related or common problems with similar ideas. Thus, a useful starting point for a review of the literature on organizational learning is human learning theory with its disciplinary roots in psychology--where the most rigorous models of learning are to be found.

During the period of early laboratory experimental research in the 1930s, learning was defined by behavioral psychologists as *a relatively permanent change in behavior due to experience* (see Hilgard & Bower, 1966; Mednick, 1964; Thorndike, 1931). Psychologists proposed that while we do not see learning, we can infer that it has occurred by observing a behavior that is different from past behavior given the same stimulus (Kimble, 1969). In addition, *not just behavior, but also the potential for behavior, is a reasonable indicator of learning* (see Deutsch & Krauss, 1965; Gardner, 1987; Hilgard & Bower, 1966; Norman, 1981; and Huber, 1991). During the 1950s, with the advent of computer technology, cognitive psychologists began to emphasize information processing and problem-solving, introducing new ideas to learning research. In effect, they redefined learning by including knowledge acquisition as a

central feature of the learning process (see Baddeley, 1990; Estes, 1975; Gardner, 1987; Hilgard & Bower, 1966; Norman, 1981; Shrivastava, 1983).

The difference between these two major approaches to learning in psychology is that *behaviorists emphasized a change in the probability of responses whereas cognitive psychologists focused on a change in the states of knowledge*. The significant methodological shift between the two approaches has been from extensive laboratory experimentation to computer simulation and modeling of learning processes. These distinctions have carried over to organizational level learning theories and have implications for theory building and empirical research, as we will see in discussions throughout this chapter. The next section considers the learning concept as it has been defined by scholars of organization theory.

**Definitions**

Although the organizational studies literature contains an assortment of definitions of organizational learning, paradoxically, there is also a noticeable convergence of key terms and their meanings. For example, there is widespread agreement that organizational learning is a change process that is influenced by past experience, focused on problem identification and correction (or prevention), and coupled with organizational memory. **Table 2.1** presents 15 unique definitions of organizational learning as they were developed in 17 major works. [Because two research groups relied on Simon's (1969) definition which is already included in Table 2.1, only 15 unique definitions are enumerated.]

*Table 2.1 indicates that the 15 definitions of organizational learning are primarily complementary and convergent rather than contradictory and divergent.* In other words, there appears to be a reasonable consensus about the definitions of organizational learning even though theorists use somewhat different terms, hold

**Table 2.1. Major Theorists' Definitions of Organizational Learning**

| *Date* | *Theorist(s)* | *Definitions* |
|---|---|---|
| 1963 | **Cyert & March** | Organizational learning is an adaptive process through which firms respond to environmental changes by readjusting their goals, attention rules, and search rules. Organizations change their goals, shift their attention, and revise their procedures for search as a function of their experience. |
| 1965 | Cangelosi & Dill | Organizational learning is a sporadic, stepwise, adaptive process that is the product of interactions among three kinds of stress, generating both individual and organizational level outcomes. |
| 1969 | Simon | Organizational learning is the growing insights and successful restructurings of organizational problems by individuals reflected in the structural elements and outcomes of the organization itself. Learning consists of changes in states of knowledge and organizational outcomes. |
| 1974 | Duncan | Organizational learning is a process by which subunits search for, collect, and use information about the environment to make and execute effective decisions. The process includes using different structures, with the goal of adapting to environmental uncertainty, stability, pressures, and changes. |
| 1976 | **March & Olsen** | Organizational learning is a process through which organizations adapt their behavior in terms of their experience. They modify their understandings in a way that is intendedly adaptive. In the learning process, actors impose order, attribute meaning, and provide explanations to make sense of experience under conditions of ambiguity. |
| 1978 | **Argyris & Schon** | Organizational learning is a process in which organizational members detect error or anomaly and correct it by restructuring organizational theory of action (the norms, assumptions and strategies inherent in collective practices) and by encoding and embedding the results of their inquiry in organizational maps and images. |
| 1978 | Duncan & Weiss | Organizational learning is the process within the organization by which knowledge about action-outcome relationships and the effects of the environment on them is developed. Learning is linked with sense-making processes which are interpretive routines to detect and correct problems. |
| 1980 | Miller & Friesen | Organizational adaptation is a process through which modifications in the evolutionary direction of the mutually reinforcing organizational elements of strategy, structure, and environment extrapolate past trends. |
| 1981 | **Hedberg** | Organizational learning is a process through which members acquire and process information through interaction with their environments in order to increase their understanding of reality by observing the results of their acts. Unlearning is the process through which members discard knowledge, making way for new responses and mental maps. Unlearning is accompanied by relearning (i.e., making new connections between stimuli and responses and modifying cognitive maps). |
| 1981 | Miles & Randolph | See Simon (1969). |

**Table 2.1 (continued). Major Theorists' Definitions of Organizational Learning**

| *Date* | *Theorist(s)* | *Definitions* |
|---|---|---|
| 1982 | Chakravarthy | Organizational adaptation is the continuous process through which the firm is fitted more particularly for existence under the conditions of its changing environment. Adaptation is the primary purpose of strategic management. |
| 1982 | Meyer | Organizational adaptation is a process of selection, interpretation, and response to feedback that maps environmental attributes into theories of action encoded in prevailing organizational strategies and ideologies. |
| 1983 | SHRIVASTAVA | Organizational learning is the process of sharing knowledge, beliefs, or assumptions developed through experience that directs adaptation of goals, selective attention to the environment, and search for solutions to problems. |
| 1985 | FIOL & LYLES | Organizational learning is the process of developing insights, knowledge and associations between past actions, the effectiveness of those actions, and future actions. Adaptation is the ability to make incremental adjustments as a result of environmental changes, goal structure changes, or other changes. |
| 1988 | **LEVITT & MARCH** | Organizational learning is a routine-based, history dependent, target-oriented process through which subunits encode inferences from history into routines that guide behavior. |
| 1989 | Lundberg | See Simon (1969). |
| 1991 | **HUBER** | Organizational learning is the processing of information that changes the range of the organization's potential behaviors; learning involves acquiring of knowledge that is recognized as potentially useful to the organization. |

Note: A literature review is indicated by capitalization of author's name. Bold typeface indicates publications that are discussed in greater detail below.

different assumptions, and concern themselves with different empirical subjects. Thus, a composite of the definitions in Table 2.1 states:

> **Organizational learning is an experience-based process through which knowledge about action-outcome relationships develops, is encoded in routines, is embedded in organizational memory, and may change collective behavior.**

The implication is that organizational learning is a change process which results in cognitions and/or behaviors that are different from prior beliefs and actions. The new

ideas and behaviors may be better or worse than their predecessors, however, the crux of the learning process is variation itself. From a more contemporary perspective, Garvin (1993: 79-80) recently proposed a similar definition whose main advantage over my more academic interpretation is that it is "actionable and easy to apply":

> A learning organization is an organization skilled at creating, acquiring, and transferring knowledge, and at modifying its behavior to reflect new knowledge and insights.

Both of the above listed definitions of organizational learning recognize the cognitive and behavioral elements of change, and Garvin's (1993) description emphasizes the importance of action as evidence that learning has occurred.

To further examine the similarities among scholars, **Table 2.2** presents the results of a content analysis of the 15 definitions listed in Table 2.1 (see **Appendix A** for the details on analysis procedures). The compound definition stated above contains *six basic cognitive and/or behavioral elements of organizational learning common to almost all researchers* and are listed as the six column headings in Table 2.2. A further comparison of these six elements, presented in Table 2.2, shows that 13 of the 15 definitions indicate that (1) learning is based on *past experience* and (2) learning involves *knowledge acquisition*. Fifteen definitions refer to *action-outcome relationships*. Six definitions mention *routines*, although one does so only by connotation (Cyert and March [1963] referred to 'procedures') and another specifies only interpretive (not behavioral) routines (Duncan & Weiss, 1978). Nine definitions refer to *memory* although this precise term is not used by all researchers (e.g., Hedberg used 'cognitive maps' and Meyer referred to 'ideologies'). Finally, the notion of *actual or potential collective behavioral change* is incorporated in 14 definitions.

A review of Table 2.2 indicates that there is more conceptual agreement than has been previously asserted in the literature. The problem for the field seems to be

Table 2.2. Content Analysis of Major Theorists' Definitions of Organizational Learning.

| | ELEMENTS OF ORGANIZATIONAL LEARNING | | | | | |
|---|---|---|---|---|---|---|
| | 1 *PAST EXPERIENCE* | 2 *KNOWLEDGE* | 3 *ACTION-OUTCOME RELATIONSHIP* | 4 *ENCODED IN ROUTINES* | 5 *EMBEDDED IN MEMORY* | 6 *MAY CHANGE BEHAVIOR* |
| **COUNT**** | **13:15** | **15:15** | **15:15** | **6:15** | **9:15** | **14:15** |
| **Cyert & March** | X | X* | X | X* | X* | X |
| **Cangelosi & Dill** | | X* | X | | | X |
| **Simon** | X* | X | X | | X* | X |
| **Duncan** | X* | X* | X* | | X* | X |
| **March & Olsen** | X | X | X* | | | X |
| **Argyris & Schon** | X* | X* | X* | X* | X | X* |
| **Duncan & Weiss** | X* | X | X | X | | X* |
| **Miller & Friesen** | X | X | X* | | X* | X* |
| **Hedberg** | X | X | X | X | X | X* |
| **Miles & Randolph***** | | | | | | |
| **Chakravarthy** | X* | X* | X* | | | |
| **Meyer** | X* | X* | X* | X* | X* | X* |
| **Shrivastava** | X | X | X | | X* | X* |
| **Fiol & Lyles** | X | X | X | | | X* |
| **Levitt & March** | X | X | X* | X | X | X |
| **Lundberg***** | | | | | | |
| **Huber** | | X | X* | | | X |

NOTE: "x" indicates this element is explicitly stated in this definition;
"x*" indicates that this element is implicitly stated in this definition.
** Count = number of theorists of total (15) count who use this definition.
*** See Simon.

not with researchers' definitions but with interpretations of them. Hilgard and Bower (1966: 6-9) concluded that learning theorists in psychology have been similarly encumbered:

> The controversy is over fact and interpretation, not over definition. There are occasional confusions over definition, but such confusions may usually be resolved by resort to pointing, to denotation.
>
> The differences between two theorists are primarily differences in interpretation. Both theories may fit the facts reasonably well, but the proponent of each theory believes his view to be the more fruitful.

It is important to be aware of the root cause of scholars' disagreements about definitions of organizational learning not so much in the interest of resolving differences, but rather to appreciate the multiple perspectives and be able to work within one or more of them for one's own research objectives. In this way, different theoretical interpretations can be applied constructively to investigate empirical problems.

## Review and Synthesis of 17 Publications on Organizational Learning

A variety of terms have accumulated and serve as referents for the organizational learning construct (e.g., 'learning,' 'adaptation,' and 'change') as a result of a lack of integration among theoretical perspectives. There is also a wide range in the subjects of empirical studies which complicates consolidation of prior research. And while the evidence from the literature shows that there is some consistency among definitions of organizational learning, several scholars have still argued that there may be too much divergence to facilitate conceptual cross-fertilization and empirical advances among researchers (see Huber, 1991 and Lundberg, 1989). Therefore comes the untamed question: What is organizational learning?

**Table 2.3** presents a summary of 17 publications that are commonly cited as either fundamental or definitive works in the academic literature on organizational learning. The table lists the terms that researchers used to refer to organizational learning and the foci of a variety of studies spanning early research efforts in the 1960s to the present time. *Terms* such as 'adaptation' and 'learning' have been customarily used or interchanged by most scholars but *definitional* distinction between the two has been problematic. Empirical studies have generally *focused* on decision making processes although several researchers have emphasized strategy and structure while others have concentrated on norms, assumptions, beliefs, knowledge, interpretations, and actions. Each of these three elements--*terms, foci, and definitions*--is considered in detail below.

**Terms Used in Organizational Learning Research**

Table 2.3 shows that researchers generally used terms such as 'adaptation' or 'learning' when referring to organizational learning, and in addition, the concept appears to be subsumable under 'change' processes in the literature (see below). Van de Ven (1988: 188) defined 'change' as "an empirical observation of differences in time on one or more dimensions of an entity." This differs from how I define the process of change, however:

> Whereas change is an empirical or manifest observation, the process of change is an inference of a latent pattern of differences noted in time. Thus, change processes are not directly observed. Instead, they are conceptual inferences about the temporal ordering of relationships among observed changes (Van de Ven, 1988: 188).

*'Organizational learning' designates a family of descriptive models of change in collective cognitions and/or behavior* (Cohen, 1993). However, distinguishing between *adaptation* and *learning* continues to be problematic and attempts to differentiate the two change concepts have met with mixed results.

**Table 2.3. Orientations of the Major Organizational Learning Theorists**

| *Date* | *Theorist(s)* | *Terms* | *Foci of Empirical Studies* |
|---|---|---|---|
| 1963 | **Cyert & March** | Adaptive learning | Decision making behavior |
| 1965 | Cangelosi & Dill | Adaptive learning | Decision making |
| 1969 | Simon | Adaptation, adjustment | Decision making |
| 1974 | Duncan | Learning | Decision making, structure |
| 1976 | **March & Olsen** | Learning; rational adaptation; interpretation | Decision making |
| 1978 | **Argyris & Schon** | Learning | Norms, assumptions |
| 1978 | Duncan & Weiss | Learning | Decision making; developing knowledge base |
| 1980 | Miller & Friesen | Adaptation | Strategy and structure: actions |
| 1981 | **Hedberg** | Learning, unlearning and relearning | Beliefs, actions |
| 1981 | Miles & Randolph | Learning | Decision making, beliefs, behaviors |
| 1982 | Chakravarthy | Adaptation | Strategy and structure |
| 1982 | Meyer | Adaptation | Strategy, structure and ideology |
| 1983 | SHRIVASTAVA | Learning (systems), adaptation | Strategic decision making |
| 1985 | FIOL & LYLES | Learning, adaptation | Strategic decision making |
| 1988 | LEVITT & MARCH | Learning | Routines recorded in memory; beliefs |
| 1989 | LUNDBERG | Learning, adaptation change | Operational cause maps and behavior |
| 1991 | **HUBER** | Learning | Beliefs, decision making, behaviors, development of knowledge base |

*Note*: A literature review is indicated by capitalization of author's name.

For example, Fiol and Lyles' (1985) review was an important first attempt to order the growing literature. Their critique broke ground by identifying both the behavioral and cognitive elements of organizational learning (Weick, 1991) and by recognizing that the terms 'change,' 'learning,' and 'adaptation' ". . . have not been used consistently with the same meanings" (Fiol & Lyles, 1985: 805). However, their review overlooked March and Simon's (1958) important statement that short-run adaptiveness corresponds to problem-solving whereas long-run adaptiveness corresponds to learning. In spite of that oversight, Fiol and Lyles (1985) usefully summarized the work of Hedberg (1981) and Meyer (1982) which argued that *compared to learning, adaptation involves action-taking or 'adjustment' that is reactive in nature; and furthermore, adaptation does not necessarily require in-depth understanding of either past actions or action-outcome relationships*.

Meyer's (1982) work advanced efforts to clearly define 'learning' and distinguish it from adaptation. In his study of three hospitals' responses to environmental jolts, he divided adaptations into three phases (anticipatory, responsive, and readjustment), each of which might involve conscious perception of stimuli. He noted that when the perturbations subsided, *first-order changes dissolved as the organizations reverted to their antecedent states and only second-order changes endured*. Meyer (1982: 521) stated:

> . . . whereas some organizations learn during jolts and undergo second-order changes, others rebound, untutored to their original states when perturbations cease. This dimension was assessed by asking administrators two questions: (1) What did you learn from the strike? and (2) What *enduring organizational changes* have resulted? [Emphasis added.]

In addition, Sitkin (1992: 241) added some clarity by differentiating between "the *short-term performance*-focused benefits of success from the more *long-term learning*-focused benefits of failure" [emphasis added]. As further support, decades of

psychological research have shown that temporary behavioral changes due to influences such as mere presence (Weick, 1992; see also Zajonc, 1968), fatigue, maturation, growth, drugs, or crisis have not qualified as learning (see Estes, 1975; Hilgard & Bower, 1966).

In sum, as Hedberg (1981: 3) argued, "It is misleading to equate learning with adaptation." Moreover, "Learning is not adaptation, and it requires more subtlety and complexity than mere change" (Starbuck, 1992: 724). Following Hedberg and Starbuck, *I view adaptation and adaptability as distinct from organizational learning which is itself nested within the concept of organizational change.* In other words, a learning perspective is only one of many approaches to organizational change. This last statement raises the inescapable, vexing question of conceptual hierarchy: Does organizational change subsume organizational learning or does organizational learning subsume organizational change?

*Learning requires change, but change does not require learning.* I propose that the concept of learning is subsumed by the concept of organizational change. Supporting that position, Van de Ven and Poole (1993) conducted an interdisciplinary literature review encompassing over one million publications on change and development in social, biological or natural physical entities. They presented a typology of four basic types (or families) of process theories of organizational development and change (including life cycle, teleological, dialectical, and evolutionary), each of which encompassed numerous perspectives or frameworks of organizational change and development. For example, life cycle theories included developmentalism, biogenesis, ontogenesis, several stage theories of child development, human development, moral development, organizational development, group decision making, and new venture development (Van de Ven & Poole, 1993: 10). Similarly, Levy and Merry (1986) differentiated and described many theoretical perspectives on organizational change including management, innovation and creativity,

politics, natural selection, organization and environment interaction, life cycle, developmental stages, *learning*, and phenomenology. In these comprehensive analyses, organizational change was the overarching concept within which numerous theoretical perspectives were housed, including organizational learning and adaptation. This helps to explain and support the conceptual distinctions that I have drawn throughout this study.

**Foci of Empirical Research**

The present research includes analyses of organizations' past successes and failures in quality improvement. Extensive problem solving and decision making were among the primary activities through which learning occurred and was studied. Most empirical research on organizational learning has focused on decision making although strategy, structure, beliefs, norms, assumptions, ideology, and outcomes have also been studied. I have followed Simon's (1986) distinction between *problem solving* (choosing issues that require attention, setting goals, finding or designing suitable courses of action) from *decision making* (evaluating and choosing among alternative actions). However, in the literature reviewed here, the singular concept of 'decision making' has generally been used by researchers to refer to some or all of the processes identified in the two distinct activities originally defined by Simon.

Studies that focused on *behavioral learning* involved new or different responses or actions (Hirschhorn, 1993; Hirschhorn & Young, 1991; Nonaka, 1991) that were based on shared interpretations (Argyris & Schon, 1978; Daft & Weick, 1984). For example, plant-level performance mastery of a new technology is outcome evidence that learning has occurred (Epple, Argote, & Devadas, 1991). In contrast, research on learning that involved *cognitive development* has been reported in organizations': theories of action (Argyris & Schon, 1978); shared interpretations (Bartunek, 1984; Daft & Weick, 1984); knowledge acquisition and information

distribution (Huber, 1991); widely used system of action-outcome heuristics for decision making (Shrivastava, 1983); myths and sagas (Hedberg, 1981); and memory (Walsh & Ungson, 1991). The present study included both cognitive and behavioral development aspects of organizational learning, both of which have been extensively reported in the literature.

Although the literature has paid a great deal of attention to the conditions necessary for organizational learning to occur, an emphasis on failure, negative feedback, stress, or 'crisis' as a learning stimulus has eclipsed the potential importance of other meaningful stimuli (e.g., opportunities, people, and success). As Hedberg (1981: 17) argued, if problems were the only triggers of learning, problem-ridden organizations would be the best innovators. One example of alternatives to negatively stimulated learning is 'opportunity:' Senge's (1990: 315) experimental approach to organizational learning used computer microworlds. This afforded managers and teams the chance to explore diverse issues in 'practice fields' where they integrated learning about complex team interactions with learning about complex business interactions. Another alternative to negatively stimulated learning is 'success:' many companies "benchmark their current practices against the best relevant practices in the economy in regard to such areas as marketing systems, sales systems, delivery and distribution systems, and products/services" (International Quality Study, 1992). An organization that studies 'best practices' concentrates on successfully meeting performance standards and then aspiring to surpass them. Hence, *failing* to achieve desired outcomes is only one of several drivers of learning (see Sitkin, 1992). The present research included observation of both negatively and positively stimulated organizational learning.

In sum, past research has focused on whether, how, and what learning occurs in organizations along both cognitive and behavioral dimensions. In addition, while there has been a wide range of subjects studied, more attention has been directed toward learning that results from stimuli that are negative (e.g., crisis, problems,

failure, decline, etc.) rather than positive (e.g., stability, slack, success, growth, etc.). Building on the existing literature, the present investigation addressed both cognitive and behavioral development as well as negatively and positively stimulated learning.

**Comparing Theoretical Perspectives**

**Table 2.4** presents a comparison of six of the 17 theoretical perspectives on organizational learning that were listed in Table 2.3. These six works were selected for further analysis based on their *Social Sciences Citation Index* frequencies from 1963 to 1993 (see **Appendix B**). In other words, the six works shown in Table 2.4 have been the most frequently cited of all 17 publications shown earlier in Table 2.3. The remainder of this section summarizes the six theories presented in Table 2.4 vis-a-vis theorists' approaches to and models of organizational learning, concepts of organizing, the foci of their empirical studies, and the processes and mechanisms of learning that are common and unique across theorists.

**Approaches to organizational learning.** Although research using a descriptive approach has appeared in the literature (Adler & Cole, 1993; Borys & Adler, 1991; Brown & Duguid, 1991; Hirschhorn, 1991; Hutchins, 1991; Lanzara, 1983), explanatory or normative approaches have dominated. Table 2.4 demonstrates that Cyert and March (1963), March and Olsen (1979), Levitt and March (1988), and Huber (1991) took explanatory approaches to organizational learning. Argyris and Schon (1978) along with Hedberg (1981) stood apart in taking a normative and intervention-oriented approach; however, Argyris and Schon (1978) also used a descriptive approach for one of their several models of organizational learning and they proposed that the best models are both descriptive and normative. They (1978: iv) also pointed out that "Theories created to understand and predict may be quite different from theories created to help people make events come about."

**Table 2.4. Six Perspectives on Organizational Learning.**

| | *ORGANIZATIONS AS PROGRAMS OF ACTION* Cyert & March, 1963 | *ORGANIZATIONS AS PROGRAMS OF ACTION* March & Olsen, 1979 | *ORGANIZATIONS AS PROGRAMS OF ACTION* Levitt & March, 1988 |
|---|---|---|---|
| *Approach:* | Explanatory | Explanatory | Explanatory |
| *Model:* | S-R | S-R and Cognitive | S-R and Cognitive |
| *Concept of Organizing:* | Multiple-goal coalitions of diverse, shifting subgroups; complex system. | A set of procedures for argumentation & interpretation as well as problem solving & decision making. | Routines independent of individuals. Actions are history-dependent. Action oriented to targets. |
| *Terms-- Concept of Learning:* | Adaptive rationality | Rational adaptation | Learning |
| *Definition of Learning:* | Adaptive process. Respond to environment. Readjust goals, attention rules, search rules as function of experience. | Adapt behavior as function of experience. Impose order, attribute meaning, provide explanations to make sense. | Routine-based, history-dependent, target-oriented. Subunits encode inferences from history into routines that guide behavior. |
| *Foci:* | Decision making process. Execution of choice. | Decision making process. Cognitions. Preferences. | Routines. Beliefs. |
| *Processes & Mechanisms:* | Standard operating procedures. Adaptation of goals, attention rules, search rules. Adaptive rationality subprocesses: quasi resolution of conflict, uncertainty avoidance, problemistic search, organizational learning. | Routines. S-R system: complete cycle of choice model (individual beliefs, individual actions, organizational actions, environmental actions or responses). | Routines. Socialization, education, imitation, professionalization, personnel movement, mergers & acquisitions. Direct experience. Experience of others. Interpretation of experience. Memory. Ecologies of learning units. |

**Table 2.4 (continued). Six Perspectives on Organizational Learning.**

| | *ORGANIZATIONS AS SHARED ASSUMPTIONS* Argyris & Schon, 1978 | *ORGANIZATIONS AS LEARNING AND UNLEARNING SYSTEMS* Hedberg, 1981 | *ORGANIZATIONS AS INFORMATION PROCESSORS* Huber, 1991 |
|---|---|---|---|
| *Approach:* | Normative and intervention-oriented | Normative and intervention-oriented | Explanatory |
| *Model:* | S-R and Cognitive | S-R and Cognitive | S-R and Cognitive |
| *Concept of Organizing:* | Organization-as-agent.Members decide & act "for" organization from rules. Reflexive inquiry. Cognitive process. | Organizations are dynamic systems of activity programs & interacting processes that guide action. | Organizing is information processing |
| *Terms--Concept of Learning:* | Learning | Learning; unlearning; relearning. Adaptation-Manipulation. | Learning |
| *Definition of Learning:* | Detect error or anomaly. Correct errors. Restructure theory of action. Encode & embed in maps/images; memory. | Acquire & process information thru interaction w/environment to increase understanding of reality by observing results of actions (acts). | Process information that changes range of potential behaviors. Acquire knowledge that is recognized as potentially useful. |
| *Foci:* | Assumptions. Norms. Cognitive maps. Strategies, policies. Theory of action. | Cognitive maps. Theories of action, myths, and sagas. | Beliefs, decision making, behaviors. |
| *Processes & Mechanisms:* | Expectation-outcome error detection & inquiry to correct error, conflict. Transform theory of action. Discovery, invention, production, & generalization. Organizational map. Single-loop & double-loop learning. Recognize and resolve conflict. | Learn by: Trial and error, imitation, assimilation. S-R model (two-level). Unlearn by disconfirming mechanisms for: selecting stimuli, S-R connections, response assemblies. 3 learning levels: adjustment, turnover, and/or turnaround. SOPs, customs, symbols, myths, sagas, managerial cultures, professional groups. | Knowledge acquisition,interpretation, distribution; and organizational memory. Subprocesses are: congenital,experiential vicarious learning; grafting, searching and noticing (i.e., experiments, self-appraisal, experimenting/self-designing, unintentional learning,learning curves, scan,focused search,performance monitor framing and cognitive maps, unlearning, information storage and retrieval). |

More specifically, *the processes and content involved in learning vs. learning for improvement may not be the same*. For example, at the individual level of analysis, learning for more effective performance requires particular mechanisms and techniques [e.g., practice, repetition, and frequency of varying durations and intervals (Baddeley, 1990)] that differ from the cognitive processes of initial learning. Because organizational learning is not always conscious or intentional and does not always increase effectiveness (see Huber, 1991: 88-89), an outcome-oriented approach may distort how we understand the phenomenon and become distorted itself. The narrowness of an instrumental view also undercuts the potential for gaining the most objective and comprehensive grasp of how learning really unfolds in organizations. Broader conceptions may provide greater opportunities for useful findings and ideas (Huber, 1991).

In sum, there are a range of perspectives on organizational learning and whether one chooses to take a normative, explanatory, or descriptive approach is a matter of context. The key point is that each perspective rests on different assumptions and raises different implications for research and practice.

**Models of learning**. Almost all organizational learning theories assume that learning rests on cognitive processes in which knowledge and potential behavior are acquired in the absence of direct external reinforcement (e.g., imitation, assimilation, modeling or observational learning, etc.). Most also build on the stimulus-response (S-R) paradigm (Hedberg, 1981: 7) which states that learning consists of the association of stimuli with responses as a result of the reinforcement that follows those connections. Both cognitive and behavioral models are needed to understand organizational learning processes. This is because organizations learn not just through trial-and-error experimentation but also through assimilation and imitation, neither of which imply S-R mechanisms or assume that stimuli always precede responses (Hedberg, 1981: 7).

An important shortcoming of the S-R paradigm is connected to the changing nature of work in organizations. As will be considered in greater detail below, as knowledge work increases, routines diminish and work becomes more complex and nonroutine (Pasmore & Woodman, 1992). Under such conditions, the cognitive model takes on a more prominent role in explaining organizational action:

> . . . we all know that we develop smooth-running skills by practicing them; what we learn is responses. But . . . if we locate a candy store from one starting point, we can find it from another because we "know where it is"; what we learn is *facts*. A smooth-running skill illustrates a learned habit; knowing alternate routes illustrates cognitive structure. A stimulus-response perspective shows that what is learned are 'habits' whereas a cognitive view indicates that what is learned are 'cognitive structures' (Hilgard & Bower, 1966: 10).

**Concepts of organizing.** 'Organizations as open systems' was a common theme across researchers on organizational learning. Following Katz and Kahn (1978: 7), organizations were generally viewed as systems of common behavioral segments, and what constitutes organizing are interrelated social behaviors of numerous people (March & Simon, 1958: 84). An 'organizations as programs of action' perspective that focuses on 'procedures,' 'routines,' or 'programs' (March & Olsen, 1963; Levitt & March, 1988; and Hedberg, 1981) reflects empirical and theoretical findings (e.g., Weick & Gilfillan, 1971; Katz & Kahn, 1978; Nelson & Winter, 1982) that suggest: organizations exist and persist even though membership changes. *The notion of behaviors that are perpetuated over time in spite of personnel turnover constitutes one of the two defining features of learning at the organizational level of analysis* (the other is shared understandings of knowledge and behaviors, as discussed earlier).

**Foci of studies.** The majority of the foci of empirical studies reported in the work of the six theorists listed in Table 2.4 included '*cognitive* structures' in one form or another: 'decision making,' 'choice,' 'cognitions,' 'preferences,' 'beliefs,' 'assumptions,' 'cognitive maps,' 'theory of action,' 'myths,' 'sagas,' 'knowledge.' There was also a *behavioral* component across perspectives: 'execution of choice,'

'decision making process,' and 'behaviors.' 'Routines' as subjects of empirical work included both cognitive and behavioral elements (see Levitt & March, 1988; Nelson & Winter, 1982). There does not seem to be much variance except for two perspectives. First, Cyert and March's (1963) behavioral theory did not explicitly consider cognitive processes such as interpretation. Second, Huber (1991: 89) emphasized the importance of cognitive vs. strictly behavioral change: "An entity learns if, through its processing of information, the range of its *potential* behaviors is changed"--that is, "*learning need not result in observable changes in behavior.*"

**Processes and mechanisms of organizational learning.** *Routines and standard operating procedures are among the primary mechanisms for learning* (Cyert & March, 1963; March & Olsen, 1979; Levitt & March, 1988). Hedberg (1981: 7) explained how, in an S-R model, responses can be assemblies that incorporate many subroutines. Huber (1991) included routines along with standard operating procedures as part of the content of organizational memory although he did not discuss them in depth. Argyris and Schon (1978: 20) described 'organizational practices [that are] regularized so that they are unaffected by some individual's departure,' and in later works, Argyris (1982, 1985, 1990) developed and elaborated on the notion of organizational 'routines' that are defensive, counterproductive in nature, and integral to learning.

In addition, a learning 'system' framework appeared in four perspectives (March & Olsen, 1979; Levitt & March, 1988; Argyris & Schon, 1978; and Hedberg; 1981) and the notion of 'levels of learning' (or depth of learning) was expressed both by Hedberg (1981) and by Argyris and Schon (1978) (e.g., single-loop and double-loop learning). *All theorists conceived of learning as taking place to some degree by trial and error experimentation, imitation, and/or assimilation.* Levitt and March (1988) partitioned learning processes into two categories that subsume these three

modes--*direct* learning (through first-hand experience) or *vicarious* learning (through the experience of others) and this distinction is a core element in the present research.

Finally, interpretation was either implicitly or explicitly emphasized in all perspectives. As noted above, it was given the least attention by Cyert and March (1963), but *all other theorists viewed interpretation as a, if not the, central subprocess in organizational learning* and the concept is central to studying quality improvement.

**Summary and Conclusions**

Organizational learning as a scholarly domain is yet inchoate, and many current researchers are working toward both further discovery as well as better cumulation and integration than the field has witnessed to date. The foregoing comparative analysis demonstrates a convergence of learning terms and concepts, definitions, foci, and mechanisms that (1) has not been previously documented in the literature and (2) was an essential building block in my ability to develop a framework of organizational learning and continuous quality improvement. The review has provided a synthetic and workable definition of organizational learning that incorporates both cognitive and behavioral, micro and macro elements of the concept. Learning is described as a multilevel, experience-based change process that can occur in either a direct or vicarious manner via negative or positive stimuli. Organizational learning refers to relatively long-term variations in cognitive and behavioral states that may or may not be intelligent, beneficial, intentional, or conscious. Learning is an organizational (rather than individual) process when we observe two phenomena: (1) shared understandings of knowledge and behaviors (see Hedberg, 1981; Huber, 1991; Swanson, 1992; Weick & Roberts, 1994), and (2) perpetuated routines, despite personnel turnover (see Weick & Gilfillan, 1971; Katz & Kahn, 1978; Nelson & Winter, 1982). Learning is one of many types of organizational change processes and it is distinct from adaptation. Having carefully examined the literature and developed a

synthetic definition of organizational learning, attention may now turn to a review of the literature on continuous quality improvement--the other central concept in this study.

## Continuous Quality Improvement

As a normative theory of organizational learning, models of continuous quality improvement represent ideal types of change. A continuous quality improvement approach contains recipes and profiles of the activities that advance organizational performance to meet customers' needs and desires (often, despite customers' self-unconsciousness). In contrast to organizational learning theories which explain how behaviors change, a continuous quality improvement approach focuses on what is required to excel and progress, and it may be defined as:

> A process through which knowledge constantly, gradually develops about action-outcome relationships, is encoded in routines, is embedded in collective memory, upgrades organizational standards, and makes performance more effective (see Imai, 1986; Garvin, 1988; Sashkin & Kiser, 1993).

A more "actionable and easy to apply" (Garvin, 1993: 79) form of this definition is:

> An organization that continuously improves quality is skilled at creating, acquiring, and transferring knowledge, and at constantly, gradually upgrading its standards and performance to reflect new knowledge and insights.

Thus, continuous quality improvement is similar to organizational learning in its long-term cognitive and behavioral change aspects but the focal points of the two processes differ significantly: advancing performance (continuous quality improvement) vs. varying performance (organizational learning). The two types of change are also dissimilar in another major way: some critics have maintained that quality improvement technologies are too inwardly focused on process advances--to the detriment of an organization's ability to attend to critical developments in the external environment (Steel & Jennings, 1992). In contrast, 'doing' organizational learning encompasses change of both an endogenous and exogenous nature and the external

environment is often a major stimulus of multilevel cognitive and/or behavioral change (see, for example, March, 1991; March & Olsen, 1979).

## Background: The Quality Movement Roots of Continuous Quality Improvement

Continuous quality improvement is best seen as a philosophy or core value that has become embedded as a set of organizing principles and practices in the larger U.S. quality movement. The roots of this movement can be found in: Taylor's (1911) scientific management; Deming's (1982, 1986) statistical process control and quality management philosophy; Juran's cost of quality and company-wide integrated approach (see Juran & Gryna, 1980; Juran, 1988, 1989); Feigenbaum's (1963) total quality control concept; and Crosby's (1979) top-management directed price of nonconformance concept, zero defects approach, and stages of quality management development; as well as Ishikawa's (1968) total quality control and defect prevention approach and Taguchi's (1986, 1987, 1993) design-integrated product quality approach. Efforts to upgrade quality typically have targeted processes, products, services, human resources or any combination of them. Interestingly, although some U.S. conventions seem to have developed regarding quality improvement methods, technologies, techniques, and tools, the meaning of the word, *quality*, just like *productivity* and *effectiveness* (see Cameron, 1981, 1986; Cameron & Whetten, 1983), continues to defy standardization.

Only precarious definitions of *quality* have been elaborated. For example, W. Edwards Deming argued that quality has no meaning except as it is defined by customers' needs and desires (Deming, 1986; Gabor, 1990). In short,

> There are as many definitions of quality as there are people defining it, and there is no agreement on what quality is or should be. The same is true of productivity.
>
> . . . quality is associated not only with products and services but also with the way people work, the way machines are operated,

> and the way systems and procedures are dealt with. It includes all aspects of human behavior (Imai, 1986: 8-9).

The Malcolm Baldrige National Quality Award's framework for evaluating quality makes no effort to define the quality concept because "a meaningful definition is simply not possible" (Hart & Bogan, 1992:4). Instead, the Baldrige award primarily serves to identify organizational activities that are conducive to continuous quality improvement. But to help the reader understand some of the many dimensions of quality, a few examples can be presented. First, the dimensions of product quality include (but are not limited to) performance, features, reliability, conformance, durability, serviceability, aesthetics, perceived quality, (Garvin, 1988) value, and cost (Steel & Jennings, 1992). Another example: The dimensions of service quality usually include reliability (consistency, dependability), responsiveness (willingness, readiness, timeliness), competence, access (approachability), courtesy, communication, credibility, security, understanding/knowing the customer, and tangibles (physical representation of the service) (Parasuraman, Zeithaml, & Berry, 1985 cited in Huff, 1993). From a more holistic perspective, "quality is the capacity, that whole organizations can be made to have, to continually learn and implement customer wants" (Green, 1993: 87). A continuous quality improvement approach has been adopted by many organizations to help them accomplish such ambitious goals.

## Review of Publications on Continuous Quality Improvement

Continuously improving quality is a slow process aimed at consciously *maintaining and upgrading standards* through small, gradual changes (Imai, 1986: 29). These standards must be systematically, perpetually advanced so that as soon as they are established, they are challenged with new plans for further changes (Garvin, 1988; Imai, 1986). In other words, establishing performance standards is the heart of continuous quality improvement. As an illustration of this point, Adler and Cole

(1993: 89) reported on continuous quality improvement approaches in two automotive manufacturing organizations, one of which was not successful:

> But workers at Uddevalla had no mechanism for identifying, testing, or diffusing the improvements that individual workers might make to eliminate these sticking points. The engineering staff from different work areas met to share new ideas. But without a well-documented, standardized process, it is hard to imagine how these people could have spotted improvement opportunities or shared them across the teams. You cannot sustain continual improvement in the production of products as standardized as automobiles without clear and detailed methods and standards (Adler & Cole, 1993: 89).

In organizations with "quality programs that are expected to aim for perfection, anything less is regarded as an interim goal, to be succeeded by progressively tighter standards" (Garvin, 1988: 191-2) until no defects are perceptible. At the same time, however, perfection is recognized as an impossible objective; it serves primarily as a motivating force for constant, positive change. In this way, quality goals become moving targets that are reset at higher and higher levels (Garvin, 1988: 26). As Imai put it:

> . . . even when an innovation makes a revolutionary standard of performance attainable, the new performance level will decline unless the standard is constantly challenged and upgraded (1986: 24).

> Improving standards means establishing higher standards. Once this is done, it becomes management's maintenance job to see that the new standards are observed. Lasting improvement is achieved only when people work to higher standards. Maintenance and improvement have thus become inseparable for most Japanese managers (1986: 6).

Continuous quality improvement contains two core functions (Imai, 1986: 6):

> What is improvement? Improvement can be broken down between *kaizen* and innovation. *Kaizen* signifies small improvements made in the status quo as a result of ongoing efforts. Innovation involves a drastic improvement in the status quo as a result of a large investment in new technology and/or equipment.

Innovation means "the adoption of an idea or behavior that is new to the organization's industry, market, or general environment." (Daft, 1989: 267). That is,

innovative organizational change creates process and product leaders. But technological advances are not the only province for this type of change--management system innovations also abound. For example, Walton (1987: 4) summarized some of the innovative changes in the organization and methods of U.S. automotive production processes, including: selective supplier policies, multiple skilling and flexibility in work assignments, using work teams, policies that promote employment continuity, and structures for sharing management's power and responsibility with employees and unions. More specifically, Urabe (1988: 3) defined innovation as "the generation of a new idea and its implementation into a new product, process or service" leading to economic growth, increased employment, and the creation of pure profit. Based on Abernathy's (1978) model, Urabe (1988) distinguished between two sequential types of innovation: *radical product innovation* and *incremental process innovation*. The latter is oriented to improvement of production processes for cost minimization and increases in productivity and quality, and it comes into play once the dominant design is established (through radical innovation) and standardized. But Urabe (1986: 7) emphasized that "Incremental process innovation owes more to managerial innovation than to technological innovation." That is, incremental process innovation concerns not "hardware innovation" (technological change) but "software innovation"--a new approach, system, or technique regarding strategy, marketing, organization, management, personnel development, or labor relations (Urabe, 1986: 7-8).

**Table 2.5** reflects the core distinctions among four change processes that are linked to continuous quality improvement: 'small improvements' (*kaizen*) and [radical] innovation (Imai, 1986: 23-24), incremental innovation (Urabe, 1988), and organizational learning. As the second column ('*small improvements*' or *kaizen*) in Table 2.5 shows, this form of continuous quality improvement includes long-term, undramatic, incremental, gradual, constant maintenance and advancement activities sparked by conventional know-how and directed toward processes and efforts for better

**Table 2.5. Comparison of Change Processes: Continuous Quality Improvement, Incremental Innovation, and Organizational Learning**

| | CONTINUOUS QUALITY IMPROVEMENT | | | |
|---|---|---|---|---|
| | Small Improvement (*kaizen*) | [Radical] Innovation | INCREMENTAL INNOVATION | *ORGANIZATIONAL LEARNING* |
| *Focus of Change:* | *STANDARDS* | *TECHNOLOGY, PRODUCTS* | *PROCESSES* | *ROUTINES* |
| 1. Effect | Long-term and long-lasting but undramatic | Short-term but dramatic | Long-term but dramatic | *Long-term; dramatic or undramatic* |
| 2. Pace | Small steps | Big steps | Small to moderate steps | *Small, moderate, or big steps* |
| 3. Timeframe | Continuous and incremental | Intermittent and non-incremental | Intermittent and incremental | *Continuous and incremental or intermittent and non-incremtnal* |
| 4. Change | Gradual and constant | Abrupt and volatile | Gradual and volatile | *Gradual and constant or abrupt and volatile* |
| 5. Involvement | Everybody | Select few "champions" | Everybody; some champions | *Everybody including champions* |
| 6. Approach | Collectivism, group efforts, systems approach | Rugged individualism, individual ideas and efforts | Collectivism; individualism | *Collectivism and individualism* |
| 7. Mode | Maintenance and improvement | Scrap and rebuild | Innovative improvement | *Innovative variation* |

**Table 2.5 (continued). Comparison of Change Processes: Continuous Quality Improvement, Incremental Innovation, and Organizational Learning**

| | CONTINUOUS QUALITY IMPROVEMENT | | INCREMENTAL INNOVATION | *ORGANIZATIONAL LEARNING* |
|---|---|---|---|---|
| | Small Improvement (*kaizen*) | [Radical] Innovation | | |
| *Focus of Change:* | *STANDARDS* | *TECHNOLOGY, PRODUCTS* | *PROCESSES* | *ROUTINES* |
| 8. Spark | Conventional and state of the art know-how | Technological break-throughs, new inventions, new theories | Conventional know-how and new ideas | *Conventional know-how and new ideas* |
| 9. Practice requirements | Requires little investment but great effort to maintain it | Requires large investment but little effort to maintain it | Requires moderate investment; moderate effort to maintain | *Requires little, moderate, or large investment and efforts to maintain* |
| 10. Effort orientation | People | Technology | People and technology | *People and technology* |
| 11. Evaluation criteria | Process and efforts for better results | Results for profits | Process and results (not efforts) | *Process and efforts for different results* |
| 12. Advantage | Works well in slow-growth economy | Better suited to fast-growth economy | Best in slow to moderate growth economy | *Best in slow to moderate growth economy* |

*Adapted* from: Imai, M. 1986. *Kaizen: The key to Japan's competitive success*. New York, NY: McGraw-Hill. Imai's original list (p. 24) summarized the 12 elements (above) of change for both functions of the continuous quality improvement concept: 'small improvement *(kaizen)*' and '[radical] innovation.' The category label *continuous quality improvement* integrates both of Imai's functions. The category labels *radical innovation* and *incremental innovation* are from Abernathy (1978) and Urabe (1988). The items listed in the fourth column under *incremental innovation* have been generated by the author based on Imai (1986) and Urabe (1988). The italicized items listed in the fifth column under *organizational learning* have been generated from the author's synthetic literature review.

results. In contrast, [*radical*] *innovation* (the third column in Table 2.5) precedes *kaizen* in time and it includes short-term but dramatic intermittent and non-incremental, abrupt and volatile 'scrap and rebuild' activities sparked by technological breakthroughs or inventions and new theories. In the fourth column of Table 2.5, the characteristics of *incremental innovation* are listed, including long-term but dramatic, intermittent and incremental, gradual as well as volatile, small to moderate steps that focus on improving processes and results. Recall that Urabe (1988) defined incremental innovation as the second phase of an innovation sequence. The attributes listed for incremental innovation were generated by the author based on Imai's (1986) and Urabe's (1988) descriptions of innovative processes in organizations. Finally, the characteristics of *organizational learning* (which appear in the fifth column of Table 2.5) were generated by the author's synthetic literature review. The main distinctions between organizational learning and the other three change processes delineated in Table 2.5 are as follows: learning involves the *long-term* modification of *routines* through *variations* in people and technology *without an explicit emphasis on advancing* processes, human efforts, or results.

Imai (1986: 23-24) stated that a high technology organization's competitive edge depends on technology-oriented processes that place *a dual focus on innovation and kaizen,* resulting in an "innovative product with a kaizen orientation." This is reminiscent of Urabe's (1988) description of a two-phase, sequential innovation process consisting of radical product innovation followed by incremental process innovation to support it. Green (1993: 191-192) argued persuasively that the latter pivots on what at first sounds like an oxymoron: standardization as organizational learning. This odd concept contradicts traditional U.S. notions that standardization is the antithesis of organizational learning. The unraveling of the puzzle is in the fact that continuous quality improvement involves a moving standard (see Garvin, 1993; Imai, 1986). Green (1993: 192) described the phenomenon:

> The standard is set in a fast process of a few weeks as hundreds of workgroups adjust to the new best practice and set up measures for adhering to it. Then a few weeks later, as a new best practice is discovered and proven with data, the standard is changed, in a process that again lasts a few weeks at most, and everyone conforms to the new standard. In this way workgroups can adhere to several successively better standards for any one process during any given year.

Changing the standard of a work practice (i.e., upgrading it) requires transmission of experience from one cohort of workers to another, from one function or department to another, from one worker to other workers who replace her or him, from an individual to the entire organization, from the organization to an individual, and it also includes accumulation of experience among individual members as well as in the entire organization (Green, 1993: 192). In this way, standardization (embedded in continuous quality improvement) is learning and it occurs both cognitively and behaviorally.

To "commonize cognition [and action] across whole corporations" (Green, 1993: 203) requires that the entire work force understand and use the same tools for problem solving and decision making about quality-related issues. There are 14 quality improvement techniques and tools that are commonly studied and then used to help people track and then control variability in manufacturing or service processes (Sashkin & Kiser, 1993). The "seven old tools" are basic and include control charts, Pareto charts, fishbone diagrams (cause-and-effect diagrams or Ishikawa diagrams), run charts, histograms (bar charts), scatter diagrams, and flow charts (Ishikawa, 1968; Sashkin & Kiser, 1993). The "seven new tools" include relations diagrams, affinity diagrams, system diagrams, matrix diagrams, matrix data analyses, process decision charts, and arrow diagrams (Green, 1993). The first seven tools are quantitative (except for fishbone diagrams) while the second set of seven tools are qualitative.

But in addition to using quality tools, constantly adjusting standards also involves people in numerous other quality-related activities that cut across inter- and intra-organizational functions and levels. These practices will be more fully described in the next chapter, but they are briefly listed in **Table 2.6** in order to help flesh out the

reader's image of typical continuous quality improvement activities in organizations (see Cameron & Barnett, 1994).

**Table 2.6. Typical Continuous Quality Improvement Activities**

1. Benchmarking (internal, external, and out-of-industry)
2. Cross-functional and cross-level teams and team work
3. Sharing quality improvement stories (successes and failures)
4. Collecting and then using quality-related information (e.g., about customer expectations and satisfaction levels, employee attitudes and morale, domestic and global competitors' performance, supplier quality, things-gone-wrong and things-gone right, unit costs, timeliness of work, new ideas for improvement, etc.)
5. Monitoring and assessing quality improvement and quality performance
6. Generating and disseminating new ideas and suggestions for improvements
7. Using quality tools
8. Involving customers and suppliers in forming quality improvement plans, setting quality improvement objectives, solving quality problems, etc.
9. Constantly revising standards

## Summary and Conclusions

Continuous quality improvement represents a normative theory of organizational learning and focuses on advancing performance to meet customers' needs and desires. Efforts to upgrade quality typically have targeted organizational processes, products, services, and/or human resources. The heart of continuous quality improvement is upgrading *standards* through small, gradual, ceaseless changes that feed into a set of quality goals which are essentially 'moving targets,' reset at higher and higher levels, with perfection serving as the overarching motivating force for further, ongoing and endless re-standardization. The approach also involves incremental process *innovation* that targets "software" changes in basic perspectives, systems, or techniques regarding organizational strategy, marketing, management, personnel development, labor relations, etc. Standardization facilitates learning because experiences with new work practices must be transmitted across individual workers, work groups, functions, and departments. Seen this way, continuous quality improvement is a process oriented

(rather than a results oriented) ideology or approach to organizational change that promotes flexibility (Choi, 1993; Imai, 1986; Krishnan, Shani, Grant, & Baer, 1993).

The major problem now facing researchers is that there is very little empirical work investigating the relationships between quality qua organizational change and a host of other organizational concepts including organizational learning.[1] The lack of empirical work is puzzling because quality has been the most influential and pervasive of all the organizational change initiatives effecting managerial and academic thought during the past two decades (Cameron, 1993b; Krishnan, Shani, Grant, & Baer, 1993). The *Academy of Management Journal, Organizational Studies,* and *Administrative Science Quarterly* published less than a half dozen articles on quality during 1992 and 1993, "none of which empirically measured quality or its impact on organizational or individual performance" (Cameron, 1993b: 1). This gap can be bridged in part by the present study which represents a scarce, systematic investigation of continuous quality improvement and its relationship to organizational performance over a three year time period.

Perhaps of greater concern is the realization that in the organizational change literature, quality *implementation* tends to command center stage, to the neglect of an equally if not more important problem--total quality *integration* (Dean & Goodman, 1993). That is, there is a need for theory development around how a new set of principles and practices are absorbed into all of an organization's culture and activities (Dean & Goodman, 1993; Schein, 1985; Tichy, 1983; Trice & Beyer, 1993; Zald, 1970a, 1970b; Zald & McCarthy, 1979). It is precisely this type of problem that the present study of organizational learning and continuous quality improvement addresses.

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[1] A review of the organizations literature quickly shows that there is also very little empirical work on quality qua organizational change and performance, productivity, effectiveness, culture, leadership, human resource management, downsizing, sense making, decision-making, etc.

The theoretical gap that needs bridging requires answers to questions like: What types of learning mechanisms and processes are engaged when organizations initiate quality improvement activities? The major contributions of this study are in (a) its empirical testing and prediction of a model of continuous quality improvement and (b) identifying the underlying learning processes that may be leveraged by managers to enhance continuous quality improvement and quality performance in their organizations.

With the foregoing descriptions of organizational learning and continuous quality improvement in mind, attention may turn to the theoretical framework that shows how learning processes and quality improvement activities may be associated as well as the implications of their relationship for organizational quality performance.

# CHAPTER 3

# THEORETICAL FRAMEWORK

This framework draws from interviews with Pioneer managers and organization science experts, as well as from the literature on psychology, organizational learning, organizational change, and continuous quality improvement. The framework specifies the links between quality activities and quality improvement performance outcomes at the organizational level of analysis. That is, the framework addresses the question, "What variables intervene between quality improvement practices and results?"

## A Mediator Model of Organizational Learning

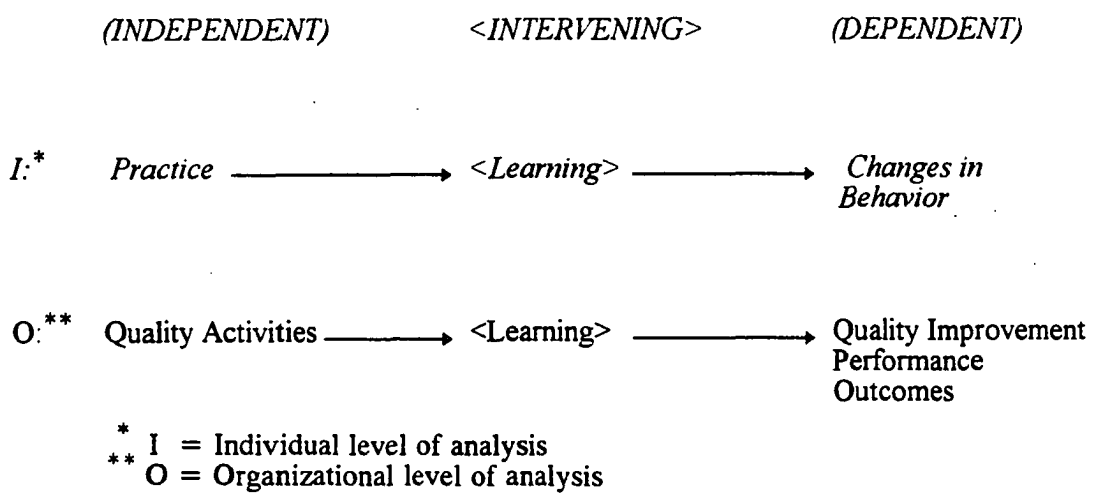
The literatures on organizational learning, organizational change, and continuous quality improvement indicate that numerous variables may intervene between quality activities and performance outcomes. Time, repetition, training, rewards, leadership, ambiguity, or fear may all serve as means to achieve differential quality improvement performance outcomes. But in addition, a great deal of research in the field of psychology has shown that *learning* is a critical link between practice (i.e., experience, activities) and changes in behavior (i.e., performance) (see Deutsch & Krauss, 1965; Estes, 1975; Gallistel, 1990; Gardner, 1985; Hilgard & Bower, 1966; Hilgard & Marquis, 1961; Kimble, 1969; Norman, 1981; Zajonc, 1968).

The organizational learning literature review presented in Chapter 2 designated this same linkage at the macro (vs. micro) level of analysis. Both bodies of research (psychology and organizational learning) focus on the same phenomenal level (observing and measuring change in individual cognitions and/or behaviors) but

conceptually, their ideas and theories diverge (see Katz & Kahn, 1978: 12-15). In addition to a concern with individual-level phenomena, the organizational learning literature describes group- and organization-level subjects of empirical research (e.g., routines, norms, organization strategy and structure, etc.). Two processes, diffusion and institutionalization, provide the link from learning at the individual level to organizational level learning (Glynn, Lant, & Milliken, 1994: 21).

As **Figure 3.1** shows, evidence from psychological research indicates that, "The term *learning* itself has the status of an intervening, unobserved variable linking these two sets of observables" [i.e., linking 'practice' and 'changes in behavior'] (Kimble, 1961, 1969: 93; Hilgard & Bower, 1966). At the organizational level of analysis, learning assumes the status of an intervening variable between quality activities and quality improvement performance outcomes. That is, organizational learning may operate as a mediator of quality improvement performance outcomes.

**Figure 3.1. Learning as an Intervening Variable**




Mediators are a type of intervening variable that show how or why certain effects occur (Baron & Kenney, 1986: 1176):

> This model assumes a three-variable system such that there are two causal paths feeding into the outcome variable: the direct impact of the independent variable (Path 'c') and the impact of the mediator (Path 'b'). There is also a path from the independent variable to the mediator (Path 'a').
>
> When Path 'c' is reduced to zero, we have strong evidence for a single, dominant mediator. If the residual Path 'c' is not zero, this indicates the operation of multiple mediating factors. . . . a more realistic goal may be to seek mediators that significantly decrease Path 'c' rather than eliminating the relation between the independent and dependent variables altogether. *From a theoretical perspective, a significant reduction demonstrates that a given mediator is indeed potent, albeit not both a necessary and a sufficient condition for an effect to occur* [emphasis added].

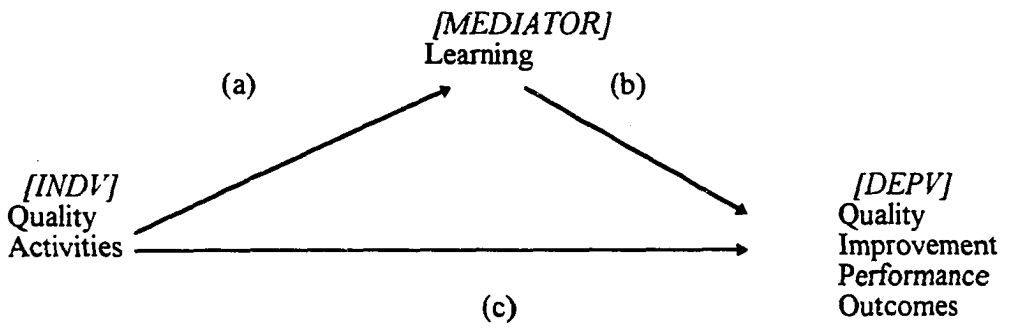
For example, quality tools represent one type of quality activity (e.g., histograms, control charts, Ishikawa diagrams, cross-functional teams, etc.). These tools are necessary but not sufficient for favorable quality improvement performance outcomes (Sashkin & Kiser, 1993: 51-52). Tools, along with techniques and training, are often the most visible, superficial aspects of a quality system, but they are not the heart of it. When overemphasized, they can even impede an organization's direction toward developing a commitment to customers and quality (Sashkin & Kiser, 1993: 51-52):

> This is what Deming discovered after World War II. Despite his success in training workers and engineers throughout the United States to use his tools and techniques, his efforts, for the most part, came to nothing because management had not adopted the philosophy that the tools and techniques were intended to support.

'Adopting the philosophy' is a learning process without which quality activities may have little to no effect on performance outcomes.

**Figure 3.2** shows a model of organizational learning as a mediator of quality improvement performance. In the remainder of this chapter, I describe each of the three primary factors in the model, consider how they may be interrelated, and delineate the conceptual framework that guided the present research. A diagram of the conceptual framework is presented at the end of the chapter.

**Figure 3.2. Organizational Learning as a Mediator of Quality Improvement Performance**




## Quality Activities

> The American automobile industry is not a 'smokestack' industry but a 'catalyst' industry, leading other U.S. industries in the creation of higher levels of quality, new technology, and a better-educated work force. The driving force has been quality improvement.
>
> Harold A. Poling,
> Former Chairman of the Board,
> Ford Motor Company

The prodigious quality literature contains descriptions of hundreds of activities that constitute quality-focused production and service systems in organizations of almost every nationality and stripe (see, for example, Campbell, 1987; Carmen, 1993; Crosby, 1979; Deming, 1985, 1986; Easton, 1993; Green, 1993; Hart & Bogan, 1992; Imai, 1986; Ishikawa, 1968; Juran, 1974; Kano, 1993; Lu, 1985; Nakajima, 1988; Ohno, 1988; Price & Chen, 1993; Shingo, 1987; Urabe, Child, & Kagono, 1988). As one would expect, these quality improvement artifacts vary greatly within and across industries around the world. For example, quality circles are not ubiquitous, and comparing them across firms and countries where they do exist shows that they are uniquely tailored to local contexts rather than globally applied in a lock step fashion. But there are also a number of other practices articulated in the literature that are widely, similarly practiced and generally considered to be pillars of any

that are widely, similarly practiced and generally considered to be pillars of any continuous quality improvement effort. These have been included in the conceptual framework that guided this research and they are described below. The activities that are incorporated in a continuous quality improvement approach are intended to manage ongoing, complex processes rather than to solve discreet problems--the latter is the task of simple improvement (Hart & Bogan, 1992: 32).

**Benchmarking**. Although often confused with and limited to competitive comparisons, the purpose of benchmarking is to generate process (Easton, 1993: 39), product, and service innovations (Hart & Bogan, 1992: 115) both within and across industries. This involves searching inter- and intra-organizationally for new ideas for improvement and "either adopting the *practices* or adapting the best features [of others], and implementing them to obtain the best of the best" (Camp, 1989: xii cited in Hart & Bogan, 1992: 115). "The greatest benefits come from studying practices, the way that work gets done, rather than results" (Garvin, 1993: 86). Numerical operating targets must be established for particular functions using the best possible industry (or out-of-industry) practices. Hart and Bogan (1992: 115) noted that,

> This concept is very new for most companies, and stands in contrast to their current practices, which project the future from the company's own past trends, without any reference to what competitors and other leading companies are doing. . . . Benchmarking validates and adds credibility to the goal-setting process. . . . benchmarking obliterates divisive internal debate on targets. A company can undertake a major change because 'our competitor, or someone else, is already doing it.' With no benchmarking data, that kind of change would be unimaginable.

One of the most critical questions for continuous quality improvement advocates is: How do organizations improve the benchmarking capabilities that they already have (Hart & Bogan, 1992: 115)?

**Teams (cross-functional and cross-level)**. Teams involved in continuous quality improvement activities are generally formal groups made up of interdependent individuals who are jointly responsible for achieving complex goals over short- as well

as long-term timeframes. In an automotive manufacturing organization, cross-functional teams typically consist of members from assembly, engineering, production, quality control, general management, etc. Cross-level teams commonly include line operators, line supervisors, several levels of assistant managers, and mid-level managers. The team concept gives worker groups "the chance and the authority to identify problems and opportunities, find out where and why processes go wrong, develop and test proposed solutions, and implement those that work" (Hart & Bogan, 1992: 140).

**Sharing stories.** "Sharing success stories provides a look at your strengths that will reveal opportunities for performance improvements" (Hart & Bogan, 1992: 208). Company newsletters are often a medium for sharing stories of successful quality improvements throughout the organization although it appears that the value of failure stories has yet to be similarly realized. In addition, formal presentations and informal word-of-mouth transmission of quality improvement stories are frequent mechanisms for disseminating the lessons of experience to a broad cross-section of organizational members. In seminars, stories can be more systematically analyzed to share knowledge about triggers of change, expected and important results, how results were measured, cause and effect relationships between actions and results (Hart & Bogan, 1992: 209), and the underlying principles of continuous quality improvement (Cameron, 1992). **Appendix C** shows an exemplary story that appeared in a recent edition of a Pioneer Motor Company Engine Division newsletter.

**Collecting and using information.** "Reliable, appropriate data are the lifeblood of a quality-improvement system" (Hart & Bogan, 1992: 103). Processes cannot be monitored and progress cannot be assessed without systematic data collection of relevant information. The base of data and information used for planning, day-to-day management, and evaluation of quality encompasses many domains: company performance and internal operations (including things-gone-right, things-gone-wrong,

timeliness of work, new ideas for improvement, employee attitudes and morale, etc.); customers' needs, desires, expectations, and satisfaction levels; intra- and inter-organizational benchmarks; financial calculations; and supplier-related facts. Ideally, measures are interlinking, data are thoroughly analyzed, they are universally accessible, they are used, and they focus on key control points defined as critical areas where operational factors tend to cause variation or where something could go wrong (Hart & Bogan, 1992: 108). That is, the optimal focus is on preventive data.

**Monitoring and assessing (processes, products, services, and performance)**. Evaluations of quality improvements and outcomes may be performed by individuals, teams, and outside as well as internal auditors. Depending on the type of data sought, they may require measurement at hourly, weekly, or monthly intervals. Both internal business processes and support services also need to be monitored (e.g, legal services, finance, accounting, sales, marketing, purchasing, human resource management, plant and facilities management, research and development, administrative services, etc.). Finally, monitoring and assessing performance against goals is generally a good indicator of progress gained or lost in continuous quality improvement efforts. In an automotive manufacturing organization, the following outcome measures are commonly used to determine acceptability of performance: errors or defect rates, rate and degree of quality improvement, cycle times, costs, complaints, warranties, etc. But interpretation of results can sometimes be slippery, as Baldrige examiners know (Hart & Bogan, 1992: 168):

> If the system looks good but results are bad, the examiner will look for some sort of explanation: the economy, new regulations, poor implementation or deployment of the system, environmental factors, and so on. If the system does not look all that good but the results are stellar, examiners must consider what is causing the results: Is it plain good fortune, or, upon further examination, is the system more effective or innovative than it appeared on first inspection?

**Generating new ideas and suggestions**. In addition to the customer-related and organizational benefits of suggestion systems (e.g., improved quality, reduced cost, and improved efficiency), there are substantial personal benefits for organizational members (Japan Human Relations Association, 1988). For example, greater understanding of one's job comes through observing its problems, systematically researching and evaluating them, and making them visible by recording them in writing. The new ideas that emerge in a quality improvement oriented work place need to be encouraged, recognized, and rewarded whether they pertain to small improvements or to large improvements and/or inventions and employees require training in problem identification and solution processes and methods.

**Using quality tools**. The tools for continuous quality improvement provide structured problem-solving processes using graphical techniques that significantly contribute to removing the causes of system problems (Brassard, 1988). But these same tools also teach several other important but subtle lessons (see Sashkin & Kiser, 1993: 49-51). First, using quality improvement tools teaches the meaning of variability, without which people cannot understand the causes of problems. Second, quality improvement tools teach people how to control variability (a product of random change) and thus, tools allow them to go on to control and improve processes. Third, tools show that people can be causes, controlling and determining outcomes; as a result, using quality improvement tools tends to enhance self-efficacy and self-esteem.

**Involving customers and suppliers**. Relationships between customers and organizations committed to continuous quality improvement look like partnerships (Hart & Bogan, 1992: 176). They are characterized by relentless data collection because: "Customers can provide up-to-date product information, competitive comparisons, insights into changing preferences, and immediate feedback about service and patterns of use" (Garvin, 1993: 86). The mechanisms that organizations use to involve customers in continuous quality improvement plans and actions include

surveys, interviews, focus groups, complaints, task forces and panels, and joint design teams. Moreover, there has been an increase in the frequency of joint design teams with both customers *and* suppliers in manufacturing companies and many have extensive programs with their suppliers (including supplier quality systems audits, rating and qualification systems, training, and recognition programs) (Easton, 1993: 41-42).

**Constantly revising standards.** "The distinction between improvements that result from bringing a process into control and continuous improvement once the process is in-control is often not understood" (Easton, 1993: 430). As explained in Chapter 2, continuous quality improvement emphasizes consciously maintaining and upgrading standards and systematically, perpetually challenging them with new plans for further changes (Garvin, 1988; Imai, 1986). The pivotal characteristic of continuous quality improvement is the never ending re-establishing of performance standards.

The above listed quality activities are connected to two broad categories of learning processes--vicarious and direct. Each type and its variants is discussed below, followed by a final discussion of the whole theoretical framework.

## Learning Processes

March (1994: 40-41) described how learning is one of several mechanisms that generate a path of history. He stated that on the one hand, the logic is anticipatory and change stems from the future imposing itself on the present. For example, "The forms and procedures that an organization uses in the present can be seen as shaped by expectations and intentions for the future" (March, 1994: 40). But on the other hand, there is the view that the present is a residue of the past. The logic is historical, not anticipatory. For example, "An organizational past can be seen as imposing itself on the present through retention of organizational experience in organizational routines"

(March, 1994: 41). In other words, *sometimes organizations learn from prior experience. The interesting question is: whose?*

Change in organizational cognitions and behaviors often emerges as a result of *vicarious* learning--acquiring second-hand experience pertaining to the strategies, administrative practices, or technologies of other organizations (Huber, 1991). Alternatively, cognitive and/or behavioral change in organizations may emerge through direct learning--acquiring first-hand experience. The most important distinction between direct and vicarious learning is that the latter is more efficient than tedious trial-and-error learning (Bandura, 1977a; 1977b; Dodgson, 1993) and sometimes more effective (Cameron & Barnett, 1994). The implications of this distinction are critical because organizational performance implies a concern not just for effectiveness but also for efficiency. In other words, ***there may be an important link between performance and types of quality activities based on the efficiency and effectiveness of the learning processes that they engage***. The next section describes two major learning processes (vicarious and direct) and their relationship to quality activities.

**Vicarious Learning**

Benchmarking is a form of vicarious learning. It is fundamentally a **modeling** or **observational learning** process that involves the acquisition of knowledge and potential behavior and is not dependent on reinforcement (see Deutsch & Krauss, 1965; and Hilgard & Bower, 1966). Therefore, in terms of observational learning, what a company is capable of doing depends on acquired knowledge and skills rather than rewards. But performance--what a company actually does--is linked to incentives, values, and expected outcomes. In addition to benchmarking, several other quality activities involve primarily vicarious learning processes: using cross-functional and cross-level teams, sharing stories about quality improvement endeavors, involving

customers and suppliers in quality plans and decisions, and constantly revising standards according to appraisals of competitors' practices and performance.

Similar to modeling, **imitation** is a process that involves reproduction or close correspondence of an observed action or behavior. But imitation is different from modeling because it depends on reward (Bandura & Walters, 1963; Mischel & Staub, 1965). In the language of institutional theory, "organizations imitate other organizations because doing so minimizes sanctions from a variety of stakeholders" (Huber, 1991: 96). Thus, both imitation and modeling are observational learning processes, but only imitation depends on reinforcement. Imitating may arise during benchmarking activities and as a function of experiences in cross-functional and/or cross-level teams. Sharing stories about quality successes as well as involvements with customers and suppliers may also engage imitating processes as knowledge about quality and its improvement diffuses on an organization-wide basis.

The store of organizational knowledge may be increased vicariously by acquiring new members (i.e., "**personnel movements**") which is often faster than acquisition through experience and more complete than imitation (Huber, 1991: 97). When cross-functional and cross-level teams are established or customers and suppliers are involved in quality planning, new people and knowledge are quickly introduced to the local situation. Organization members learn through the experiences of others as knowledge from new personnel diffuses throughout the organization; new behaviors reflect the knowledge and insights gained from importing and transporting people throughout the organization.

**Direct Learning**

In contrast to vicarious learning processes, direct learning may be engaged by such quality activities as information collection and use, monitoring and assessing performance, using quality tools, and constantly revising standards. Direct learning

processes take many forms including learning by insight, experiments, trial-and-error, and simulations.

**[1] Learning by insight.** When confronted with a novel problem, learners can reach a solution through a perceptual structuring that leads to 'insight,' that is, to an understanding of the essential relationships involved in the given situation (Hilgard & Bower, 1966: 10). Learning by insight requires "acting in accordance with some sort of 'map' of the situation, and not according to blind habit" (Hilgard & Bower, 1966: 198). This involves clearly seeing and understanding the relation of means to ends. It only occurs when a situation has been so arranged that all the necessary parts which need to be brought into relationship for solution are simultaneously present and open to observation. Wolfgang Kohler's (1951) classic animal intelligence experiments still serve as dramatic illustrations of learning by insight:

> In the single-box situation, a lure, such as a banana, is attached to the top of the chimpanzee's cage. The lure is out of reach but can be obtained by climbing upon and jumping from a box which is available in the cage. The problem is a difficult one for the chimpanzee. Only Sultan (Kohler's most intelligent ape) solved it without assistance, though six others mastered the problem after first being helped either by having the box placed beneath the food or by watching others using the box. The problem was not solved by direct imitation of others. What watching others use the box did was to lead the observer to attempt to use the box as a leaping platform, but sometimes without making any effort whatsoever to bring it near the lure. When the problem was mastered, a chimpanzee alone in a cage with box and banana would turn away from the goal in order to seek the box and to move it into position. This 'detour' character of insightful behavior is, according to Kohler, one of its important features (Hilgard & Bower, 1966: 230).

In addition, some degree of trial-and-error behavior [see below] occurs during the course of achieving insightful solution (Hilgard & Bower, 1966: 241-242).

All of the quality activities described in the previous section have the potential to involve learning by insight (i.e., benchmarking, teams, story sharing, collecting and using information, monitoring and assessing performance, generating

new ideas and suggestions, using quality tools, involving customers and suppliers, and constantly revising standards).

**[2] Organizational experiments.** Important as learning mechanisms, experiments involve intentional, systematic efforts and feedback about cause-effect relationships between actions and outcomes (see Huber, 1991). 'Experimenting' or 'self-designing' organizations "maintain themselves in a state of frequent, nearly-continuous change in structures, processes, domains, goals, etc., even in the face of apparently optimal adaption" (Nystrom, Hedberg, and Starbuck, 1976; Hedberg, Nystrom, and Starbuck, 1976; Starbuck, 1983; cited in Huber, 1991: 93). Experimenting may involve the use of quality tools as well as collecting and using quality information. It may also include revising standards and engaging customers and suppliers in new knowledge-generating projects or programs.

**[3] Trial-and-error learning (or learning by selecting and connecting).** This involves a problem situation in which a goal is reached by choosing the appropriate response from a number of possible alternatives; a trial is measured either by the length of time or number of errors involved in a single reaching of the goal (Hilgard & Bower, 1966). Tests are repeated, as non-productive methods to discover a desired result are eliminated. Many of the above listed quality activities (e.g., collecting and using information, monitoring and assessing performance, generating new ideas and suggestions, using quality tools, involving customers and suppliers, and constantly revising standards) have the potential to engage learning by trial-and-error which may be used exclusively or perhaps as a serial step in a broader sequence of change(s).

**[4] Simulations of hypothetical events.** One technique involves "defin[ing] and elaborat[ing] a class of historical non-events that can be called **near-histories**--events that almost happened" (March, Sproull, & Tamuz, 1991: 4)--for example, defining "a safety 'incident' as an event that, under slightly different circumstances,

could have been an accident" (p. 5). In a second technique, **hypothetical histories** are constructed. "Small pieces of experience are used to construct a theory of history from which a variety of unrealized, but possible, additional scenarios are generated" (p. 5), as a way to develop distributions of possible futures from ideas about historical processes selected from case studies. Simulation learning processes are often embedded in stories of failures and successes that are widely shared among organization members.

**Mixed Forms of Learning**

Usually designated as a form of direct learning, generating new ideas and suggestions sometimes involves **vicarious** learning processes. For example, in automotive manufacturing, a rework team may share knowledge with a quality inspection team; this equates to learning through the process of personnel movements. But experiments or trial-and-error within a team may also generate new ideas; in this scenario, learning is **direct.** For example, members of an engineering and production task force in an auto assembly plant often combine resources to install and fine tune new robotics. An organization may also integrate both **vicarious and direct** learning in a hybrid process that begins, for example, with hiring new expertise or benchmarking a competitor's processes (vicarious learning), and then progresses to experiments or simulations (direct learning) as local adaptations are developed.

In sum, vicarious and direct learning processes represent variables that may intervene between quality activities and organizational performance. Vicarious learning processes include modeling, imitating, and personnel movements. Direct learning processes involve insight, experiments, trial-and-error, and simulations although insight is sometimes a by-product of vicarious experience. Typically, each of these two major forms of learning (vicarious and direct) are engaged by different quality activities, but 'mixed' forms are also sometimes possible as illustrated previously. Learning processes can be analyzed to gain insight about how quality activities and organizational

performance are related. The next section explains measures of organizational performance.

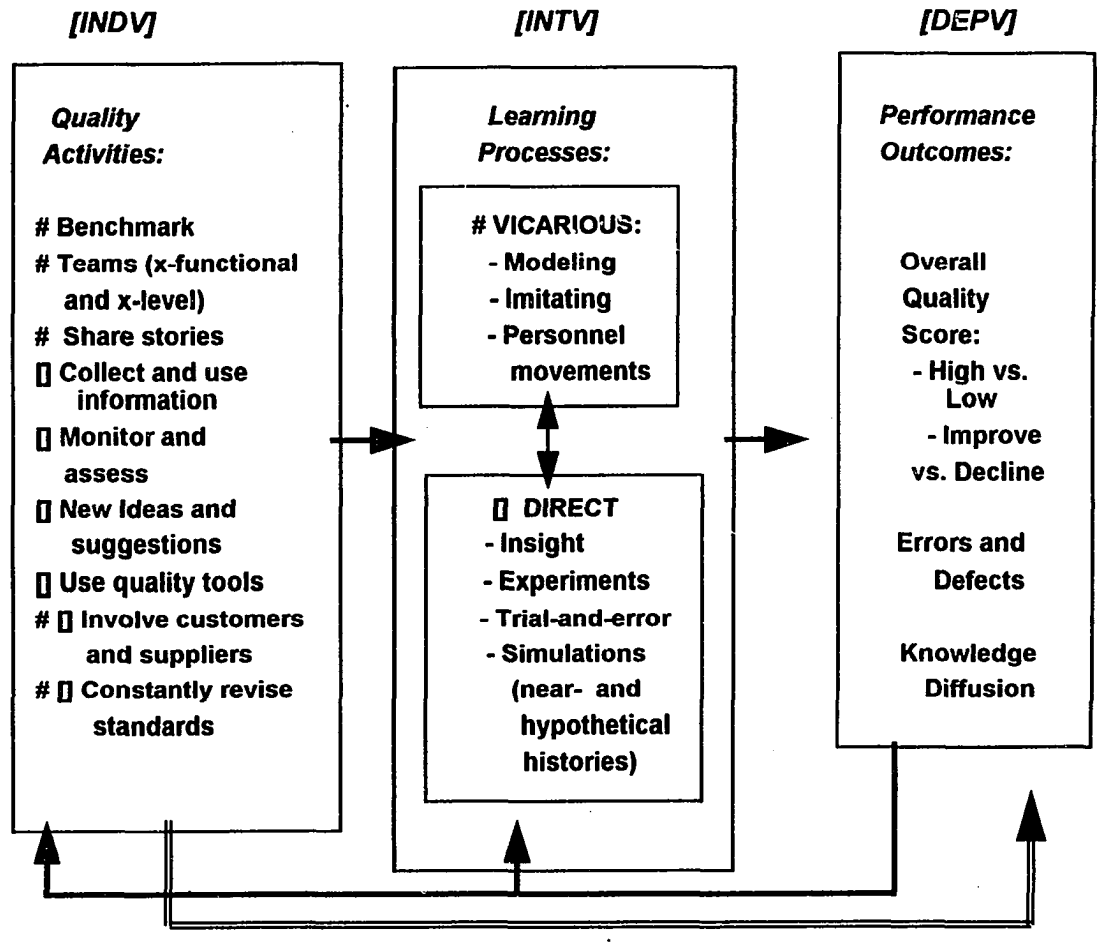
## Quality Improvement Performance

The third and final element in this theoretical framework is organizational performance outcomes. Following Boschken (1990: 138), I have defined organizational performance in terms of transitional change in order to make comparisons across Pioneer units. One measure involves a longitudinal assessment of how much, how, and why an organizational unit's quality performance may be improving vs. declining over the course of the three-year time period. In addition, a second measure involves a cross-sectional, overall assessment of an organizational unit's quality improvement performance for the entire three year study period. Using both types of measures provides a reasonable picture of changes in units' quality improvement performance during the study period and also helps point to directions for understanding why and how certain changes may or may not have occurred.

## Theoretical Framework

**Figure 3.3** shows the full model in which quality activities engage vicarious and/or direct learning processes that then may influence the degree to which an organizational unit's quality performance outcomes will be favorable or unfavorable. Feedback loops are indicated along the bottom of the diagram, and the hollow arrow between 'activities' and 'outcomes' indicates that improvement may occur in the absence of learning. For example, take the case of superstitious learning (see March & Olsen, 1979: 58): a performance improvement at a quality-focused assembly plant is widely attributed to a supplier's visible and increased involvement in plantwide quality planning. However, unknowingly to all parties, the supplier's employees have recently begun shipping higher grade material to the plant. Therefore, the assembly plant

**Figure 3.3. A Conceptual Framework for a Study of the Influence of Continuous Quality Improvement and Organizational Learning on Quality Peformance**



managers have not correctly learned the cause of improvement; nevertheless, performance has improved.

The model suggests that learning may be one of several multiple mediating variables between quality activities and performance. As mediators, vicarious and direct learning would *significantly decrease* the statistical relationship between quality activities and performance (*rather than eliminate* it altogether). Thus, learning may sometimes be a potent mediator of quality performance, but it may not be both a necessary and sufficient condition for an effect to occur (see Baron & Kenny, 1986). More specifically, *I hypothesize that in the present study, organizational units that emphasize quality activities which engage (more efficient) vicarious learning processes should demonstrate the best quality performance and the greatest performance improvements over time*. This means that the "low performing" business units might be emphasizing quality practices that involve direct rather than vicarious learning processes. Alternatively, "low performers" may be engaged in fewer and less varied quality activities and learning processes than "high performers." In addition, "high performing" and "low performing" organizational units may demonstrate unique patterns in their quality activities and learning processes. That is, processes used in earlier steps may facilitate or impede later steps in an entire cycle of quality activities.

In the next chapter, I describe a study of these phenomena within one of the leading U.S. automotive manufacturing firms in the world.

# CHAPTER 4

# RESEARCH METHODOLOGY

In this study, I examined vicarious and direct learning processes connected to quality improvement activities in 13 organizational units belonging to one of the *Big Three* automotive companies. Through an iterative process, the theoretical framework presented in Chapter 3 was initially deductively derived and then elaborated and investigated using an inductive approach. That is, the strategy involved quantitative and qualitative methods that utilized self-report measures (written questionnaires), stories, and interviews as well as observations and self-ratings. The quantitative data made possible the statistical analysis of independent and dependent variables and their relationships (i.e., quality activities and performance). This generated preliminary findings that I then embellished with the qualitative data in order to discover in what ways the intervening variables (vicarious and direct learning) might be operating and linked to both independent and dependent variables. Subsequently, the theoretical framework was further elaborated in order to use it to guide survey development and to test it on a new sample of organizations.

## Background

It is widely recognized that American auto firms have intensified attention to quality issues since the late 1970s when Japanese manufacturers began to make inroads on the U.S. market. Although American manufacturers achieved considerable quality improvement progress in the 1980s, by 1989 the average number of defects per 100 vehicles in U.S. assembly plants located in North America was 82.3 compared to only 65.0 for Japanese plants in North America and 60.0 for Japanese plants in Japan

(Womack, Jones, & Roos, 1990: 92-93). [The combined European volume producers averaged 97.0 assembly defects per 100 vehicles (*ibid.*).] J.D. Power recently reported that as a group, *Big Three* cars and trucks have more defects than the best of the Japanese manufacturers (i.e., than Toyota Motor Corporation and Honda Motor Company) (*Wall Street Journal*, January 27, 1994: B1). Exacerbating the situation, while Pioneer and other American auto makers are chanting the quality mantra, their competitors have also continued to improve and the stubborn performance gap between the rival American and Japanese groups has yet to be closed.

As a result of the fierce global competition in the auto industry, Pioneer's commitment to improving quality has become a central organizing theme. All organizational units have been pressured to advance beyond a "find and fix" approach to quality and instead, to develop a more advanced type of culture that Cameron (1993) described as *innovation coupled with continuous improvement*. This is a relatively mature phase of quality culture development that characterizes the world's best companies and the highest performing teams (see Green, 1993). But approaches to continuously improving quality tend to differ across organizations depending on their products, services, processes, size, age, financial resources, structure, and so forth. Thus, each Pioneer unit in effect has had to design a unique approach to quality, yet one that would still be nested within the overarching corporate quality philosophy and mandate--an interesting set of interdependencies to steer. For all the foregoing reasons, the U.S. automotive industry stands out as a fruitful domain for research on quality improvement and how it links to organizational learning.

## Research Sites

The original sample was composed of sixty-eight organizational units within one of the *Big Three* automotive firms. Pioneer Motor Company is the pseudonym for this corporation which is involved in the design, engineering, manufacture, assembly,

sales, consumer financing and distribution of automotive products. There are four primary organizations within Pioneer: the automotive group, financial services group, automotive components, and corporate staffs. Many (but not all) types of operations in Europe, Asia, Australia, and South and North America were included in the full sample:

-- units from the automotive group (car product development, body and assembly operations, body engineering, powertrain operations, marketing and sales operations, customer service division, export sales, truck operations, environmental and safety engineering staff, research laboratory, simultaneous engineering);

-- units from the financial services group (credit operations, banking, leasing);

-- units from automotive components (climate control division, electrical and fuel handling division, electronics division, glass division, plastic and trim products division);

-- and units from the corporate staffs (corporate quality, employee relations, governmental affairs, public affairs, finance, marketing strategy office, office of the general counsel, purchasing and supply, and corporate design).

Some organizational units (also known as *components* among Pioneer employees) represented multiple sites. For example, Pioneer body and assembly plants were located in Michigan, Georgia, Ohio, Missouri, New York, Virginia, and Illinois as well as overseas, in Mexico, and in Canada. The 'organizational unit' was the unit of analysis in this study and was characterized by its technology and end products. Thus, all engine plant units used similar manufacturing processes to produce engines and their components, and all employee relations department units used virtually the same methods for recruiting, selecting, appraising, developing, and rewarding a skilled and able work force.

Of the original 68 units, thirteen were selected for further study based on their performance scores on the preliminary survey. Data analyses distinguished these

13 units from the rest of the sample and assigned them into two contrasting groups. Six units were classified as 'high performers' and seven units were categorized as 'low performers' based on their scores on a survey of 120 quality activities.

'High performers' showed the highest mean score on the index as well as either the most positive change in that score over time or the most stability in that score over time. 'Low performers' showed the lowest mean score on the index as well as either the most negative change in that score over time or the most stability in that score over time. (The index is more fully described in the section below on quantitative measures.) **Table 4.1** describes each of the thirteen research sites in terms of the types of organizations represented (research, staff, service, manufacturing, etc.) and the number of managers per unit.

In order to cross-validate the ranks of organizational units as 'high performers' or 'low performers' (derived from the survey data), I established a panel of experts comprised of six Pioneer general managers. Their task was to classify and rank each unit's quality improvement performance. The panel included general managers from the top levels within automotive operations (e.g., quality), vehicle controls (e.g., powertrain engineering), the executive development operation, and program operations (e.g., body and assembly operations). In addition to their general knowledge of the business, these six executives also personally interacted with respondents during monthly executive education sessions conducted at the Michigan Business School and delivered formal presentations on continuous quality improvement. One of their primary goals in their interactions with executive education participants was to raise levels of consciousness about the importance of continuously improving the quality of Pioneer's processes, products, and services. Thus, this group of six general managers was uniquely qualified as a panel of judges that was knowledgeable about both generic quality-related issues within the global automotive industry and familiar with many of the particular quality-related problems and successes within each of the units under

**Table 4.1 Description of Organizational Units in Sample**

| *Site #* | *Type of Organization* | *Number of managers in sample* |
|---|---|---|
| | ***Group 1, HIGH PERFORMERS:*** | |
| 1. | Research and development (R&D) group | 21 |
| 2. | Assembly plants | 106 |
| 3. | Engine division | 26 |
| 4. | Glass division | 14 |
| 5. | Powertrain group | 11 |
| 6. | Transmission and chassis group | 20 |
| | Subtotal | 198 |
| | ***Group 2: LOW PERFORMERS*** | |
| 7. | Employee relations operations | 15 |
| 8. | Environmental and safety engineering services group | 21 |
| 9. | Export operations | 6 |
| 10. | External affairs group | 5 |
| 11. | Land services and development group | 9 |
| 12. | Office of the General Counsel | 15 |
| 13. | Public affairs operations | 11 |
| | Subtotal | 82 |
| Total sample | | 280 |

study. The relationships between the general manager group and survey respondents was longstanding, having begun at the start of 1990 when the first quality-focused Pioneer executive courses were being developed and delivered at the Michigan Business School.

The present longitudinal study was built from this executive education program designed for Pioneer upper-middle managers. Ongoing monthly survey data collection was begun in January 1990 and lasted through December 1992 (three years). During the 36 month study period, the core program was delivered to 30 discontinuous classes of 25-35 Pioneer managers (there were two months in 1990 and four in 1991 without classes). Regarding selection issues, there was no evidence of systematic bias

toward any particular Pioneer unit or function; and a bias toward either 'high performing' or 'low performing units' was also unlikely. Participants in the week-long executive education program completed a survey on Pioneer's quality culture during the first day of class and then received feedback later in the same week. One of the primary goals of the survey was to generate quality culture profiles for each respondent's unit as well as for Pioneer Motor Company overall and then to draw comparisons with several industry competitors. Thus, the participants were motivated to learn how quality improvement was being implemented and integrated within their own and other organizations.

## Respondents

The full sample contained 935 upper mid-level managers of whom 86 percent were between 35 and 55 years of age. Respondents' tenure with the corporation ranged from approximately 3 to more than 15 years. In order to enrich the survey data, qualitative interview data were collected from the subsample of predominantly male (95 percent) managers from the six 'high performer' units and a subsample of managers from the seven 'low performer' units. Two interviewees were targeted per site, for a total of 26. I eventually interviewed only 24 managers, however, because of a lack of availability of managers at two of the sites. All but two sites were represented (Glass Division and Transmission and Chassis--both in the 'high performer' category). Thus, a 60 percent response rate was generated--40 managers were originally asked to interview and 24 participated. Of the managers who did not participate in interviews, most had relocated to other Pioneer units as a normal function of the career development system, although a few managers had recently retired. Several other managers claimed they did not have relevant experience or information. Three managers also arranged site visits in addition to telephone and face-to-face interviews. These three managers were situated in an assembly plant, an engine plant, and an

engine division's advanced engineering group headquarters--all of which had been intensely engaged in quality improvement initiatives for several years.

## Types of Data Collected

Three types of data collection efforts were used as part of this investigation: questionnaires, interviews and stories, and observations. The questionnaire measured beliefs about quality improvement activities and outcomes. The interviews provided contextual information about the 13 organizational units as a backdrop to story data from informants as well as fine detail about site-specific learning and quality improvement processes and problems. Observations at several sites contributed insights about the complexities of learning and quality improvement in real time automotive manufacturing.

### Questionnaires

During the three year study period, 935 questionnaires were completed--by 133 managers in 1990, by 358 managers in 1991, and in 1992, by 444 managers. Questionnaires were distributed to respondents during their executive education sessions by the faculty director of the program. The program's research staff processed the surveys which were then returned to executives on the third day of the program for diagnostic purposes.

The questionnaire assessed the extent to which a mature quality culture existed in Pioneer units and included 120 questions on quality processes and practices. Many of the Malcolm Baldrige National Quality Award categories were included in the instrument (e.g., senior executive leadership and quality management, information analysis and use, quality planning, human resource development and utilization, quality assurance, and customer satisfaction). In addition, the questionnaire included dozens of items about performance outcomes (e.g., defect and improvement rates, cycle times, warranty costs, organizational effectiveness, etc.). A copy of the survey instrument

appears in **Appendix D**. The present study focused specifically on the following questionnaire areas: performance outcomes; information analysis, use, and dissemination; team processes and structures; quality performance assessments and monitoring; and innovation along with new ideas for improvement.

**Interviews and Stories**

From March through May of 1993, I initiated a preliminary series of observations and interviews of managers attending the monthly Pioneer executive education programs. Each week-long program included a full day session on quality; I attended four of these sessions. In the role of research assistant and classroom visitor, I took hand written notes on and/or tape recorded managers as they told the group success stories about quality improvement efforts in their units. Approximately six stories were shared and analyzed by the group at each of the four sessions I attended, yielding a total of 24 stories. Most of the tapes were subsequently transcribed (see below) and used in concert with my notes to help generate empirical profiles of both continuous quality improvement and organizational learning.

The 24 stories also served as focal points of 30- to 60-minute face-to-face interviews conducted with managers during their one-week executive education program at The University of Michigan. Because the study was in an exploratory phase at the time, these interviews used primarily 'open ended' questions (see Brenner, Brown, & Canter, 1985; Cannell & Kahn, 1966; Glaser & Strauss, 1967; Strauss, 1987; Strauss & Corbin, 1990) about learning processes (including types, phases, levels, and depths of learning as well as knowledge creation and diffusion patterns) and quality improvement (types of standards and measures, specific implementation problems, common tools and procedures, and accessibility of archival data).

From September 1993 through January 1994, I conducted 24 telephone interviews that were a more focused attempt to refine empirical profiles of quality

improvement and learning processes. Each interview required two contacts by the interviewer. The purpose of the first call was to introduce the respondent to the study and to schedule a future interview with sufficient advance time for the respondent to organize stories of his or her unit's past experiences in one successful and one failed effort to improve quality. The order in which stories were told was randomized so that sometimes a success story was solicited first and other times a failure story was solicited first. After each story had been reported, interviewees answered questions that had direct linkages to both the framework and key items on the questionnaire. This allowed some degree of cross-validation of the survey data and contributed to the ongoing refinement of the conceptual framework.

The telephone interviews lasted from 30 to 90 minutes. Following a manager's story telling and depending on his or her unique context, I asked questions for clarification as well as for new information pertaining to some combination of the following issues:

-- Vicarious forms of learning

  -- How and why is benchmarking conducted?
  -- What Pioneer units or outside organizations are studied? Why?
  -- What Pioneer units or outside organizations are permitted to benchmark your unit? Why?
  -- How and why are personnel moved to optimize problem solving expertise (e.g., cross-functional and/or cross-level teams, task forces, new hires, consultants, etc.)?
  -- Are quality improvement stories shared throughout this unit? If so, what is the mechanism (e.g., presentations, newsletters, videos, word-of-mouth, etc.); if not, why not?
  -- How are customers and suppliers typically involved in quality improvement efforts?

-- Direct forms of learning

  -- What types of experiments are most likely to be conducted in this unit? Why?
  -- What types of quality problem solving require trial-and-error as the preferred method? Why?
  -- How and why are near- and hypothetical

histories constructed and studied?

-- Quality improvement measurement

-- What standard measurement tools or systems are used?
-- What measurement innovations has your unit produced? How satisfactory have they been?
-- What types of measures does your unit need but not have? Can they be developed? Describe some of them.
-- What unique measures has your unit developed? Describe some of them.
-- What kinds of archival records regarding quality improvement does your unit maintain?

Due to cross-site contextual variations, not all questions were asked of all interviewees. However, overall, each of the issues covered in the above listed questions were addressed by some managers across units.

The majority of the stories and interviews were tape recorded and transcribed. In other cases, especially where interviews were shorter, an audio recording along with hand written notes provided sufficient research records.

**Observations**

Three managers arranged for half-day site visits and face-to-face interviews during September, November, and December of 1993. One of them had participated in a telephone interview that included his stories about benchmarking and cross-functional team work as well as quality measurement innovations. I visited this site (an advanced engineering group headquarters--part of the engine division) in order to receive education on the development and use of its novel quality measures and to acquire samples of the charts and other tools that this unit had been developing.

A second manager, located in an engine plant, invited me to interview him on site--but only after a complete tour of his facility. He believed that the plant's unique team approach to quality improvement had to be seen to be comprehended.

The third site visit occurred at the suggestion of an assembly plant manager whom I interviewed by telephone in early September 1993. For reasons of geographic

convenience, he arranged for me to tour not his own but another assembly plant at which I had already scheduled future telephone interviews with key quality control managers. During the assembly plant visit, I shadowed the Quality Council's Operating Committee--a cross-functional, cross-level team of approximately 25 managers, area managers, supervisors, and the assistant plant manager. The committee made two (2-hour) inspection rounds per day of new vehicles coming off the assembly line. This afforded me an opportunity to observe quality problem solving processes in action and to gain insight about the complexities of assembly plant operations. For example, perpetual motion, serpentine, fully loaded conveyor belts were suspended from the ceiling as well as mounted on the floor. At this assembly plant, 60 cars on average were produced per hour which translated to one car per minute--no small feat considering that the typical finished luxury car had over 70,000 interconnected parts or components.

## Measurement and Analysis

The framework presented at the end of Chapter 3 (see Figure 3.3) was developed through an iterative process involving literature, data, and analysis. Profiles of the 13 'high performer' and 'low performer' units were initially derived from the literatures on continuous quality improvement and organizational learning. The profiles served as building blocks for the emerging framework. Preliminary analysis of quantitative data collected through questionnaires helped to narrow the research focus by identifying the significant quality variables for inclusion in the framework. Qualitative data collected through interviews, stories, and observations added clarity about quality improvement and learning on both conceptual and phenomenal grounds and supplemented the survey data. This enabled further revision of the profiles and the theoretical framework. It also suggested some possibilities about how the variables in the framework might merge into different patterns based on whether learning occurred

through vicarious and/or direct processes. Both quantitative and qualitative measures and analyses are described in the remainder of this section.

## Quantitative Approach

### Measures of Quality Activities, Learning, and Performance Outcomes

The questionnaire contained 120 items that measured quality improvement activities and performance outcomes. I aggregated responses at the unit level which produced a data set at the organizational level of analysis.[2] For most items that were relevant to the framework, measurement was on a scale of 1 to 6 (with no neutral anchor) as follows:

6 = Agree strongly
5 = Agree moderately
4 = Agree slightly
3 = Disagree slightly
2 = Disagree moderately
1 = Disagree strongly.

However, one set of relevant items measured the frequency with which units used ten different quality tools such as statistical process control, Pareto processes, root-cause analysis, and so forth (6 = constantly use, 1 = never use).

In addition, I constructed three indices that incorporated some items that used a 6-point scale measuring frequency or intensity rather than amount of agreement. 90). One scale (TOOLS7R) measured the use of the most frequently used quality tools; this was a 7-item index (alpha = .93). Another scale (V105106) measured performance outcomes in terms of defects and errors (alpha = .72). The third scale (V148) measured overall quality improvement activities and performance. This was a 120-item index (alpha = .90).

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[2] The process through which variables were deemed relevant to the framework and thus selected for further analysis is discussed in the next section of this chapter, 'Analyses.'

The overall quality index (V148) included questionnaire items from four major areas: quality activities, quality management, quality tools, and quality results. The 'quality activities' section of the survey included questions about: top management's commitment to quality improvement; benchmarking practices and results; collecting and using quality data about customer satisfaction, competitors' performance, suppliers' products, things-gone-wrong, things-gone-right, unit costs, and so forth. The section of the survey on 'quality management' included questions about training, goals, and rewards for continuous quality improvement; commitment to quality improvement principles and practices, etc. The 'quality tools' section of the survey included questions about the extent to which units were using a variety of methods and techniques to improve quality, including: statistical process control (SPC), quality function deployment (QFD), design of experiments (DOE), root-cause analysis, *kaizen*, cross-functional teams, suggestion systems, and so forth. Finally, the 'quality results' section of the survey asked respondents to compare their unit's performance to that of the industry average, to their best competitors, to their customers' expectations, and to their own goal specifications. This section of the questionnaire included questions about: the volume of errors and defects occurring in each unit, the rate of each unit's quality improvement, overall organizational effectiveness, re-work rates, missed deadlines, time to market, and so forth.

Using an iterative process between the theoretical framework, the organizational learning and quality improvement literatures, and the questionnaire, all variables in the data set were examined for their conceptual relevance. This analysis yielded a collection of variables that were then subjected to preliminary statistical analyses (described below). The results indicated thirty-seven items that were statistically significant and relevant to the framework. A summary of all variables retained appears in **Table 4.2**. The measures listed under 'Quality Activities' were

**Table 4.2. Quantitative Analyses: Variables Used**

| Variable Number | Variable Name | Item | Coeff. Alpha |
|---|---|---|---|
| | ***1. Quality Activities:*** | | |
| (1) V14 | Frequently benchmark | Many aspects of my unit's work are "benchmarked." | |
| (2) V15 | Improve via benchmarking | We have made quality improvements in our processes and practices as a result of the data we collect through benchmarking. | |
| (3) V50 | Involve customers and suppliers | Customers and suppliers, as well as employees, are actively involved in helping form quality improvement plans. | |
| (4) V52 | Opportunities to participate in teams | We provide opportunities for all employees to participate in quality improvement efforts through activities such as cross-functional teams, cross-level teams, suggestion systems, and hotlines. | |
| (5) V19 | Establish teams | In order to determine where quality improvement is needed, we establish teams to report regularly. | |
| (6) V77 | Stories shared | Stories or examples of quality improvement are regularly and widely shared throughout the organizations. | |
| (7) V70 | Quality data put in useful format | The quality data we collect is put in a useable format so that everyone who sees it can understand and use it. | |
| (8) V74 | Collect data | Information is collected regularly on adverse indicators (complaints, claims, refunds, etc.) | |
| (9) V48 | Use several types of assessments | We use several types of quality assessments (such as benchmarks, independent evaluations, customer surveys, internal audits) to measure our quality performance. | |
| (10) V69 | Have ongoing monitoring | We have an on-going monitoring system that helps identify what needs improving in the organization. | |
| (11) V13 | Regularly assess how improving | Regular assessments are conducted in our organization of the extent to which employees are improving quality. | |
| (12) TOOLS7R | Use quality tools | How frequently does our unit use these quality improvement tools? (SPC, QFD, DOE, 8-D, Pareto Processes, fault tree or root-cause analysis, kaizen) | .93 |

**Table 4.2 (continued). Quantitative Analyses: Variables Used**

| Variable Number | Variable Name | Item | Coeff. Alpha |
|---|---|---|---|
| | | ***2. Performance Outcomes:*** | |
| (13) V47 | Time to diffuse knowledge | We have taken steps to shorten the time it takes to gather data, analyze it, and disseminate it throughout the organization. | |
| (14) V105106 | Low rates of defects/ errors | We have lower defects/errors than (a) our best competitor or (b) our customers expect. | .72 |
| (15) V148 | Overall Quality | Index of 120 items about quality activities and performance outcomes | .90 |
| | | ***3. Organizational Learning:*** | |
| | | We collect on-going quality data in the following areas: | |
| (16) V24 | | customer expectations | |
| (17) V25 | | customer satisfaction levels | |
| (18) V26 | | employee attitudes and morale | |
| (19) V27 | | domestic competitors' performance | |
| (20) V28 | | global competitors performance | |
| (21) V29 | | supplier quality | |
| (22) V30 | | things-gone-wrong | |
| (23) V31 | | things-gone-right | |
| (24) V32 | | unit costs | |
| (25) V33 | | timeliness of our work | |
| (26) V34 | | new ideas for improvement | |
| | | We use the data we collect in these areas in our day-to-day work: | |
| (27) V35 | | customer expectations | |
| (28) V36 | | customer satisfaction levels | |
| (29) V37 | | employee attitudes and morale | |
| (30) V38 | | domestic competitors' performance | |
| (31) V39 | | global competitors performance | |
| (32) V40 | | supplier quality | |
| (33) V41 | | things-gone-wrong | |
| (34) V42 | | things-gone-right | |
| (35) V43 | | unit costs | |
| (36) V44 | | timeliness of our work | |
| (37) V45 | | new ideas for improvement | |

generally described in Chapter 3. But the items shown under the captions, 'Performance Outcomes,' and 'Organizational Learning' require some explanation.

**Performance outcomes.** As stated earlier, 'Overall Quality' (V148) was an index used to classify units according to high and low performing groups for the purpose of maximizing variance. In addition, changes in units' quality improvement performances over the three-year study period were assessed by comparing unit scores on the 'Overall Quality' index (V148). That is, I analyzed changes in scores on the index by comparing means for three twelve-month periods (1990, 1991, 1992).

I identified questionnaire items that were relevant to performance outcomes and appropriate to serve as dependent variables. Seven such items were identified and they addressed issues pertaining to reducing costs (V87), defects/errors (V107), re-work (V117), time to diffuse data (V47), introducing new products or services or ideas (V124); as well as meeting deadlines (V118) and using data collected on timeliness of work done (V44). Only two variables showed significant differences between 'high performer' and 'low performer' groups. These were V47 ('we are reducing the time it takes to diffuse data') and V105106 ('we have lower rates of defects/errors'). Thus, these two variables were selected as complementary outcome measures. That is, choosing quality improvement outcome indicators is slippery because the meaning of the concept, 'quality' and how to measure it are debatable. On the one hand, we can use results-oriented measures of defects and errors to tell us about the impact of quality actions. On the other hand, we can use process-oriented measures such as 'time to diffuse knowledge' to inform us about the actions used to achieve quality improvement. The analyses that are described in the next section have included measures of quality improvement processes as well as results in order to expand the possibilities for discovering the more promising predictors of quality improvement performance.

**Organizational learning**. There are 22 variables listed in Table 4.2 under 'Organizational Learning' and they are comprised of two matching sets of 11 items each. The first group of 11 items provides a response to the question of how much ongoing quality data is collected in various areas. The second group of 11 items provides a response to the question of how much of the collected quality data is used in units' day-to-day work. A comparison of responses to these two sets of questions represents a proxy variable about the amount of learning occurring in these organizational units. That is, learning is defined as a process involving knowledge acquisition about action-outome relationships. The potential for learning seems to be greatest when more rather than less information is available. On the other hand, although collecting more information means that more information is available for use, it may never be used. Therefore, an assessment of information use should be made and when more information is both available and used, then the likelihood of learning is greatest. As pointed out in Table 4.2, the information is specifically focused on action and outcomes. An example of high levels of organizational learning would be a unit with a rating of 6 ('agree strongly') on an item about *collecting* quality data and a rating of 6 ('agree strongly') on an item about *using* [collected] data. Those managers who rated their units as high ('agree strongly') on *both* collecting and using quality data would be the best candidates for having a great deal of learning occurring in their units.

Prior research suggests that managers who strongly agreed that they collected and used quality data were more likely to be engaged in learning than managers who strongly disagreed (see Ajzen, 1982; Aronson, 1992; Berger & Luckmann, 1967; Eden, 1990; and Fishbein & Ajzen, 1975). Consequently, units whose managers rated them as high in data collection and use were more likely to demonstrate learning. This is similar to Bromiley and Cummings' (1993) study of organizational trust, in which they make an argument for using proxy perception measures for concepts that are otherwise difficult to measure objectively:

> If management believes that subordinates do not act in a trustworthy manner, management will tend to spend more on control systems to keep subordinates in line. Note that the causal variable here is managerial belief which may or may not be aligned with actual behavior (1993: 16).
>
> The theory here makes many predictions that rest on perceptions of trust not whether or not the focal entity truly merits trust. Perceptions rather than 'objective fact' influence behavior (March & Simon, 1958) so that our predictions of behavior may be tested best using perceptions of trust rather than measures of whether the focal entity merits trust (1993: 26). Where the predictions address performance, the connection between perception and actual does become critical.

Likewise, in the present study, the assessment of organizational learning relies on perceptions of information availability and use, not on objective measures of learning.

**Analyses**

The quantitative analyses were aimed at investigating the conceptual framework presented in Chapter 3 with an emphasis on helping to see how vicarious vs. direct learning processes might mediate the quality improvement performances of two different types of organizational units--'high performers' and 'low performers.' The central question inherent in the framework is, "What variables intervene between quality improvement performance and results?" The quantitative data and analyses provided a 'broad stroke' response, they complemented the qualitative data and analyses, and they simplified possibilities for relationships among independent and dependent variables.

**Table 4.3** presents the descriptive statistics and zero-order correlations for variables used in the analyses. All variables in the data set were examined through a variety of SPSS programs for their fit with the assumptions of multivariate analysis. The survey contained 120 items that assessed quality improvement practices and processes--37 of which were associated with organizational learning on conceptual grounds. T-tests were conducted to determine which of those 37 items significantly discriminated between high and low performing units. Apart from the overall quality

**Table 4.3. Means, Standard Deviations, and Correlations* of Variables Related to Organizational Learning****

| VARIABLES | Means | s.d. | N | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. (V14) Frequently benchmark | 4.18 | 1.38 | 280 | | | | | | | | | | | | | | |
| 2. (V15) Improve via benchmarks | 4.31 | 1.37 | 279 | .67 | | | | | | | | | | | | | |
| 3. (V50) Involve customers, suppliers | 4.33 | 1.26 | 271 | .45 | .49 | | | | | | | | | | | | |
| 4. (V52) Opportunities for team work | 4.57 | 1.35 | 271 | .38 | .47 | .60 | | | | | | | | | | | |
| 5. (V19) Establish teams for Q.I. | 4.23 | 1.48 | 258 | .33 | .45 | .53 | .43 | | | | | | | | | | |
| 6. (V77) Stories shared | 3.84 | 1.52 | 274 | .28 | .36 | .47 | .43 | .41 | | | | | | | | | |
| 7. (V70) Quality data put in useful format | 3.71 | 1.49 | 275 | .36 | .42 | .59 | .53 | .55 | .49 | | | | | | | | |
| 8. (V74) Collect data on adverse indicators | 4.55 | 1.54 | 274 | .34 | .45 | .55 | .53 | .53 | .47 | .61 | | | | | | | |
| 9. (V48) Use several types of assessments | 4.76 | 1.34 | 271 | .43 | .54 | .58 | .49 | .57 | .35 | .56 | .62 | | | | | | |
| 10. (V69) Have ongoing monitoring | 3.67 | 1.46 | 275 | .34 | .37 | .56 | .45 | .50 | .44 | .66 | .47 | .45 | | | | | |
| 11. (V13) Regularly assess how improving | 4.24 | 1.37 | 280 | .43 | .48 | .56 | .42 | .49 | .39 | .58 | .51 | .56 | .45 | | | | |
| 12. (TOOLS7R) Use quality tools index | 3.64 | 1.66 | 276 | .40 | .48 | .50 | .51 | .43 | .35 | .54 | .60 | .53 | .42 | .50 | | | |
| 13. (V148) Overall quality index | 3.97 | 0.63 | 280 | .53 | .61 | .76 | .70 | .55 | .65 | .73 | .67 | .67 | .67 | .65 | .64 | | |
| 14. (V47) Reducing time to diffuse data | 4.22 | 1.31 | 271 | .33 | .40 | .53 | .48 | .36 | .35 | .50 | .48 | .52 | .48 | .42 | .43 | .62 | |
| 15. (V105106) Defects/errors index | 3.97 | 1.06 | 262 | .07 | .12 | .08 | .09 | .08 | .06 | .17 | .26 | .35 | -.004 | .20 | .34 | .10 | .12 |

* Correlation coefficients of .17 or greater are significant at $p < .001$, one-tailed tests.

** Variables were included only if they significantly discriminated between high and low performing units.

index (V148), there were fourteen learning-related items that significantly discriminated between high and low performing units (V14, V15, V50, V52, V19, V77, V70, V74, V48, V69, V13, seven items on quality tools [scaled as 'TOOLS7R'], and two items on performance outcomes [V105 and V106 on defect/error rates]). Among the non-significantly different items were beliefs about: top management's commitment to the corporate quality philosophy (V8), the frequency of using new ideas for improvement (V45), quality taking a high priority even in tight financial times (V126), and organizational structure not inhibiting achievement of quality objectives. In all, there were no statistically significant differences between high and low performing units on 23 variables; no systematic pattern was observed in this group. In addition, although not reported here, correlational and exploratory factor analyses were performed and the results generally confirmed my a priori expectations about the relationships among independent variables in the conceptual framework.

In order to more clearly grasp the strength of those associations, a series of twelve discriminant function analyses was performed on the statistically significant variables. This technique is useful in determining which linear combination of variables are the best predictors of group membership--the opposite of multiple analysis of variance (MANOVA) which asks whether group membership produces reliable differences on a combination of dependent variables. My objective in performing discriminant function analyses was to generate a collection of variables that could be used to predict 'high performer' vs. 'low performer' group membership and to link those variables to vicarious and/or direct learning processes.

A series of discriminant function analyses was run for all statistically significant variables. The questionnaire was organized into major sections according to categories similar to the Malcolm Baldrige National Quality Award (e.g., quality leadership, information and analysis, customer satisfaction, quality tools, etc.). Initial runs were performed on variables within each of those sections. Next, the most

significant discriminating variables were identified from each section and used together in a final analysis to find the dimensions along which 'high performer' and 'low performer' groups differed from each other. Then I examined whether vicarious and/or direct learning processes were underlying factors for each of the discriminating variables. In this way, I was able to arrive at an approximate, indirect measure of the dominant form of learning used in 'high performer' vs. 'low performer' groups. These analyses were instrumental in helping me to begin developing empirical profiles of continuous quality improvement and of learning for the 'high performer' and 'low performer' groups. The empirical profiles were compared to theoretical profiles that I had previously developed with the aim of refining the conceptual framework and giving more focused direction to the emerging qualitative data collection effort.

The next major link in the framework involved performance outcomes. Earlier, I explained construction of an overall quality index (V148) that was used to classify organizational units into either a 'high performer' or 'low performer' group. Units were also categorized according to whether their score on the overall quality index had improved or declined from 1990-1991 and from 1991-1992. Because both of these analyses depended on survey respondents' perceptions, some degree of cross-validation was achieved by establishing a panel of Pioneer general manager experts to rate the 13 units along several dimensions:

1. *Which units would you expect to have shown the best quality improvement performance during the last 3-4 years?*
2. *For each unit, would you expect to have seen high, medium, or low quality improvement performance over the past 3-4 years?*

The results of the panel's assessment complemented data from surveys and interviews.

Continuing in my exploration of how quality activities might be related to quality improvement outcomes, sets of bivariate and multiple regression analyses were performed. Every independent variable (see Table 4.3) was regressed on each of two

of the outcome variables: (V47) 'shortening the time to diffuse data/knowledge' and (V105106) 'lower rates of defects/errors than best competitor has or customers expect.' These were the two significant outcome variables emerging from previous analyses. This provided a sense of how important each single variable might be to prediction. All independent variables were then regressed on each of the two dependent variables using the direct method ('standard,' or 'simultaneous,' multiple regression). This procedure is appropriate for exploratory research and allows adequate opportunity for identifying superfluous independent variables.[3] No regression analysis was performed using the outcome variable 'V148' which was the index of all survey items; this variable was not appropriate because of its strong correlations with the independent variables from which it was constructed. In sum, the series of regression analyses helped to identify some of the variables that were promising predictors of quality performance outcomes.

The last segment of the framework to be statistically analyzed involved a proxy for organizational learning. As shown in Table 4.2, the questionnaire contained a matched set of 22 items on beliefs about collecting and using [collected] quality data. Cases were analyzed with the aim of determining how many fell into the '6' ('agree strongly') category for *both* collecting and using information. All cases in this class were examined for group membership and an analysis performed to determine if they belonged primarily to the 'high performer' or 'low performer' group. The findings from this analysis were also used to cross-validate interview data about learning patterns in each of the 13 units under study.

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[3] Standard multiple regression does not involve prior theoretical considerations about how important each variable might be (as in hierarchical multiple regression, which can also be used for testing hypotheses) nor does it rely solely on statistical criteria (as in stepwise or setwise regression, which is useful for model-building and especially when multicollinearity or singularity are present).

The survey data and analyses described above were enhanced by blending them with qualitative data collected after the questionnaires had been completed. The next section describes the more inductive side of this study.

## Qualitative Approach

The survey data addressed my central interests--vicarious and direct forms of learning--in a useful but indirect fashion. Through story, interview, and observational data, I gained a deeper view of the learning dynamics within each organizational unit and could compare what I saw with the results of the quantitative data analyses. The framework continued to be modified as stories and interview data were collected.

### Measures and Analyses

Within an overarching interview context, managerial stories of successful and failed efforts to improve quality were recorded and transcribed. I have treated the stories as relatively accurate accounts of past events rather than as symbolic reconstructions of the organization's history (see Gabriel, 1991: 856).[4] Content analyses of the story and interview data were guided by interview summary sheets (see **Appendix E**) that included the key components of the framework (see Figure 3.3) and corresponding survey questions.

Following Miles and Huberman (1984) and Weber (1990) a list of the themes to be coded was developed by the author but later refined to synchronize analysis efforts with two other coders (see below). Codes were developed for two major themes: quality activities used by managers to solve problems and learning processes used in quality problem solving. There were 39 different codes developed and applied to quality activities and 7 codes for organizational learning processes. For example,

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[4] Nevertheless, "stories often conceal as much as they reveal . . . ." (Gabriel, 1991: 858) and the past "enlightens only with delicate coaxing" (Fischoff, 1982). Let the listener beware.

'BEN' was the code for benchmarking (a quality problem solving activity) and 'MOD' was the code for modeling (an organizational learning process). Learning processes were further subcategorized as either 'vicarious' or 'direct' in accordance with the thrust of the research questions outlined earlier. In addition to an interest in finding evidence of quality problem solving activities and vicarious or direct learning processes in the interview transcripts, I was also interested in identifying sequences of learning processes in the stories. That is, the coders and I were also looking for learning patterns in quality problem solving. For example, solving a quality problem might initially involve benchmarking (a vicarious form of learning), followed by trial-and-error (a direct form), followed by an experiment (another direct form), followed by a vicarious form of learning, and so forth. Through this analysis, it was hoped that vicarious and direct learning patterns would emerge and could then be linked to particular performance outcomes. The third page of the interview summary sheet provided a tracking mechanism for this type of sequence analysis (see Appendix E).

Two first-year B.B.A. students were recruited and trained as coders. They had recently completed the core course in organizational behavior at the Michigan Business School and were interested in gaining non-paid experience on a research project involving a Fortune-500 company. Several practice sessions were conducted to allow for refinements in coders' definitions of the various categories to be coded and revision of coding rules. In order to test the clarity of category definitions, the students were then assigned duplicate copies of the same eight interview transcripts for independent coding. Because each interview contained a success and a failure story, there were 16 stories (total) to code in addition to the more general interview text. Of the 24 interviews that were completed, this set of eight was selected for simultaneous analysis because by comparison, it contained the most well defined stories that were clearly articulated and substantively unambiguous (i.e., jargon free). In short, they were highly analyzable. After four interviews were completely coded, the student

raters completed one set of interview summary sheets for each interview transcript. We then met as a group to reconcile the interview summaries through negotiation and reached compromise in every case of disagreement. The second set of four interviews (i.e., eight stories) was analyzed in the same fashion. Four transcripts provided interview data from managers in high performing units and four other transcripts provided data from low performing units. Inter-rater reliability before reconciliation was 95 percent for the vicarious learning category and 56 percent for the direct learning category across all units (i.e., high and low performing units combined). The coders found that instances of vicarious learning (modeling, imitating, or personnel movements) were much more readily identifiable than instances of direct learning (insight, experiments, trial-and-error, simulations). The negotiation process therefore involved careful review of definitions of the learning concept that had been established earlier in the analysis process.

Although extensive quantitative analyses were not planned for the interview data, their value to the study was still high. Coding and content analyzing the stories/interviews by multiple independent raters represented an important reliability check on my own thinking. It allowed me to verify interpretations of textual passages in the interviews that I had independently developed as supplements to the survey data.

The results of the qualitative and quantitative analyses are reported in the next chapter.

# CHAPTER 5

# ANALYSES AND RESULTS

The task in this chapter is to weave together quantitative and qualitative findings to produce a relatively unified perspective on how vicarious and direct forms of learning may mediate the relationship between quality activities and results. The findings from statistical analyses of questionnaire data on quality activities and outcomes are compared to the qualitative data in order to identify areas of consensus as well as new puzzles that the contrast reveals. The quantitative examination of the data constitutes the core of the analysis. The story, interview, and observational data analyses supplement the survey results. Blending discussion of quantitative and qualitative analyses provides an opportunity to consider the fit between the organizational units in the sample and the main elements in the theoretical framework presented in Chapter 3.

## Quality Activities

### Quantitative Approach

**High vs. low performers.** The main focus of this section is on the variables shown in the conceptual framework which were described in Chapter 4 (see Table 4.2). **Table 5.1** summarizes scores on the overall quality index (V148) for both high and low performing units during the study period. The cross-sectional measure of a unit's overall score for the combined three years was used to separate groups into 'high performer' and 'low performer' categories. In addition, in each of these groups, some units demonstrated a higher score and others, a lower score by the end of 1992.

**Table 5.1. Overall Quality Index: Change in Units' Scores from 1990-1992**

| ***HIGH PERFORMING UNITS*** | **1990 Mean Score V148** | **1991 Mean Score V148** | **1992 Mean Score V148** | **1990-1992 Overall Score** | **Change: 1990-1992** |
|---|---|---|---|---|---|
| R&D | N/A | 4.14 | 4.35 | 4.28 | 0.21 |
| Assembly | 3.81 | 4.25 | 4.25 | 4.19 | 0.44 |
| Engine | 4.06 | 4.05 | 4.33 | 4.15 | 0.27 |
| Glass | 4.33 | 3.94 | 4.05 | 4.04 | -0.28 |
| Powertrain | N/A | N/A | 4.08 | 4.08 | N/A |
| T&C* | 4.12 | 4.06 | 4.07 | 4.10 | -0.04 |

| ***LOW PERFORMING UNITS*** | **1990 Mean Score V148** | **1991 Mean Score V148** | **1992 Mean Score V148** | **1990-1992 Overall Score** | **Change: 1990 to 1992** |
|---|---|---|---|---|---|
| ER | 3.67 | 3.38 | 3.74 | 3.59 | 0.07 |
| ESES** | 3.72 | 3.69 | 3.50 | 3.59 | -0.23 |
| Export | N/A | N/A | 3.51 | 3.52 | N/A |
| Ext. Affairs | 3.18 | 3.73 | N/A | 3.29 | 0.55 |
| Land Services | N/A | 3.64 | 3.37 | 3.46 | -0.27 |
| OGC (legal services) | 3.75 | 3.25 | 3.45 | 3.47 | -0.3 |
| Pub. Affairs | N/A | 3.15 | 3.24 | 3.20 | 0.09 |

N/A = data are not available.

* T&C = Transmission and Chassis
** ESES = Environmental and Safety Engineering Services

Differences within groups were of theoretical and empirical interest, but tests were inconclusive because of small sample size. For example, there were only 6 managers in the Export unit, 5 managers in External Affairs, and 9 managers in Land Services.

To cross-validate managers' ratings as they appear in Table 5.1, a panel of Pioneer experts at the upper management level was established for the purpose of ranking the 13 organizational units along two dimensions. Each of six general managers was asked to provide two assessments:

1. *During the past 3-4 years, which of the following components/units would you expect to have shown "High," "Medium," or "Low" quality improvement (QI) performance? Please label the units as "H" (high performance), "M" (medium performance), "L" (low performance), or "-" (don't know).*

2. *If possible, rank the units (from 1 to 13) to reflect which units you would expect to have shown the best quality improvement (QI) performance during the last 3-4 years [#1 to indicate most superior and #13 to indicate least superior performance].*

As **Table 5.2** indicates, overall, survey respondents and expert panel members were in relatively strong agreement about units' quality improvement performance. The rank order correlation coefficient between survey respondents' and experts' rankings is .58. **Table 5.3** presents the results of a correlational analysis that indicates this overall agreement. Additional preliminary tests were performed on all variables pertaining to: performance outcomes; information analysis, use, and dissemination; team processes and structures; quality performance assessments and monitoring; and innovation and new ideas for improvement.

**Table 5.2 . General Managers' Rankings of 13 Organizational Units' Quality Performance Over Time**

| | Rankings by General Manager 1 | | Rankings by General Manager 2 | | Rankings by General Manager 3 | | Rankings by General Manager 4 | | Rankings by General Manager 5 | | Rankings by General Manager 6 | | Rankings by survey respondents |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **HIGH PERFORMERS** | Rank | Class | Rank | Class | Rank | Class | Rank | Class | Rank | Class | Rank | Class | Rank |
| R&D | 8 | L | 6 | | - | | 7 | M | - | | - | H | 1 |
| Assembly | 6 | M | 3 | | 1 | H | 4 | H | 2 | H | - | H | 2 |
| Engine | 2 | H | 1 | | 5 | M | 1 | H | 1 | H | - | H | 3 |
| Glass | 1 | H | 4 | | 3 | M | 5 | H | 5 | L | - | M-H | 6 |
| Power | 3 | H | 1,2 | | 4 | M | 1 | H | 4 | H | - | H | 5 |
| T&C | 7 | H | 2 | | 2 | M | 1 | H | 3 | H | | H | 4 |
| **LOW PERFORMERS** | Rank | Class | Rank | Class | Rank | Class | Rank | Class | Rank | Class | Rank | Class | Rank |
| ER | 9 | L | 7 | | 6 | L | 10 | L | 6 | L | | L | 7 |
| ESES | 12 | L | 5 | | - | | - | | - | | | M | 8 |
| Export | 5 | M | 5 | | - | | 9 | M | - | | | M | 9 |
| Ext. Affairs | 11 | L | 7 | | - | | 8 | M | - | | | L | 12 |
| Land | - | | - | | - | | - | | - | | | M | 11 |
| OGC | 7 | L | 6 | | - | | 6 | M | - | | | M | 10 |
| Pub. Affairs | 10 | L | 7 | | - | | 10 | L | - | | | L | 13 |

H = High, M = Medium, L = Low - indicates missing data

Not all managers could both rank and classify the 13 organizational units. In some cases, managers' knowledge was insufficient. All available data are displayed.

**Table 5.3 Matrix of Spearman Correlation Coefficients on Expert Panel's vs. Survey Respondents' Assessment of Units' Quality Improvement Performance over Time**

| | *(Judges on Expert Panel)* J1 | J2 | J3 | J4 | J5 | J6 | *Survey* Respondents |
|---|---|---|---|---|---|---|---|
| J1 | 1.00 | | | | | | |
| J2 | .35 | 1.00 | | | | | |
| J3 | .09 | .06 | 1.00 | | | | |
| J4 | .21 | .96 | .21 | 1.00 | | | |
| J5 | .26 | .70 | .37 | .70 | 1.00 | | |
| J6 | .66 | .66 | .66 | .70 | .66 | 1.00 | |
| Survey | .14 | .55 | .60 | .58 | .94 | .66 | 1.00 |

**Table 5.4** shows the results of t-tests[5] that determined significant differences in means between the 'high performer' and 'low performer' groups. The most conspicuous difference between the groups was in the area of tools (listed as the 12th variable in the table). 'High performing' units seemed to be significantly more likely to use the basic quality tools (#12), as well as to put quality data in a useful format that everyone understands (#7), to collect data on adverse indicators (complaints, refunds, defects, returns, etc.) (#8), and to use several types of assessments of quality improvement performance (benchmarks, independent evaluations, internal audits, customer surveys, etc.) (#9). The first two quality improvement activities emphasize direct forms of learning whereas the latter two activities focus more on vicarious learning. To gain clarity on the pattern of occurrences of these two forms of learning, several analyses were undertaken.

**Identifying strong predictors.** To examine the strength of association between group membership and the predictor variables, I ran tests to determine which of the full set of 120 variables were among the strongest discriminators of high and low performing units. To find the dimensions along which groups differed, a series of 12 direct discriminant function analyses were performed.[6] Each run included variables from one of 12 primary questionnaire categories (e.g., quality leadership,

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[5] Because no survey items measuring suggestion systems, new ideas for improvement, or similar activities showed significant differences between group means, this dimension ('new ideas and suggestions') of the framework was not analyzed using questionnaire data. To compensate, qualitative data was collected and analyzed for this element of quality activities.

[6] Though not reported here, exploratory factor analysis supported these results and helped to provide a clearer sense of the coherent subsets that might be formed from the entire set of independent variables. The subsets could then be classified as containing underlying processes--either direct, vicarious, or mixed forms of learning--that might be influencing performance.

**Table 5.4. Results of t-tests for Unit Type and Quality Improvement Variables**

| Variables | High Perf. Units Mean | High Perf. Units S.D. | High Perf. Units N | Low Perf. Units Mean | Low Perf. Units S.D. | Low Perf. Units N | t-value | Signif.* |
|---|---|---|---|---|---|---|---|---|
| *INDEPENDENT VARIABLES* | | | | | | | | |
| 1. (V14) Frequently benchmark | 4.45 | 1.22 | 198 | 3.51 | 1.5 | 82 | 5.03 | .001 |
| 2. (V15) Improve via benchmarks | 4.63 | 1.17 | 197 | 3.54 | 1.52 | 82 | 5.84 | .001 |
| 3. (V50) Involve customers, suppliers | 4.62 | 1.07 | 196 | 3.57 | 1.40 | 75 | 5.85 | .001 |
| 4. (V52) Opportunities for team work | 4.88 | 1.11 | 196 | 3.74 | 1.55 | 75 | 5.80 | .001 |
| 5. (V19) Establish teams for Q.I. | 4.54 | 1.28 | 181 | 3.50 | 1.65 | 77 | 4.97 | .001 |
| 6. (V77) Stories shared | 3.98 | 1.35 | 196 | 3.02 | 1.57 | 79 | 4.75 | .001 |
| 7. (V70) Quality data put in useful format | 4.26 | 1.37 | 196 | 2.76 | 1.32 | 78 | 8.30 | .001 |
| 8. (V74) Collect data on adverse indicators | 5.05 | 1.15 | 195 | 3.30 | 1.65 | 79 | 8.56 | .001 |
| 9. (V48) Use several types of assessments | 5.18 | .96 | 196 | 3.65 | 1.55 | 75 | 7.96 | .001 |
| 10. (V69) Have ongoing monitoring | 3.97 | 1.41 | 196 | 2.91 | 1.28 | 79 | 6.03 | .001 |
| 11. (V13) Regularly assess how improving | 4.63 | 1.21 | 198 | 3.28 | 1.27 | 82 | 8.21 | .001 |
| 12. (TOOLS7R) Use quality tools **index** | 4.43 | 1.07 | 198 | 1.61 | 1.08 | 78 | 19.51 | .001 |
| *DEPENDENT VARIABLES* | | | | | | | | |
| 13. (V148) Overall quality **index** | 4.16 | .51 | 198 | 3.47 | .63 | 82 | 8.74 | .001 |
| 14. (V47) Reducing time to diffuse data/knowledge | 4.51 | 1.17 | 196 | 3.45 | 1.31 | 75 | 6.11 | .001 |
| 15. (V105106) Defects/errors **index** | 4.25 | .92 | 189 | 3.22 | 1.03 | 73 | 7.41 | .001 |

* $p < .001$, 2-tail significance

quality assurance, information analysis and use, etc.).[7] The statistically significant variables with the highest structure coefficients, or 'loadings,' on each discriminant function in each of the 12 runs were included in a final analysis. The last run produced a set of discriminating variables that were the best predictors of group membership based on types of quality activities. **Table 5.5** shows the results of these analyses.

The results presented in Table 5.5 were highly significant: Wilks' lambda[8] was .19 at $p < .0000$, the canonical correlation of the discriminant function was .90, and a total of 97.57 percent of cases were classified correctly. In short, this analysis identifies the linear combination of 20 variables that were significant predictors of membership in either high or low performing groups. That is, based on these 20 variables, 97.57 percent of cases were correctly classified into their proper performance cluster when the probability of being classified into each group is constrained to be equal (see Cameron, 1981: 37; Klecka, 1975; Tabachnick & Fidell, 1989).

One of the primary goals of this analysis was to discover and interpret the combination of predictors (the discriminant function) that separated high and low performing units. 'High performing' units were distinguished by their frequent use of quality tools (Table 5.5 lists seven variables), collecting information in a few critical areas (e.g., things-gone-wrong, adverse indicators, supplier quality, unit costs), putting the data in useable formats, conducting multiple and diverse assessments of their quality performance, rewarding for quality improvement by incorporating quality goals in annual performance appraisals, and providing ongoing training in quality concepts as

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[7] These are similar to the basic Baldrige categories.

[8] Near-zero values of lambda denote high discrimination between group centroids although lambda can also be used as a measure of association. In discriminant function analysis, lambda provides a test of significance by converting it into an approximation of either the chi-square or F distributions (see Klecka, 1980: 38-40).

**Table 5.5. Results of Final Discriminant Function Analysis for Quality Activities in Two Groups**

**Function 1:**

| Eigenvalue | Percent Variance | Canonical Correlation | Wilks' lambda | Chi square | df | Sig |
|---|---|---|---|---|---|---|
| 4.21 | 100 | .90 | .19 | 267.31 | 84 | .0000 |

| VARIABLES | | CORRELATION WITH DISCRIMINANT SCORE |
|---|---|---|
| V98 | Use Pareto processes (quality tools) | .60 |
| V94 | Use statistical process control (quality tools) | .51 |
| V97 | Use 8-D (quality tools) | .50 |
| V99 | Use fault-tree, root-cause analysis (quality tools) | .41 |
| V95 | Use quality function deployment (QFD) (quality tools) | .35 |
| V30 | Collect data on things-gone-wrong | .34 |
| V96 | Use DOE (design of experiments) (quality tools) | .32 |
| V48 | Use several types of assessments (benchmarks, indep. evals., etc.) | .31 |
| V29 | Collect data on supplier quality | .31 |
| V100 | Use *kaizen* (quality tools) | .29 |
| V41 | Use data collected on things-gone-wrong | .28 |
| V74 | Collect information on adverse indicators | .28 |
| V61 | Quality goals included in annual performance appraisals | .27 |
| V32 | Collect data on unit costs | .27 |
| V56 | Everyone is trained in quality concepts, techniques, methods | .26 |
| V46 | Types and analyses of our quality data are constantly improving | .26 |
| V31 | Collect data on things-gone-right | .25 |
| V57 | Ongoing quality training every year | .25 |
| V70 | Quality data put in useable format that everyone understands and can use | .25 |
| V13 | Regular assessments made of extent to which employees are improving quality | .25 |

| GROUP | CENTROID | % CASES CLASSIFIED CORRECTLY |
|---|---|---|
| High performers | 1.25 | 98.0% |
| Low performers | -3.30 | 96.5% |
| Total | -- | 97.57% |

well as techniques and methods. In sum, the high performing units were characterized by attention to gathering, analyzing, and using data about quality performance and its improvement. In other words, a defining characteristic of the high performing units was knowledge acquisition and use.

The set of discriminating or predictor variables listed in Table 5.5 provided a powerful explanation of differences among the two groups of Pioneer units and was therefore retained and used to help refine the conceptual framework. In addition, it was somewhat modified: the seven variables in Table 5.5 that pertain to 'quality tools' were transformed into a 7-item scale (alpha = .93) to simplify interpretation in subsequent quantitative analyses.

**Determining promising predictors**. Another series of multivariate analyses investigated relationships between the key quality activities and performance outcomes shown in the conceptual framework. Two questions drove this inquiry. The first, and the underlying question of interest, was: Do particular types of learning processes (vicarious vs. direct) explain differential success in quality improvement performance across organizational units? This can be answered by blending qualitative data into this analysis, once the relationship between quality activities and performance has been clarified. A second related question is: do particular learning sequences or patterns explain differential success in performance outcomes across time? This question also requires first examining quantitative results.

The dependent variables selected for investigation were described in Table 4.3 (means, standard deviations, and correlations) and Table 5.4 (t-test results). They are listed in **Table 5.6.** Combining them with the same set of 12 independent variables used in discriminant analyses, a series of bivariate regressions were performed followed by two standard multiple regression analyses. The purpose of the bivariate regressions was to identify the best predictors of the outcome variables listed in Table 5.6.

**Table 5.6. Dependent Variables: Performance Outcomes**

- *(V47)* Reducing time to diffuse data/knowledge

  *Quality as action (process)*

  "We have taken steps to shorten the time it takes to gather data, analyze it and disseminate it through the organization."

- *(V105106)* Defects/errors

  *Quality as outcome (results)*

  "We have lower defects/errors than (a) our best competitor and (b) our customers expect."

**Table 5.7** shows the results of bivariate regression analyses and **Table 5.8** presents results from the direct multiple regressions.

The pool of potentially best predictors of each outcome variable is shown in Table 5.7. On the one hand, different quality activities appeared as potentially significant predictors of different outcomes. On the other hand, there was overlap among quality activities and some of them appeared as significant predictors of both outcome variables. For example, 'use several types of assessments' (V48) was identified as a potentially powerful predictor of both dependent variables. Typical 'assessments' might include benchmarking (internal and external), customer surveys, independent evaluations, internal audits, and so forth--signifying a mix of vicarious and direct learning processes.

The results of the multiple regression analyses are shown in Table 5.8. The most powerful independent variable was V48 'use several types of assessments.' It was a significant predictor of both performance outcomes. Two other independent variables showed promise as strong predictors: V69 'ongoing monitoring,' and TOOLS7R 'use quality tools'--both of which have been characterized in this study as indicating direct rather than vicarious learning processes. These regression analyses suggest that neither vicarious nor direct learning processes are clearly dominant factors but instead, their proper blend might be key. Continuous assessing and monitoring performance with the right mix of quality tools appears to be a significant feature of successful quality performance.

To cross-validate this finding, I investigated the differences between high and low performing units regarding their patterns of collecting and using quality data in eleven key areas.

**Collecting and using quality data.** As described in Chapter 4 (see Table 4.2), the questionnaire contained a matched set of 22 items on collecting

**Table 5.7. Results of Bivariate Regression Analyses: Performance Outcomes**

| Predictor Variables | | Dependent Variable (V47) Reducing time to diffuse data/ knowledge | | Dependent Variable (V105106) Lower Defects/ than best competitors; than customers expect | |
|---|---|---|---|---|---|
| | | **Beta** | **Adj.$R^2$** | **Beta** | **Adj.$R^2$** |
| 1. (V14) Frequently benchmark | | .33 | .11 | .07 | .001 |
| | F | 33.08*** | | 1.29 | |
| 2. (V15) Improve via benchmarks | | .40 | .16 | .12 | .01 |
| | F | 50.60*** | | 3.64 | |
| 3. (V50) Involve customers, suppliers | | .53 | .27 | .08 | .002 |
| | F | 102.63*** | | 1.63 | |
| 4. (V52) Opportunities for team work | | .48 | .22 | .09 | .005 |
| | F | 78.14*** | | .2.19 | |
| 5. (V19) Establish teams for Q.I. | | .36 | .13 | .08 | .002 |
| | F | 37.85*** | | 1.49 | |
| 6. (V77) Stories shared | | .35 | .12 | .06 | -.0008 |
| | F | 38.01*** | | 0.79 | |
| 7. (V70) Quality data put in useful format | | .50 | .25 | .17 | .03 |
| | F | 87.09*** | | 7.61** | |
| 8. (V74) Collect data on adverse indicators | | .48 | .23 | .26 | .06 |
| | F | 79.87*** | | 18.23*** | |
| 9. (V48) Use several types of assessments | | .52 | .27 | .35 | .12 |
| | F | 100.78*** | | 36.10*** | |
| 10. (V69) Have ongoing monitoring | | .48 | .23 | -.004 | -.003 |
| | F | 79.46*** | | .004 | |
| 11. (V13) Regularly assess how improving | | .42 | .18 | .20 | .04 |
| | F | 58.09*** | | 10.74*** | |
| 12. (TOOLS7R) Use quality tools | | .43 | .18 | .34 | .11 |
| | F | 61.77*** | | 34.55*** | |

* $p < .05$
** $p < .01$
*** $p < .001$

**Table 5.8. Results of Multiple Regression Analyses: Performance Outcomes**

| Predictor Variables | Dependent Variable (V47) Reducing time to diffuse data/knowledge | Dependent Variable (V105106) Lower defects/errors than best competitor; than customers expect |
|---|---|---|
| | **Beta** | **Beta** |
| | **For Variables in the Equation:** | **For Variables in the Equation:** |
| 1. (V15) Improve via benchmarks | .03 | |
| 2. (V50) Involve customers, suppliers | .14 | |
| 3. (V52) Opportunities for team work | .12 | |
| 4. (V70) Quality data put in useful format | .08 | |
| 5. (V74) Collect data on adverse indicators | .05 | -.007 |
| 6. (V48) Use several types of assessments | .20** | .28*** |
| 7. (V69) Have ongoing monitoring | .14* | |
| 8. (V13) Regularly assess how improving | .03 | -.05 |
| 9. (TOOLS7R) Use quality tools | .04 | .20** |
| | $R^2$ .40<br>Adjusted $R^2$ .38<br>F = 18.63<br>Signif F = .0000 | $R^2$ .15<br>Adjusted $R^2$ .14<br>F = 10.87<br>Signif F = .0000 |

* p < .05
** p < .01
*** p < .001

and using [collected] quality data. These 11 pairs of variables are proxies for organizational learning.

**Table 5.9** shows that high performing units clearly dominate low performing units in that they tend (a) to collect quality data on customer expectations, satisfaction and eight other key areas as well as (b) to use those collected data in their day to day efforts to improve quality. Thus, managers in high performing units rated their units as having more learning going on in their day-to-day work than did managers in low performing units.

It is interesting to note that the area of information collection and use most frequently chosen was things-gone-wrong (frequency = 72). In contrast, things-gone-right was selected by only 39 managers as an area in which they believed quality data were extensively collected and used. In sum, this suggests that more managers believed that they learned from failure than success. This has important implications for approaches to organizational learning; for example, benchmarking (vicarious learning) involves studying another organization's success and then adapting its recipes to fit local conditions. Yet, the empirical emphasis (above) is on learning from failure and organizations do not typically codify their mistakes, even when they are worthwhile over the long-term.

In sum, the quantitative data analyses indicated that generating new ideas and suggestions was not a significantly important element of successful continuous quality improvement. Moderately important elements included benchmarking, story telling, teams, and involving customers and suppliers in quality planning. Critical factors appeared to be collecting and using various kinds of quality data, monitoring and assessing quality performance, and using quality tools.

The survey data analyses suggested what *types* of assessments or quality tools would make a difference in performance in different organizational units. Data from stories and interviews provided important details to enrich and supplement the survey

Table 5.9. Distribution of Values for 'Data Collected' and 'Data Used' among High and Low Performing Units

| Key: 6=Strongly agree 1=Strongly disagree | Customer expectations | | Customer satisfaction | | Employee attitudes | | Domestic competitor | | Global competitor | | Supplier quality | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Collect data v24 | Use data v35 | Collect data v25 | Use data v36 | Collect data v26 | Use data v37 | Collect data v27 | Use data v38 | Collect data v28 | Use data v39 | Collect data v29 | Use data v40 |
| **SUMMARY OF HIGH PERFORMERS' Frequency of Matched Responses ("6" on "Collect" and "6" on "Use")** | | | | | | | | | | | | |
| R&D (n=21) | 5 | | 7 | | 3 | | 4 | | 4 | | 0 | |
| Assembly (n=106) | 29 | | 35 | | 7 | | 21 | | 27 | | 29 | |
| Engine (n=26) | 1 | | 3 | | 0 | | 4 | | 6 | | 8 | |
| Glass (n=14) | 5 | | 5 | | 0 | | 2 | | 3 | | 4 | |
| Power (n=11) | 0 | | 2 | | 1 | | 0 | | 1 | | 0 | |
| T&C (n=20) | 4 | | 5 | | 2 | | 3 | | 4 | | 5 | |
| *TOTAL (n=198)* | 44 | | 57 | | 13 | | 34 | | 45 | | 46 | |
| **SUMMARY OF LOW PERFORMERS' Frequency of Matched Responses ("6" on "Collect" and "6" on "Use")** | | | | | | | | | | | | |
| ER (n=15) | 0 | | 2 | | 0 | | 0 | | 1 | | 0 | |
| ESES (n=21) | 0 | | 0 | | 0 | | 0 | | 1 | | 1 | |
| Export (n=6) | 0 | | 0 | | 0 | | 0 | | 1 | | 0 | |
| Ext. Affairs (n=5) | 0 | | 0 | | 0 | | 0 | | 0 | | 0 | |
| Land (n=9) | 0 | | 0 | | 0 | | 0 | | 0 | | 0 | |
| OGC (n=15) | 0 | | 0 | | 0 | | 0 | | 0 | | 0 | |
| Pub. Affairs (n=11) | 0 | | 1 | | 0 | | 0 | | 0 | | 0 | |
| *TOTAL (n=82)* | 0 | | 3 | | 0 | | 0 | | 3 | | 1 | |

Table 5.9 (continued). Distribution of Values for 'Data Collected' and 'Data Used' among High and Low Performing Units

| Key: 6=Strongly agree 1=Strongly disagree | Things-gone-wrong | | Things-gone-right | | Unit costs | | Timeliness of our work | | New ideas for improvement | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Collect data v30 | Use data v41 | Collect data v31 | Use data v42 | Collect data v32 | Use data v43 | Collect data v33 | Use data v44 | Collect data v34 | Use data v45 |
| **SUMMARY OF HIGH PERFORMERS' Frequency of Matched Responses ("6" on "Collect" and "6" on "Use")** | | | | | | | | | | |
| R&D (n=21) | 5 | | 3 | | 7 | | 3 | | 7 | |
| Assembly (n=106) | 44 | | 22 | | 28 | | 14 | | 17 | |
| Engine (n=26) | 9 | | 7 | | 7 | | 3 | | 3 | |
| Glass (n=14) | 1 | | 0 | | 3 | | 1 | | 1 | |
| Power (n=11) | 4 | | 2 | | 4 | | 2 | | 2 | |
| T&C (n=20) | 9 | | 5 | | 6 | | 0 | | 0 | |
| *TOTAL (n=198)* | 72 | | 39 | | 55 | | 23 | | 30 | |
| **SUMMARY OF LOW PERFORMERS' Frequency of Matched Responses ("6" on "Collect" and "6" on "Use")** | | | | | | | | | | |
| ER (n=15) | 0 | | 0 | | 1 | | 3 | | 0 | |
| ESES (n=21) | 1 | | 1 | | 0 | | 4 | | 3 | |
| Export (n=6) | 1 | | 0 | | 1 | | 1 | | 1 | |
| Ext. Affairs (n=5) | 0 | | 0 | | 0 | | 0 | | 0 | |
| Land (n=9) | 0 | | 0 | | 1 | | 1 | | 1 | |
| OGC (n=15) | 1 | | 1 | | 1 | | 0 | | 0 | |
| Pub. Affairs (n=11) | 0 | | 0 | | 0 | | 2 | | 0 | |
| *TOTAL (n=82)* | 3 | | 2 | | 4 | | 11 | | 5 | |

data. The qualitative data were analyzed in hope of finding some kind of pattern between type of learning (vicarious and/or direct), prevalent quality activities, and performance outcomes observed. At the same time, I needed to compare the quantitative and qualitative data to see what quality activities and underlying learning processes described in the framework might not be playing an active role in real time according to story data. The next section reviews the qualitative findings.

**Qualitative Approach**

The managerial stories about successful and failed efforts to improve quality in their units provided insights about several different empirical models of learning and quality improvement in Pioneer Motor Company. Managers described numerous combinations of traditional and innovative quality activities as mechanisms for improving quality outcomes. Pockets of excellence and weakness were found in both the low performing and high performing groups. Some units have been stymied in developing a quality improvement system because traditional quality tools have been relatively meaningless to their kind of work. Other units have overridden such constraints and created novel tools, continuing to move forward in their quality improvement objectives. Some units have simply failed to act on the corporation's quality improvement initiative, others have experienced failure while acting. One of the most unexpected findings from the stories and interviews was that many of the 'low performer' units appear to be as actively involved in quality improvement as the 'high performer' units, but the former do not embrace the quality concept or engage in as much learning, and they call their initiatives by many other names.

In this section, I provide a systematic analysis of the theoretical framework's nine basic dimensions of quality activities. I also review the findings on types of learning processes identified in the interview data. Evidence of misfits between the framework and the empirical reality of the 13 organizational units is presented and I

also discuss confusions and puzzles arising from these discrepancies. In this way, the qualitative data analysis enriches and supplements the survey data and also contributes to the further development of the conceptual framework.

### Relating Quality Activities to Learning Processes and Performance Outcomes

The conceptual framework contains nine basic dimensions of quality activities and these are anchored in the left-most box in Figure 3.3. These nine dimensions of quality activities include: benchmarking, teams, sharing stories, collecting and using information, monitoring and assessing quality performance, generating new ideas and suggestions, using quality tools, involving customers and suppliers in quality planning, and constantly revising standards. As described earlier, the quantitative data indicated that not all quality improvement activities were equally relevant to performance outcomes. The most significant predictors of successful quality improvement were related to collecting and using various kinds of quality data (especially on things-gone-wrong), monitoring and assessing quality performance, and using quality tools. The quantitative analyses also indicated that benchmarking and story telling were moderately important predictors, and generating new ideas and suggestions for improvement were not significantly important elements of successful continuous quality improvement.

This section summarizes the results of qualitative data analyses and has two objectives: (1) to compare qualitative and quantitative findings and (2) to lay the groundwork for linking the nine quality activities in the framework with learning processes and performance outcomes. Using the qualitative data to illustrate, each dimension is analyzed separately and then reviewed in a concluding section and summary table.

**Benchmarking.** Overall, benchmarking was rated as an important predictor of learning and improving quality in the survey data although not a dominant one. It is

very much on managers' minds and is a key mechanism for producing organizational learning. A few interviewees (in both service and manufacturing units) reported that benchmarking played a critical role in changing quality standards and performance not just in their units but throughout the entire corporation.

Benchmarking is one of the most overt forms of vicarious learning in the conceptual framework. It involves modeling and imitation processes that are easily identifiable and this may explain in part why some of the stories included examples of benchmarking. Here is a rich illustration from an Employee Relations manager that sheds light on two important aspects of the benchmarking phenomenon. First, the example shows why, how, and when units are likely to engage in benchmarking efforts. Second, the interview excerpt details the vicarious and subsequent direct learning processes that actually constitute the full benchmarking activity cycle. My intention is to help the reader see, through a detailed illustration, how quality improvement and organizational learning processes actually operate together and unfold in this organization. The manager said that:

> The company itself has a relatively elaborate personnel development process, management development we call it, where employees are annually looked at and then the development plans identified and so forth. As the individual opportunities come up throughout the course of the year, the senior management group would make the placement decisions.
>
> The effort we undertook was to somehow get the lower level group more involved. Not only because they wanted it but frankly we thought there might be the better opportunity to identify people who need jobs, need development opportunities that in fact are good like talking with this level, and then having them recommend, not decide necessarily but recommend actions to the senior management.
>
> Our Employee Relations department became aware of the issue and had talked about it for some time and undertook it as a project. *And I guess to an extent we did benchmark because there are obviously other areas in the company who do various kinds of things and we became aware of a number who did have a mid-level personnel group that did meet.* And we did talk to a number of these groups about how it works. We went then to our mid-level management group and had a pretty significant

meeting with them talking about various alternative processes and identified one that they felt comfortable with. Then we went back to senior management to describe this process and the proposed role and to make sure that the senior management group felt comfortable, and in fact, ultimately ended up with the representatives on the senior management group below the top person actually becoming involved with this group. So this in a sense is more than mid-level, it's all management underneath the ultimate director of the office. This is a group that meets every other week.

*And the projects, if you will, that we undertook were in part based upon what we understand other organizations did in some of their growing pains.*

*The primary internal group that we looked at was various controller's office activities. They tend to be somewhat further ahead at least in terms of formal processes in terms of applying this, than other organizations in the company although we do understand engineering groups that have done this.* But within our entire operations there are several controller's offices. We talked with the Employee Relations people that represent them. Both of them had had these kinds of organizations in place for years. And were able to tell us some of the pitfalls, some of the growing pains that we could expect, some of the frustrations that would probably be generated early on. But also both had some successes ultimately.

And we found that their experiences were very helpful because in fact we appeared to be charting their path quite directly although we've only been doing this now for roughly, formally around 6-7 months. We talked about it, and went through the analysis stage the first part of the year, but it's really been only since about March that we have been implementing the process.

*But basically, this was almost a trial-and-error though in terms of how we ourselves are going to operate.* And we did not undertake any formal training, but certainly the first couple of months a lot of effort about what can we do, how will we work together, what will be responsible for, will senior management listen to us--and in fact, went through the various growing pains. But there was always a degree of excitement and we never ever had a situation where we did not have a full contingent of people, which meant that the organizations felt it was worthwhile to send people. And in fact it had some successes.

We have now been able to add some information that the senior managers and myself were able to take to the, if you will, the senior management group, with ideas and possible chains of moves some of which have been implemented. And therefore I think that in general, *the mid-level group feels that they had made some progress*, they obviously hope that there will be more in the future, but *all in all, I think the total organization feels the process has been improved.*

This story excerpt shows evidence of modeling and imitation as underlying learning processes in benchmarking in one of the low performing units in the sample. In paragraph 4, the manager said, "And the projects, if you will, that we undertook were in part based upon what we understand other organizations did in some of their growing pains." In this case, the Pioneer controller's office played the role of exemplar against which the interviewee's group could compare their plans and progress. Eventually, however, the recipe that the ER group developed from benchmarking the Controller's Office was tested through a trial-and-error process (see italicized text in second to last paragraph of excerpt). This led to incremental changes and innovations that ultimately helped create a better fit between quality improvement processes and results in this low performing unit. Thus, the story shows that *both* vicarious (modeling and imitation) and direct (trial-and-error) learning processes were part of a successful benchmarking effort. The case illustration also provides evidence of my earlier assertion that low performing units are the sites of more quality improvement effort and progress than indicated by the survey results (e.g., the Employee Relations unit belonged to the 'low performer' group).

Momentarily shifting the analytic focus to one of the high performing units, the interview data also revealed the following insights about sequences and patterns of learning as an underlying process in benchmarking. Similar to the reports of many other managers in high performing units, an engineering manager in the Engine Division explained that:

> Well, *benchmarking's the first thing plus it's an ongoing thing that we do*--when anything new comes out obviously we look at it. That'd be the first thing we do. And we look at both us and what's out there and compare how well they seem to be doing. We use dual dealership data, compare what our leaks are vs. what's out there. And sometimes, you look at what they have and look at what we have, and it doesn't look like there's any difference, so *some times we just have to go off and say, well, we're not going to learn anything from them, we're just going to have to figure out what our problems are and fix them.*

> *The trial-and-error is the last resort.* But even the trial-and-error, if we can do it on a bench, and not try to do it in engines like we used to, it's still much quicker. We can just do some things on a bench test.

There is a noticeable difference between reports from managers in high vs. low performing units: in 'high' units (such as the engine division), benchmarking is an ongoing process while in 'low' units (such as Employee Relations), it is described as an initial one-shot practice. Trial-and-error (a form of direct learning) is reported to be "the last resort" in the 'high performer' unit.

To emphasize the utility of benchmarking and vicarious learning as contributors to quality improvement outcomes, an Employee Relations manager discussed how benchmarking is used not just at the unit level, but also at the corporate level, as a mechanism for improving quality:

> The corporation studies our management development process, benchmarks other corporations and provides us with feedback to fine tune our corporate approach that is cascaded to us. So we talk about these things regularly. Employee Relations staff tries to continue to *fine tune* the process based on what the [corporate level] *benchmarking* shows.

*Fine tuning* refers to a direct learning process that is based on incremental change through trial-and-error. Attewell's (1992: 6) research on technology diffusion supports the empirical findings described above:

> . . . know-how, far from being readily or easily transferred from the originator to the user of a technology, faces barriers and is relatively immobile (Boyle, 1986; Eveland & Tornatzky, 1990: 139). Knowledge often has to be discovered *de novo* within the user organization. Using an imagery of information transfer for technical knowledge is therefore unwise; it obscures more than it enlightens.

Another manager described a benchmarking incident that involved not only success but failure--what I conceive as a process of 'benchmarking failure.' This sounds like a contradiction because benchmarking is by definition a process of learning through the study of others' best practices--which implies success. But 'benchmarking

failure' might not be a contradictory term if the focus were to be on learning *from* and *for* failure that is nested within a larger cycle of success.

To illustrate how 'benchmarking failure' might operate, an engineering manager described an informal and highly confidential technical exchange agreement between Pioneer and a major Japanese automotive manufacturer. To solve an intractable quality problem, instead of studying competitors' best practices, this cross-functional group of 18 Pioneer managers was required to first study its own failed process, to articulate it in written and oral formats, and to formally present the attempted solutions to a cross-functional group of Japanese engineering managers. After appropriate study of the problem and failed solution, the Japanese managers provided careful instruction on their successful process to Pioneer managers. Formally working through a failure analysis was the prerequisite for Pioneer managers to receive the recipes for successful practice that they needed from the Japanese engineers. In this example, learning required analyzing both what not to do as well as what to do. For the Japanese, this amounted to a learning experience that might be called 'vicarious failure' or 'learning through worst practices.' Studying failure in order to see success more clearly is a common Japanese management practice and is also used in many Pioneer units (e.g., failure mode analysis in the Engine Division). However, as stated earlier, 'benchmarking failure' was mentioned by only one manager in the group of 24 whom I interviewed. There has also been some discussion in the literature that indicates that learning from negative feedback, alone, is not particularly useful in achieving success.[9] The qualitative data on benchmarking suggest that studying both failure and

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[9] Attewell (1992) explained that in ambiguous situations, negative feedback is less valuable than positive feedback. Positive feedback teaches people that repetition of past performance is likely to lead to success. However, negative information can only teach people what not to do; they don't discover what should be done to ensure success. Thus, changing actions to avoid negative outcomes experienced with past failures doesn't help people understand if a change in action will lead to positive outcomes.

success may generate more learning about how to favorably improve quality performance than studying success alone.

In sum, benchmarking is an important activity that combines vicarious and direct forms of learning, and it was generally described as an important action for improving quality performance in the qualitative data. This finding lends support to the survey results.

**Teams.** Knowledge travels in organizations in various ways including personnel movements which are a critical mechanism for diffusing know-how as well as information on an organization-wide basis.[10] A primary source of this type of learning is found in teams. Bringing people together from diverse functions and levels in order that they may work collaboratively and synergistically translates into a physical transport of knowledge from one part of an organization to another. In this sense, team work is a vicarious form of organizational learning as explained in Chapter 3.

Both the survey and qualitative data emphasized the importance of cross-level and cross-functional team work to achieve quality improvement objectives. For example, quality problem solving generally required the efforts of cross-functional teams, task forces, committees, and other groups. However, the qualitative data showed that an emphasis on team work is no guarantee that organizational learning will occur even if quality improvement does. This is an important finding because it illustrates how learning and improvement can become disconnected in organizations seeking both. For example, there is an ironic situation at one Pioneer engine manufacturing plant that is recognized for its novel approach to team design. This comprehensive team system has been developed over more than four years through the

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[10] Huber (1991) explained that: 'Knowledge' indicates interpretations of information, beliefs about cause-effect relationships, or know-how; 'information' is defined as data that give meaning by reducing ambiguity, equivocality, or uncertainty or as data that indicate that conditions are not as presumed.

simultaneous, collaborative efforts of the top three managers and all employees. This is a team-organized plant with no external consultants or in-house OD experts guiding the team initiatives. All employees wear similar uniforms regardless of job titles or descriptions and core courses in quality, safety, and production are personally taught to all newcomers by the top managers in order to build 'personal inter-personal' relationships. One of the top managers commented:

> All the managers are assigned to teach classes. I taught; I've put 800 people through a safety seminar. My plant manager has taught production 101 to 800 people. He finds the time to do it. We work a lot of long hours. Our normal day is a 10 or 11 hour day. And it takes that kind of dedication to be able to do that sort of thing. The training is very important. And the reason that it's important is: it puts me and the other managers out in front of the people that are working in the plant and then we become touchable. They know that they can approach us and tell us that they have something that's going on, and there's that communication that has to happen in this type of environment.

Ironically, for all the commitment to teamwork and continuous quality improvement at this plant, there has been virtually no codification of team development or process. In response to questions about the existence and locations of manuals, records, policies, rule books, etc., one of the top managers said,

> I think maybe it might be all in the heads of the people who've been on this program. I don't think anybody [from corporate or corporate quality] has ever been interested enough to come here and talk to us. Nobody [at corporate] understands how we're doing what we're doing. And we're building one of the lowest cost engines in the world, the lowest cost in the country. We're building the best quality.

In sum, both questionnaires and interviews showed that team work was a critical component for successful quality improvement performance. But little or no codification of team development and process may constrain organizational learning in spite of achieving remarkable quality improvements.

**Stories.** Modeling and imitation processes are vicarious forms of learning that are embedded in story sharing. The survey results indicated that sharing stories about quality improvement efforts was a significant predictor of quality performance in

Pioneer units. The qualitative results not only supported but also supplemented the survey data by showing why and when managers might view story sharing as a critical factor in successful quality improvement.

There were several illustrations of story telling in the interview data. For example, one of the engine plants published a monthly newsletter that displayed quality improvement stories written by employees as well as hundreds of articles related to quality improvement efforts. In another case, to surface potentially useful data (for quality problem solving), stories were traditionally told by managers attending regular staff meetings in the Office of the General Counsel. Several Employee Relations managers reported that story telling was an integral part of their internal and external benchmarking processes. That is, part of the knowledge acquisition process involved their listening to stories told by managers whose operations they were benchmarking. The ER managers would then use the story data to help them in their own quality improvement initiatives. In addition, several ER managers stated that regular management meetings were held to share information and learnings among counterparts within the automotive components group (one of the four major corporate groups described earlier in Chapter 4).

In summary, vicarious learning that involved modeling and imitating through story telling was illustrated in some of the qualitative data. However, sharing stores was a relatively important contributor to continuously improving quality according to both the surveys and interviews.

**Collecting and using quality data.** The 'high performing' units showed a propensity for both collecting and using quality data and this was observed in the survey as well as story and interview data and observations. Of the low performing units, Employee Relations, Environmental and Safety Engineering Services, and Export operations appeared to place as much emphasis on data collection and use as the high performing units did. The only units that appeared to be weak on quality data

collection and use were External Affairs, Land Services, Office of the General Counsel, and Public Affairs. It was in these units that I most frequently encountered managers who claimed that their particular line of work made quality data collection difficult if not impossible.

Among interviewees whose units were active in collecting and using quality data, one manager explained how he used simulations as a source of quality data. In this case, a physical simulation was described:

> We've designed different test methods to try to simulate what the customer does. The thing that we've failed to do in the past is take the worst case customer and try to duplicate what he does. And that's hard to do but we've tried inventing tests on the bench ('bench tests') that we could do to simulate what the worst case customer would do to the engine. Because you can't really do it with a full engine; it costs too much to do that.

Simulations in the form of near histories and/or hypothetical histories were also reported. An Employee Relations manager illustrated:

> We typically look back over our history and analyze it, particularly on something like this, we would. The negotiations process itself is quite complex and anything that we can do--it's certainly done at the national level as well as the local level--anything we can do to improve that process is definitely reviewed. And the earlier you're able to get all the parties involved after this year's process transpired to think about changes, improvements for three years down the road, the better off we are. And so that is something that is traditional. We have traditionally run post-negotiations conferences.

During observations at an assembly plant, I noticed an unusual data collection process that was not included either in the survey or interviews. My field notes described the following scene at the end of the production line in an assembly plant:

> Finally, the cars reach the end of the serpentine line which continues to move forward very slowly. The car nearest to the end of the line is dramatically descended upon by 25 inspectors all at once--the Quality Control Manager, supervisors from every area (trim, paint, chassis, electronics, etc.), area managers from every area, and even the assistant plant manager (one, a woman and the rest, men). They all have pads of paper on which they enter notes about the quality of the vehicle before them. This

> 'moving' inspection is a totally human endeavor. That is, the inspectors use only their senses to judge the quality of the machine. They touch every surface. They use their eyes, tilting their heads to catch different light reflections on the paint. They smell the car. They open and close everything that has any kind of hinge. They listen with much deliberation to the sounds of doors and windows opening and closing. They stretch down to the ground and look under the car. They stand up and run their fingers along every seam between the hood and the fenders. They run their hands over all the areas that have been welded. Many of them wear white cotton gloves. All the while, they are furiously taking notes and mumbling. And the car is inert, all 70,000+ components--about to be started for the first time. Paramount in the mind of every inspector is one crucial question: Will it all work instantly, the first time, when someone turns the key?

This excerpt from field notes illustrates some of the ways in which a continuous quality improvement approach translates into a commitment to discovery and invention of multiple methods for gathering and analyzing data about quality, its maintenance, and its improvement.

In summary, collecting and using quality data seemed to be as central to quality improvement efforts as both the practitioner and academic literatures would predict. In general, there was convergence between survey and interview data, and there were no observed discrepancies. Data collection tended to engage primarily direct learning processes (insight, experiments, trial-and-error, and simulations) but vicarious processes (learning through others' experiences) were widespread in units that emphasized customer surveys and monitoring of adverse indicators. Using these indicators (e.g., complaints, re-work, errors, defects, warranty costs, etc.) represents a form of learning through failure and both survey and interview data showed that 'things-gone-wrong' received greater attention than 'things-gone-right.' The units that reportedly did not collect much quality data according to qualitative data also ranked among the lowest (overall) in terms of quality performance on the survey (i.e., Office of the General Counsel, External Affairs, Land Services and Public Affairs).

**Monitoring and assessing performance.** Multivariate statistical analyses indicated that among the most promising predictors of quality results were variables

related to ongoing monitoring and assessing performance. In interviews and stories, managers generally agreed with this finding. However, a few discrepancies between espoused theories and theories-in-use were evident in managers' stories. For example, some problems continued unresolved for long periods of time, even at great cost to operating systems, and even though managers generally agreed that monitoring and assessing performance was important and efficacious in relation to quality improvement.

The qualitative data showed that monitoring and assessing performance is a necessary but not sufficient condition for favorable change. For example, an attorney in the Office of the General Counsel described a novel computerized case management system that actually exacerbated an already stressed tracking operation:

> So what had been intended to be a method of distributing and updating case reports more quickly and efficiently has turned out to be in fact to produce the opposite result. . . . We have a separate systems group that developed this case management system for the product litigation group a long time ago, years ago. And based on our needs, they have made some changes to the program, but there are certain other things that we think would make it much better. But we're being told no, we can't do that or the system can't accomplish that. We tried to use an existing system to meet our needs and it's not working.

In general, the stories and interview data agreed with survey findings that constant monitoring and assessments are important; but the qualitative data indicated how organizational units were doing these activities (through vicarious or direct learning) or if they were using newly acquired information to shape performance. In general, there seemed to be a propensity for direct rather than vicarious learning processes to be involved in units' monitoring and assessing of their own performance.

One of the most striking illustrations came from an engineering manager in the Engine Division who described a problem tracking document that his group had designed and put into practice around 18 months earlier. It was called the 'Problem Resolution Chart' and basically, in the form of a matrix, it graphically demonstrated

where each of 30 current quality problems had been first identified. Some were noticed at bench testing, others at the supplier's operation, others further upstream at the design guide stage. In the worst case scenario, problems had become visible in the lap of the customer, a category that appeared in the right-most column of the chart (design and analytic phases were in the left-most columns). The objective of the matrix was to track existing problems from right to left (downstream to upstream) to see at what stage they were first noticed and then to try to move those types of problems further and further to the left on the chart--away from the field and customer and toward analytical and design stages of manufacturing. In the words of the engineering manager:

> We may not be able to go all the way to analytical, but we at least moved it sooner. We don't want to find them at engine, we don't want to find them--anything, the further out you go, causes us more grief, less time to react and on and on and on. And so we've got a listing of a bunch of these and we kind of track it this way. Where did we find it. What are we doing to move it all the way, really what you want to do is move it back to analytical.

This illustration represents a very sophisticated type of monitoring and assessing quality improvement performance. The engineering group had moved beyond single-loop and double-loop learning[11] and become engaged in deutero learning (Bateson, 1972; Argyris & Schon, 1978)--a form of learning that is rarely seen in organizations (Hedberg, 1981).

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[11] *Single-loop learning* is collaborative inquiry aimed at error detection and correction through changing strategies and assumptions within a constant framework of performance norms. It is geared toward effectiveness. *Double-loop learning* is collaborative inquiry that takes the form of a restructuring of organizational norms as well as associated strategies and assumptions. *Deutero-learning* (or "learning to learn") is characterized by organizational members engaging in either single- or double-loop learning as they gain insight about previous contexts for learning. They use reflection and inquiry into previous episodes of organizational learning or nonlearning. Discovering what facilitated or inhibited learning, they invent new learning strategies, produce them, and evaluate and generalize what they have produced. Encoded in individual images and maps, the results are reflected in organizational learning practice. Deutero-learning involves participants in learning about organizational learning.

In sum, there was a convergence of qualitative and quantitative data regarding monitoring and assessing performance. These activities are centrally important to the conceptual framework and where they do not occur, there is little to no evidence of continuous quality improvement efforts or results.

**New ideas and suggestions.** The conventional wisdom holds that suggestion systems, creativity, and generating new ideas for improvement are central to the success of a continuous quality improvement system. In the present study, there were no significant differences between high and low performing units regarding new ideas and suggestions for quality improvement. These types of activities (which engage primarily direct learning processes) were not conspicuous in the interview data, perhaps because they are taken for granted or otherwise not prominent in managers' thinking. This dimension of the conceptual framework seemed to be the least fitted to the data, but it needs to be included in this section because it is an important piece of any continuous quality improvement approach that I will elaborate and track differently in future studies.

**Quality tools.** Continuously improving quality is synonymous with using quality tools. Every manager whom I interviewed was knowledgeable about the various quality techniques and tools and almost all had attended some form of quality training course or program. Not surprisingly, managers in staff and service units found little use for the traditional quality tools and very few of them seemed to be developing other kinds of quality improvement methods or techniques in their place. But several organizational units that could not use run charts and check sheets or Pareto charts and root-cause analyses to achieve quality control, developed unique tools and measures as substitutes.

For example, in Employee Relations, one manager described an innovation in measuring personnel movements connected to succession planning. He said:

> As a follow up we've decided this year to set performance measurements for each of the operating managers to achieve movement tasks and we're going to measure them as part of their overall performance. We didn't do that last year so we're going to try and put more structure into the measurement of results.
>
> Annually, we give objectives to all of our management people for performance. And previously, we didn't have a line item objective on the movement of people from their plants and/or engineering or strategic business units. This year we're going to add that as a line item objective. Achieve the movement of 5 people at this level and 5 at that, in the next 12 month period. That's kind of how it would read.
>
> We're going to follow up quarterly--management development status updates--which is the second piece of our improved quality approach for next year.

Another unique measurement system was reported by a manager in the Export group:

> We've started this last year in focusing in on a number of areas like the cubic utilization which are not financial records as such but they're measurement areas of how efficiently we do our business. We've also looked at percentages of material, the weight of material that's premium shipped both inbound to Florida and outbound to the affiliates, in other words as a percent of the total business to see that we're getting improvements in those areas. And we are. So there's a number of areas that we've implemented some kind of measurement of the physical process.

In contrast, a manager in Public Affairs described how and why that operation was not amenable to either traditional or novel quality improvement tools and measures:

> In terms of quality, what I'm trying to ensure is the quality of the corporate reputation. And the problem is there are few measures in place to verify how well we're doing it.
>
> Years ago we used to do some surveys of our clients for the news media. We also used to do some surveys of our internal clients, our internal customers. But to my knowledge, neither of those have happened in the last several years. So in Public Affairs other than normal market research, the hotline studies that they do of awareness of new products, some of which therefore impacts Public Affairs . . . but other than that there really isn't any attempt to quantify or to assess quality that way. So it's really a difficult thing to get your arms around.

> I am convinced that the management of the corporation recognizes that we provide an important function and service and that they know that we'll be there to support whatever it is that needs to be supported whether it's a new product or a new manufacturing effort or global reorganization or what ever it is that they want us to do, but getting it to the point where anybody measures exactly the quality of the communication, the effectiveness, you know was this exactly the right way to go to reach these people or should we have done something else? You know, getting to that level, I don't think they've thought of it in those terms and I can't imagine that they're going to do that in the near future.

In sum, the interview and story data described many novel quality tools that have been developed to meet the unique needs of staff and service units. Both developing and using these novel tools involved primarily direct learning processes. The Public Affairs case illustration suggests that a quality focus is absent in that unit in large part due to a lack of direction and demand from top management and perhaps from client groups as well. The survey data is not discrepant with any of the qualitative data and both appear to fit with the conceptual framework.

**Customer and supplier involvement.** It might reasonably be said that the *sine qua non* of the quality effort at Pioneer Motor Company is customer focus. Involving customers and suppliers in quality improvement planning was rated as a high priority among survey respondents and this finding was confirmed by interview and story data.

When asked about setting performance measures for a new demonstration project, a manager in the research and development group stated that "the performance measures are going to be jointly done with the customer."

An engineering manager in the Engine Division explained that:

> We have the suppliers involved, I mean it's not just Pioneer. We've got the guy that supplies the seal and everyone that touches the part is involved in trying to decide how to better make it.

The importance of involvement with customers and suppliers can also be seen through the lens of quality failures which engage the same learning processes as quality

successes even though the outcomes are different. The quality control manager in a key assembly plant (a 'high performing' unit) recounted an instructive story that emphasizes direct learning through trial-and-error and experimentation:

> There are two mirrors on the Cosmopolitan. A left door mirror and a right door mirror. There's a piece of glass attached to the mirror which is mounted to the mirror body with some adhesive. Well, I'm walking through pre-delivery one day and I hear this 'ting ting ting' and I look on the floor and there's a piece of mirror glass. Laying on the floor. And I thought well geez, what the hell happened here. So I walk another 50-60 feet, and another one falls off. So right away we called the incoming quality department, we tell them the mirror glass is falling off and we've had two. Well they go into their sorts and you really can't sort this thing. I think it took us like about 2-3 hours to come up with a sort. We had to develop a suction cup and put the suction cup to the mirror itself and then pull on the mirror glass. So again all this takes time, you have to get your engineers involved because you can't just put any suction cup on and then you've got to know the force you're going to pull the mirror glass with.
>
> So as this is taking time, I'm walking into the convoy yard. I've got a group in the convoy yard and we're finding more! So we stopped shipment and when we get all our data together, it looks like, when we talk with the supplier and the whole shot, it looks like we had about maybe 5 or 10 days of units that were built that could be susceptible to this failure. Well as it turns out there was about 10 or 20 days and the mirrors, of course the units got into the customers hands, and of course we heard all these horror stories about V.P.'s getting their Cosmopolitans and their wives taking them out and the mirror glass falling out at the mall, the mirror glass falling out in their garages. So it was really kind of embarrassing.
>
> What happened, even though we couldn't control it here, our supplier decided to save a few dollars with his adhesive that he was putting on the back of the glass, and without getting prior Pioneer approval, you know through lab tests and everything, just arbitrarily went in and changed this adhesive. It looked okay to him at his place, but when it got out to our place and it sat in the car for a while, it didn't hold up. So he didn't do his testing. So we paid for that dearly in our quarterly quality ratings. We saw our numbers shoot up and then when the winter came and the cars hit the cold months, it even got worse.

This interview data illustrates the interconnectedness of relations between suppliers, customers, and the assembly plant. In this case, despite a humiliating failure that was costly in terms of sales and reputation, relations with customers and the supplier were

eventually repaired. This came about after the president of the supplier firm made a formal presentation to the head of Pioneer purchasing to review a plan for preventing similar quality problems in the future. Reconciliation was tenuous because in the past, Pioneer purchasing has cancelled contracts with suppliers whose 'prevent action' plans were unacceptable, and all suppliers know this.

In sum, customer and supplier involvement were rated similarly by most survey respondents and interviewees: they were generally seen as critical factors in quality improvement failures and successes alike. They engaged numerous vicarious and direct learning processes in a complex network of inter-relationships among three distinct organizational constituencies.

**Standards**. The subject of quality standards was inherently a part of every interview although the questionnaire contained only one item about this element (see survey question 56; V62). Revising standards is critical to any organization's quality improvement efforts. The qualitative approach produced some insights about the role of standards in learning as well as improving quality.

The notion of quality standards is implicit in benchmarking, monitoring and assessing performance, quality tools, and customer-supplier involvement as demonstrated throughout this section on qualitative data. In 'high performing' units and some 'low performing' units, I identified many of the traditional and novel standards that were used to improve quality performance. Other 'low performing' units appeared to be lacking quality standards but still claimed a commitment to quality and customer satisfaction. The essential point to be reiterated about standards is that without them, there can be no quality improvement (Garvin, 1993; Green, 1993; Imai, 1986).

In an earlier section (see Chapter 3), I described standardization as organizational learning and in the preceding discussion of the qualitative data, there have been many examples of learning that emanated from the act of changing

standards. These included illustrations of learning through failure as well as success. Recall that a supplier changing the standard for his mirror adhesive formula generated a great deal of organizational learning (e.g., engineers quickly designed a suction device to test mirror adhesion) as well as quality improvement (although preceded by quality deterioration). In sum, changing standards requires a transfer of knowledge among individual employees, work teams and groups, and the organization as a whole. Sometimes this learning may lead to quality improvement.

In the next section, attention shifts to vicarious and direct learning processes as I review the qualitative findings from analyses of the interview data.

**Vicarious vs. Direct Learning Processes**

Interview transcripts had been coded (as described in an earlier section) in order to find evidence of the types and sequences of learning (vicarious vs. direct) processes that characterized 'high performing' units and distinguished them from 'low performing' units. **Table 5.10** shows the learning processes that were most and least frequently identified in interviews with four managers in 'high performing' units and four managers in 'low performing' units. Vicarious learning included modeling, imitating and personnel movements. Direct forms of learning included insight, experimenting, trial-and-error, and simulations.

The table indicates that in interviews with managers in 'high performing' units, more mentions were made of direct learning experiences (23) than to vicarious learning experiences (7). On the other hand, interviews with managers in 'low performing' units were characterized by more instances of vicarious learning (12) than the 'high performers' but at the same time, far fewer instances of direct learning (9) than the 'high performers.'

It is interesting that analysis of data collected from managers in high and low performing units demonstrates different frequencies with regard to personnel

**Table 5.10. Vicarious and Direct Learning Processes Identified in Interview Data**

| Unit Type | Frequency of instances: *VICARIOUS LEARNING* | | | | Frequency of instances: *DIRECT LEARNING* | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | MOD | IM | PERS | *TOT* | INS | EXP | T&E | SIM | *TOT* |
| 'High performing' units | 5 | 2 | 2 | *7* | 1 | 9 | 12 | 1 | *23* |
| 'Low performing' units | 5 | 1 | 6 | *12* | 2 | 3 | 4 | 0 | *9* |

**KEY:** MOD = Modeling
IM = Imitating
PERS = Personnel movements
INS = Insight
EXP = Experimenting
T&E = Trial-and-error
SIM = Simulations
*TOT* = Total

movements (vicarious learning), experiments (direct learning), and trial-and-error (direct learning). All other types of learning (modeling and imitation as well as insight and simulations) were mentioned with relatively similar frequencies across high as well as low performing units' managers. This suggests that low performing units may learn more as a result of buying, renting, or borrowing knowledge (personnel movements) than developing knowledge (e.g., through modeling or imitation). Thus, managers in high and low performing units might be using modeling, imitating, and personnel movements in different ways. Extending this line of reasoning, Table 5.10 shows that managers in high performing units made reference to learning through experiments and trial-and-error more frequently than managers in low performing units. This suggests that high performing units may be the sites of more learning activities than low performing units. That is, it suggests that managers in high performing units learn by doing so that knowledge becomes an intrinsic and integral part of the organization. In contrast, managers in low performing units may tend to learn by borrowing, renting, or buying knowledge which raises questions about how much permanent cognitive and/or behavioral development is occurring within the original group.

Finally, interviews of managers in 'high performing' units evidenced more references to learning in general (30), compared to interviews with managers in 'low performing' units (21). Several factors could have contributed to these results in place of or in addition to actual learning habits and patterns in these units. For example, managers may have made references to the various types of learning shown in Table 5.10 not because these were dominant processes but because they happened to be on the managers' minds at the time of the interviews. Alternatively, the types of learning that surfaced most frequently in the interviews may have been the ones with which managers happened to identify. Another explanation for these findings concerns the content analysis procedure itself--raters may have been recording types of learning that

were dominating their own thinking processes, or with which they personally identified, or which they most readily comprehended.

Attempts to discover learning patterns from content analyses of interviews conducted in these eight units were problematic. No systematic sequences could be identified using the interview summary sheets in part because each managerial story was framed by a unique set of factors pertaining to the intensity of the quality problem under discussion, the type of business, the number of people involved in problem resolution, etc. However, the anecdotal data has been somewhat enlightening regarding patterns of vicarious and direct learning processes and provided a starting point for future investigative work.

## Summary

Overall, the combined quantitative and qualitative data analyses described in this chapter have supported the nine key dimensions of quality activities outlined in the conceptual framework. **Table 5.11** summarizes the findings from analyses of survey, story, interview, and observational data and links them to the key quality activities and learning processes listed in the conceptual framework.

The table shows that benchmarking (a form of learning that may integrate vicarious and direct experiences) was found to contribute moderately to successful quality improvement performance. Cross-functional and cross-level team work (a form of primarily vicarious learning) was also moderately important to performance. Sharing quality stories (another form of vicarious learning) contributed moderately to performance in the survey results but was mentioned infrequently in story and interview data. Both quantitative and qualitative results indicated that collecting and using quality data (a form of direct learning) were critical factors for quality performance. Similarly, monitoring and assessing performance (also direct learning processes) was classified as a critical factor in both the survey and story/interview

**Table 5.11. Integrated Summary of Results for Analyses of Quality Activities, Learning Processes, and Performance**

| *QUALITY ACTIVITIES AND PRACTICES* | *LEARNING PROCESSES ENGAGED BY QUALITY ACTIVITIES* | *RELATIONSHIP BETWEEN QUALITY ACTIVITIES, LEARNING PROCESSES, AND PERFORMANCE* |
|---|---|---|
| 1. Benchmarking | (V) Modeling and Imitating | Moderately important factor |
| 2. Teams | (V) Personnel movements (knowledge movements) | Moderately important factor |
| 3. Stories | (V) Modeling and Imitating | Moderately important factor |
| 4. Collect/Use Data/Information | (D) Insight, Experiments, Trial-and-error Simulations | Critical factor |
| 5. Monitor and Assess | (D) Insight, Experiments, Trial-and-error Simulations | Critical factor |
| 6. New Ideas and Suggestions | (D) Insight, Experiments, Trial-and-error, Simulations | Not important factor |
| 7. Quality Tools | (D) Insight, Experiments, Trial-and-error, Simulations | Critical factor |
| 8. Customer and Supplier Involvement | (V) Modeling,Imitating, Personnel Movements (D) Insight, Experiments, Trial-and-error, Simulations | Moderately important factor |
| 9. Revising standards | (V) Modeling,Imitating, Personnel movements (D) Insight, Experiments, Trial-and-error, Simulations | Inconclusive |

(V) = Vicarious learning processes, (D) = Direct learning processes

findings. Generating new ideas and suggestions (forms of direct learning) for quality improvements was relatively unimportant to performance. As expected, using quality tools (primarily a form of direct learning) was found to be of critical importance to performance according to survey results and the interview data both supported and supplemented this finding. Customer and supplier involvement (involving both vicarious and direct learning processes) was only moderately important according to analyses of survey data that were supported by qualitative analyses. Finally, establishing and constantly revising quality standards (which incorporate both vicarious and direct learning processes), were viewed as a critical factor for quality performance outcomes according to interview data but the validity of this finding cannot be established in the absence of a more systematic investigation using questionnaires.

The next chapter considers the implications of these analyses and findings.

# CHAPTER 6

# DISCUSSION AND IMPLICATIONS

## Overview

The central question driving investigation of the theoretical framework described in Chapter 3 was, "What variables mediate the relationship between quality activities and results?" I have offered evidence that organizational learning counts as an important intervening variable in the model. This investigation required examining several sub-questions that are summarized below.

*1. Do different types of quality practices engage different kinds of organizational learning?* This study showed how some quality practices engage primarily vicarious forms of learning, other quality practices engage primarily direct forms of learning, and a third group of quality practices tend to engage a mix of both vicarious and direct learning processes. The theoretical framework defined the nature of this dynamic.

In sum, vicarious learning involves acquiring second-hand experience pertaining to the strategies, administrative practices, or technologies of other organizations (Huber, 1991). It typically involves modeling, imitating, and personnel movements. I showed how benchmarking, virtually by definition, is a vicarious learning process. I also explained how cross-functional and cross-level teams, sharing stories, involving customers and suppliers in quality planning, and constantly revising standards are all quality improvement activities that involve knowledge acquisition through primarily second-hand methods.

I also explained how direct learning is a type of cognitive and/or behavioral change that comes about through acquiring first-hand experience. It includes insight

learning, experimenting, trial-and-error, and simulations. I showed how collecting and using quality information, monitoring and assessing performance, generating new ideas and suggestions for improvement, and using quality tools are quality improvement activities that engage primarily direct forms of learning. In addition, involving customers and suppliers in quality planning and constantly revising standards may also sometimes involve first-hand knowledge acquisition.

2. *Do particular types of learning processes (vicarious vs. direct) explain differential success in quality improvement performance across organizations?* The survey results indicated that using several types of quality assessments (involving both vicarious and direct forms of learning) was the best predictor of two important performance outcomes: reducing the time to diffuse data (or knowledge) and reducing the number of defects or errors. Developing and using ongoing monitoring systems (involving primarily direct learning) ranked as a significant predictor of reducing the time needed for diffusing data. Using quality tools (another form of direct learning) was a highly significant predictor of lower defect and error rates. The results suggested that it was the combination of vicarious and direct learning experiences that was important to favorable performance outcomes. The qualitative data complemented and supported this conclusion.

3. *Do particular learning sequences or patterns explain differential success in quality performance across organizations?* This question was aimed at the qualitative data. Systematic analysis was problematic and so further work is needed to adequately respond. In the meantime, the anecdotal data suggested that a sequence of quality improvement activities that engage primarily vicarious learning processes followed by direct learning experiences and subsequently supported through additional ongoing vicarious experiences may contribute to favorable performance outcomes. The anecdotal data suggested several factors that might influence the emerging learning patterns: the strength or scope of the quality problem, the number of people involved,

the type of business (e.g., service vs. manufacturing), the degree of environmental uncertainty, and so forth.

Given the three sub-questions and summary responses presented above, there are two important challenges implicit in this chapter. One involves determining how satisfactory the answers that I have assembled might be; so assessment is included in separate sections on the limitations and contributions of this study. The other challenge concerns some of the ironies and paradoxes of learning, improvement, and quality described at the outset of this dissertation (see Chapter 1): what new knowledge did this research yield regarding the ways in which quality-conscious organizations as learning entities can balance adherence to quality principles (reliability seeking) with learning and adaptability (variation seeking)?

The remainder of this section will address each of the above listed issues as well as their practical and research implications and directions for future research.

## Is Learning a Mediator of Quality Activities and Results?

The results of this study provided support for the conceptual framework which showed organizational learning as a variable that intervenes between quality activities and results.

Organizations adopting a quality philosophy typically focus on key problem areas that are encountered repeatedly and can be analyzed systematically (Sitkin, Sutcliffe, & Schroeder, 1994: 9). The sequential acts of identifying problems (i.e., performance gaps), subjecting them to systematic analysis, and developing solutions constitutes a learning process. Indeed, Sitkin et al. (1994: 9) have stated that the underlying goals of quality-focused organizing include "the desire for control and the desire for learning." This simply means that quality-focused learning organizations must develop abilities to reduce variability in processes (i.e., control) while at the same time increasing variation in standards and routines (i.e., learning). Balancing these two

activities constitutes a form of continuous quality improvement that incorporates the elements of change described in Table 2.5: small improvement (*kaizen*), radical and incremental innovation, and organizational learning. The qualitative data showed some of the ways in which this kind of balancing occurs. Findings from survey data analyses indicated that learning was a mediator of performance--especially with regard to collecting and using data on quality activities and problems.

Specifically, survey analyses indicated that organizational units that demonstrated the most favorable quality improvement results contained far more learning going on in their daily work than units with the least favorable quality improvement results. Compared to managers in low performing units, managers in high performing units much more frequently collected and used data in eleven different quality areas (e.g., customer expectations and satisfaction, supplier quality, things-gone-wrong, things-gone-right, etc.). Gathering information represents the knowledge acquisition (cognitive) component of learning and using that new knowledge to change performance represents the behavioral component of the learning process. Gathering and using quality data are critical parts of the learning process and these actions contributed toward discriminating between high and low performing units in the present study.

In sum, beliefs about learning can influence the actual learning experience. The survey data indicated that managers who strongly believed that a great deal of knowledge acquisition and use was characteristic of their units demonstrated the most favorable quality improvement results of the organizations sampled. Overall, learning emerged as an important mediating variable in the relationship between quality practices and quality outcomes.

## General Linkages between Quality Activities and Learning

I found quantitative evidence to support that linkages exist between quality activities and organizational learning. Collecting and using [collected] quality data stimulates both vicarious and direct learning depending on whether the data gathered were about the unit's own performance, customers' experiences, competitors' experiences, etc. More managers in 'high performing' units believed that they learned about improving quality from failure (which they labeled as 'TGW' or 'things-gone-wrong') than success ('TGR' or 'things-gone-right'). The same emphasis can be observed in the organizational learning literature, namely, a propensity for studying learning that is negatively stimulated (by error, failure, negative feedback, stress, or crisis). Why the emphasis on failure?

Error, failure, and things-gone-wrong are inevitable so it is important to design organizations for error by making it either easy, difficult, or impossible to discover and/or recover from error (see Norman, 1983, 1986, 1987 cited in Seifert & Hutchins, 1989: 42). Pioneer managers may have believed that they learned more from their failures than their successes simply because the system for discovering errors made it easier to detect, study, and change errors than to identify and improve upon successes. In addition, the system overtly rewarded managers for detecting and correcting errors, thus, 'things-gone-wrong' earned a great deal of attention--a highly expected outcome according to the fundamentals of reinforcement theory. In addition, the error-orientation in quality-focused organizations can be supported from an institutionalist perspective. That is, paying more attention to things-gone-wrong than to things-gone-right supported legitimization of the dominant cultural influence in the corporation's approach to quality. Prior research (see Cameron, 1992) found that the majority of Pioneer managers' approaches to quality improvement relied on error correction (rather than creativity and innovation or on error prevention). Thus, it is not

surprising that managers paid more attention to things-gone-wrong than to things-gone-right. However, this may not be the best strategy for continuously improving quality.

The problem with overemphasizing learning from things-gone-wrong is that negative feedback is not always the best teacher. As Attewell (1992: 6) explained:

> Although we assume that people are purposeful and either continue or change their actions with the intention of achieving positive outcomes, the logic underlying this second hypothesis is that in ambiguous situations, negative feedback is less valuable than positive feedback. From positive feedback people learn that if they do again what they did the last time they are likely to be successful. But people do not learn what to do to be successful from negative information; they only learn what not to do. People may change their actions to avoid the negative outcomes experienced with the prior course of action, but that does not tell them if a change in action will lead to positive outcomes.

This means that a vicious circle (Masuch, 1985) can be activated because managers focus on errors more so than on successes, but that may not inform them about how to be successful under new, ambiguous, or changing conditions and so the cycle of failure repeats itself.

In sum, I found support for links between quality activities and organizational learning. There was a dominant belief among managers in 'high performing' units that they learned more about improving quality from studying failures ('things-gone-wrong') than successes ('things-gone-right') and I suggest that this pattern may handicap their progress in continuous quality improvement over the long term.

## Vicarious Learning and Successful Quality Performance

One of the most promising predictors of successful quality performance outcomes was a variable representing the extent to which units used several different types of assessments in their quality improvement approach. These assessments included benchmarks, customer surveys, independent evaluations, and internal audits. By definition, to use benchmarks and customer surveys means to engage in vicarious

learning whereas independent evaluations and internal audits are quality activities that stimulate direct forms of learning. The above combination of vicarious and direct forms of learning was connected to favorable results on two performance outcomes against which it was tested--reducing time to diffuse data and knowledge throughout the organization and having lower defects or errors than the best competitor and than customers expect. The implication is that blending vicarious with direct learning generates more favorable quality results than relying on forms of direct learning alone (e.g., establishing an ongoing monitoring system or regularly assessing how the unit is improving) or relying solely on vicarious learning (e.g., through benchmarking and/or customer surveys).

In summary, the results indicated that quality activities that engaged a combination of vicarious and direct forms of learning generated the most favorable quality results.

## Vicarious and Direct Learning Patterns

Patterns of learning were only suggested in managerial stories and interviews and were not readily identifiable from the survey data. Some of the anecdotal data were moderately enlightening regarding learning sequences but the evidence was not strong enough to be able to draw valid conclusions about the value of particular early steps in the problem resolution process and their influence on later steps. Nevertheless, the qualitative data offered a few insights about vicarious and direct learning patterns that can be applied to future studies.

Specifically, the survey data analyses indicated that 'using quality tools' (a form of direct learning) was a significant predictor of favorable quality improvement outcomes (see Table 5.8). The anecdotal data complemented that finding by suggesting that without appropriate tools at the problem identification stage, subsequent correction and learning processes would become bogged down. The *Cosmopolitan* mirror failure

is illustrative: the lack of unique tools (a special suction cup) interfered with the quality improvement cycle and reportedly diminished efficiency as well as effectiveness early on in the problem solving process. In other words, an early direct learning activity (designing and developing a suction cup to test mirror durability and reliability) negatively influenced later steps (successfully identifying vehicles with defective side mirrors). An opportunity to imitate or model (vicarious learning) the suction cup design of other assembly operations--either within Pioneer or among competitor firms--that had experienced a similar problem might have contributed to faster invention (direct learning) of a detection device. For example, several managers in the Engineering and Engine Division units reported that benchmarking (i.e., modeling) was not only the first step in their quality improvement programs, but also an important ongoing activity. These findings were interesting and although inconclusive, can contribute to the design of further research in the area of learning patterns.

## Implications

There are multiple mediators of the relationship between quality practices and results many of which have already been studied and managed, thereby contributing to the control of organizational outcomes. For example, leadership, rewards, training, and socialization are among the most well researched intervening variables between organizational processes and results. But there is a relatively new and underexplored concept, organizational learning, that this study has shown to be a promising link between quality practices and performance.

In particular, the present investigation represents a first effort to understand the relationship between vicarious and direct forms of organizational learning and their influence on quality improvement performance. The evidence from this research points to the following general conclusion: different quality activities engage different types

of learning, and this contributes to explaining differential success in quality performance across organizational units.

There is a need for additional research on typologies of quality activities and organizational learning processes. There is also a need for further investigation of the linkages between quality activities and learning processes to add more detail about their strength of association. Finally, given the abundance of current knowledge about other variables that mediate the relationship between quality activities and results, new research that investigates vicarious and direct forms of organizational learning along with many of these mediators would contribute to a clearer understanding of the relative importance of the various quality activities described in the conceptual framework.

The main findings in this study also imply the need for learning organizations to develop a unified focus on opposite but equally valued states of quality performance: failure (or error) and success. Attending to one to the neglect of the other does not produce favorable quality performance results as Attewell (1992) explained earlier in this chapter. Quality-oriented organizations need to maximize the gains from error (i.e., learning from 'things-gone-wrong' or failure) and simultaneously minimize the losses from success (i.e., diminishing complacency and stagnation by developing knowledge from 'things-gone-right'). Some high performing Pioneer units characteristically studied their failures and successes as well as their competitors' failures and successes. Adhering to the precepts of a continuous quality improvement philosophy, complacency and stagnation can be reduced by perpetually revising performance standards to higher and higher levels of excellence. The organizational goal would be to develop an integrative monitoring and assessment system that could symmetrically attend to both quality failures and successes. Such a strategy would have to include a benchmarking process focused not only on successes but also on their opposite--failures.

In short, vicarious learning from the successes of other organizations has become common practice; if oppositely focused on error, it would amount to a learning experience through vicarious failure or 'learning through studying worst practices.' Combining knowledge from both analyses (vicarious success and failure) might provide organizations with more complete "how to" and "how not to" information to guide performance. In other words, the results of this research imply that quality-focused organizations should study both 'best in class' and 'worst in class' exemplars to achieve maximal and optimal learning and improvement of quality.

Along this line, the organizational studies literature has entertained discussion about how organizations may or need to reach an equilibrium between exploration of new possibilities and exploitation of old certainties (March, 1991), pursuit of quality control through reliability and pursuit of quality learning through experimentation (Sitkin, Sutcliffe, & Schroeder, 1994), enhanced competence through increased variation and increased reliability through decreased variation (Levinthal, 1991). In Cameron's (1986) terms, this suggests the application of the following principle: effective organizations must possess attributes that are simultaneously contradictory--or even mutually exclusive. For quality-focused organizations, this is particularly imperative under conditions of environmental uncertainty when interchanges from 'reliability-seeking' to 'variation-seeking' need to be made efficiently and effectively to ensure survival. The main findings in this study imply that learning organizations with favorable quality performance results must be capable of balancing reliability and variation under increasingly nonroutine conditions. Successfully executing such a learning strategy would require a blending of both vicarious and direct forms of learning and a great deal of research is needed to understand the connections between these processes and organizational performance.

## Limitations of the Study

There were some limitations pertaining to the sample in this research. Although size was not a problem in general, there were some organizational units with insufficient numbers of cases for within-group comparisons in the 'high performer' and 'low performer' groups. For example, it might have been enlightening to compare the lowest and highest of the 'high performers.' In addition, the small sample sizes of several units made it unfeasible to perform cross-validations using a split sample technique. If that had not been the case, I could have tested the framework that was proposed. Instead, I will have to test the framework on another sample of organizations in the future. Another problem with the sample was that it represented one company's North American employees. These exploratory research results may not easily generalize to other companies in the automotive industry or to other industries in this or other countries.

One major methodological problem with this study was that it did not use multiple mediator variables against which I could have compared the influence of the intervening variable of interest, organizational learning. In addition, the survey was designed to measure beliefs about quality improvement; with the exception of 22 variables focusing on organizational learning via measurement of data collection and use, the questionnaire could provide only indirect measures of learning. Some of the qualitative data compensated for this quantitative shortfall, but it would have added strength if I had developed and used a survey that more directly addressed the topic of organizational learning. On the other hand, this survey was a useful and fortunate choice because of the mapping between concepts of quality and learning that it commanded.

Regarding the qualitative data, because the managerial stories were retrospective accounts, there are concerns about accuracy. In addition, prior to the interviews, each manager was provided with category labels for each of his or her two

stories (one was a 'success story' and the other, a 'failure story'). The labels may have had a biasing effect on how informants organized their stories prior to our interviews. I arranged for two other people to code the interviews to mitigate these effects and diminish the chances of my own conceptual biases influencing coding efforts.

There were a couple of other difficulties regarding the data used in this study. The performance data was derived from the survey. Collecting objective archival performance data would have been a better strategy and in fact attempts were made to do this. The cross-validation of objective outcome, survey, and interview data also would have strengthened my interpretations and conclusions. Finally, more systematic observational data would have improved my understanding of the interplay between vicarious and direct forms of organizational learning.

## Contributions of the Study

This study has contributed to advancing research on organizational learning and change through its examination of vicarious and direct forms of learning and their relationship to organizational performance. The study also contributed to integration within the field of organizational studies by establishing conceptual linkages between two distinct areas of research--quality improvement practices and organizational learning. The present research also has contributed to theory development in the organizational studies field by empirically defining the distinctions between organizational learning and improvement and articulating the importance of organizational change through both vicarious success and vicarious failure.

As stated in Chapter 3, the goals of the present research included (a) its empirical testing and prediction of a model of continuous quality improvement and (b) identifying the underlying learning processes that may be leveraged by managers to enhance quality improvement and performance in their organizations. The specific theoretical and practical contributions of this study are outlined below.

**Theoretical Contributions**

This study provided definitional distinction between the concepts of organizational learning and continuous quality improvement. A synthetic, working definition of organizational learning was developed and four core elements of a continuous quality improvement approach were elaborated (small improvements or *kaizen*, radical innovation, incremental innovation, and organizational learning). Theoretical links between learning and quality improvement were clarified. I explored the differences between vicarious and direct forms of learning as well as their relationships to organizational performance. This research also incorporated multiple levels of analysis (individual, group/unit, organization) following the argument that micro analyses are always implicated in macro analyses and vice versa (Fine, 1990b; see also Staw, 1991).

**Practical Contributions**

The study addressed the lack of empirical publications on quality in academic journals by systematically measuring quality improvement and its impact on organizational performance. In order to be useful to theories of organizational change, instead of focusing strictly on implementation the organizational learning construct helped to address the problem of integrating quality with other organizational activities and processes. Clarity was provided regarding why and how organizations may experience learning without improvement and vice versa.

Another practical contribution of this study was the indication that different types of learning may account for differential success in quality performance. I also suggested that early steps in the quality problem solving process may facilitate or hinder later steps. Moreover, advocating intelligent organizational failure, the study explored the importance of vicarious learning from past failures as well as successes and balancing reliability-seeking with variation-seeking activity.

## Directions for Future Research

The primary need and challenge is to test the framework on a new, independent sample. But the prerequisite for that investigation is development of a survey instrument that measures organizational learning along cognitive and behavioral dimensions. In addition, the existing quality survey could be modified to include new questions about performance standards, new ideas for improvement, formal suggestion systems, and learning processes.

Another instrument development challenge involves a 'CQI[12] failure audit' instrument that managers would use to systematically measure and record non-successful quality improvement efforts. This tool would be used in conjunction with a 'CQI success audit.' Both instruments would be analyzed on individual, group/unit, and organizational levels of analysis for patterns pertaining to quality activities, learning processes, and performance outcomes.

One of the most pressing needs is to continue development of a tool and technique for tracking learning sequences. Investigating this aspect of the relationships between quality improvement, organizational learning, and quality performance holds promise for gaining insights about the intelligent balancing of adherence to quality principles (reliability-seeking) with learning and adaptability (variation-seeking).

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[12] 'CQI' stands for Continuous Quality Improvement.

# APPENDICES

## Appendix A

## Content Analysis Procedure for 17 Definitions of Organizational Learning Listed in Table 2.1.

Definitions were coded for five key dimensions:

| Code # | Code | Dimension |
|---|---|---|
| 1. | EXPER | past experience |
| 2. | KNOWL | knowledge |
| 3. | ACTION | action-outcome relationships |
| 4. | ROUT | encoded in routines |
| 5. | MEM | embedded in memory. |

A list of indicators for these dimensions was also developed. The 15 distinct definitions of organizational learning were coded by two raters--the author plus a qualitative researcher in organizational psychology at the University of Michigan.

Prior to coding interviews, the raters participated in a training session during which coding definitions and examples were discussed and agreed upon. The raters participated in a practice session. Coding a definition required raters to mark words, phrases, and clauses that indicated one or more of the key dimensions and to make marginal notations regarding which dimension was being coded. Raters noted whether indicators of each of the five dimensions were or were not present in each definition (0 = not present, 1 = present).

When both raters completed their coding, the coded definitions were compared and reconciled. Adjustments were made between the two raters so that agreement was reached on a single rating for each indicator. In three cases, the raters could not agree on a single rating and the author's rating held. Interrater agreement was 96 percent.

Social Sciences Citation Index of 17 Key Publications on Organizational Learning

| PUBLICATIONS: | YEAR | | | | | | | | | Citations TOT # | Citations TOT % |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1956 -65 | 1966 -70 | 1971 -75 | 1976 -80 | 1981 -85 | 1986 -90 | 1991 | 1992 | 1993 | | |
| 1. Cyert & March (1963) | 52 | 232 | 355 | 410 | 412 | 489 | 91 | 91 | 153 | 2285 | 59% |
| BEHAVIORAL THEORY OF FIRM | | | | | | | | | | | |
| 2. March & Olsen (1976, 1979) | | | | | | | | | | | |
| AMBIGUITY AND CHOICE | | | | 77 | 204 | 35 | 32 | 34 | 31 | 413 | 11% |
| 3. Argyris & Schon (1978) | | | | | | | | | | | |
| ORGANIZATIONAL LEARNING | | | | 30 | 102 | 140 | 29 | 42 | 41 | 384 | 10% |
| 4. Simon (1969) | | | | | | | | | | | |
| SCIENCES OF ARTIFICIAL | | 8 | 0 | 0 | 29 | 270 | 1 | 0 | 0 | 308 | 8% |
| 5. Hedberg (1981) | | | | | | | | | | | |
| HANDBOOK ORG DESIGN | | | | | 24 | 45 | 8 | 14 | 16 | 107 | 3% |
| 6. Miller & Friesen (1980) | | | | | | | | | | | |
| AMJ | | | | | 29 | 43 | 17 | 7 | 9 | 105 | 3% |
| 7. Levitt & March (1988) | | | | | | | | | | | |
| ANNUAL REVIEW SOCIOLOGY | | | | | | 7 | 3 | 23 | 19 | 52 | 1.34% |
| 8. Chakravarthy (1982) | | | | | | | | | | | |
| AMR | | | | | 10 | 16 | 9 | 7 | 3 | 45 | 1% |
| 9. Cangelosi & Dill (1965) | | | | | | | | | | | |
| ASQ | 0 | 5 | 6 | 3 | 7 | 9 | 1 | 2 | 1 | 34 | 0.88% |
| 10. Fiol & Lyles (1985) | | | | | | | | | | | |
| AMR | | | | | | 16 | 5 | 8 | 5 | 34 | 0.88% |
| 11. Meyer (1982) | | | | | | | | | | | |
| ASQ | | | | | 10 | 1 | 1 | 9 | 11 | 32 | 0.83% |
| 12. Miles & Randolph (1981) | | | | | | | | | | | |
| ORG LIFE CYCLE | | | | | 16 | 9 | 1 | 0 | 1 | 27 | 0.70% |
| 13. Shrivastava (1983) | | | | | | | | | | | |
| JMS | | | | | 4 | 12 | 1 | 4 | 6 | 27 | 0.70% |
| 14. Duncan (1974) | | | | | | | | | | | |
| DECISION SCIENCES | | | 0 | 1 | 2 | 4 | 2 | 0 | 0 | 9 | 0.23% |
| 15. Duncan & Weiss (1978) | | | | | | | | | | | |
| ROB | | | | 0 | 3 | 4 | 2 | 0 | 0 | 9 | 0.23% |
| 16. Huber (1991) | | | | | | | | | | | |
| ORG SCIENCE | | | | | | | 1 | 1 | 1 | 3 | 0.08% |
| 17. Lundberg (1989) | | | | | | | | | | | |
| ROCD | | | | | | 1 | 0 | 1 | 0 | 2 | 0.05% |
| TOTAL | | | | | | | | | | 3876 | 100% |

## Appendix C

### Sample of a Quality Improvement Story Published in a Pioneer Engine Division Plant's Newsletter

"Through Teamwork Comes Success"

The following illustrates the effectiveness teamwork has on improving the quality of our engine.

Last spring, a concern with our engine was brought to the Dynamometer Department for teardown and analysis. The concern was that some sort of foreign material was passing through the engine.

Jack Smith, the EBUT (Engine Build-Up and Test) assigned to the concern, performed a complete teardown of the engine and determined that the foreign material seemed to be sand. Product Engineering and the block supplier then teamed up and analyzed samples on both an electron microscope and the spectograph. The results also indicated sand was present.

The origination of the sand now had to be determined. Jack Smith suggested that a block be examined with the use of a boroscope before the engine was torn down. The particular area in question, was the main oil gallery that feeds the main bearing crankshaft journals. Core sand was detected with the aid of the boroscope, but it was difficult, due to their boroscope's low resolution.

The Aluminum Block Team then offered their upgraded boroscope to the Dyno Team. It had the capability of displaying the image seen at the end of the fiber optic line on a 15" monitor, with a magnification level of 2:1. Finally, it was concluded that core sand was located at the junction between the journal oil feed supply and main oil gallery.

The block casting supplier, in conjunction with Product Engineering and Supplier Quality Engineering (SQE), initiated corrective actions. Additionally, the boroscope is now being used on an audit basis in the block department, because of its success in dyno. To date, it appears that these actions have been completely successful in eliminating the problem.

This success was accomplished through a small problem solving team, with the efforts of many more people than mentioned. Teamwork, the principle [this plant] is known for, again leads us along the road of continuous quality improvement, and keeps us building the world's best engines.

Submitted by the Dynamometer Team

Source: Pioneer Motor Company,
Engine Division Newsletter, December 1993

*Note:* 'Jack Smith' is a pseudonym.

# Appendix D

## Assessing Corporate Quality Culture Questionnaire

YOUR NAME _____ YOUR ORGANIZATIONAL UNIT _____

YOUR FUNCTION _____

This questionnaire is part of the on-going effort within ____ Motor Company to assess and improve our quality performance. It's purpose is to capture an overall company perspective of our quality culture by combining ratings of individual units within ____. No individual's answers will be singled out or shared with the company, but aggregated feedback will be made available.

**In answering the questions, rate the unit in which you work.** Do not rate the entire company. This unit is listed for you above, as is your function. Please use that unit as you answer the questions. The questionnaire will take you about 30 minutes to complete.

**SECTION 1: Approaches to Quality**

In this first section, divide 100 points among the four alternatives below. Give the most points to the alternative that is most similar to your organization right now. For example, if 'A' is very similar to your organization and 'B' is somewhat similar, you might give 70 points to 'A' and 30 points to 'B'.

1.

a. _____ We haven't changed much in our approach to quality. We do things about the same as we have always done them, and our relationships with customers are about the same as always.

b. _____ We try to avoid making our customers unhappy, so we respond quickly and accurately to their complaints. We focus on finding our mistakes and correcting them. Our emphasis is on inspecting and auditing our work for errors.

c. _____ We try to satisfy our customers, so we monitor their preferences and expectations and then respond to them. We focus on preventing mistakes before they occur by doing work right the first time and by searching for root causes of problems.

d. _____ We try to surprise and delight our customers, so we constantly provide products and services that go beyond what they expect. We actually create new customer preferences by continuously improving and implementing creative ideas in everything we do.

_____
100 points

**SECTION 2: Quality Activities**

Please indicate the extent to which you agree or disagree with each of the following statements concerning your organization's activities. If you are not certain, please make your best guess. Use the following scale in responding to the items.

6 - Agree Strongly
5 - Agree Moderately
4 - Agree Slightly
3 - Disagree Slightly
2 - Disagree Moderately
1 - Disagree Strongly

2. _____ Our top level people are firmly committed to providing the highest quality work, service, and products.

3. _____ Our top level people frequently and clearly communicate the importance of quality to others throughout the organization.

4. _____ Our top leaders frequently ask employees about ways to improve quality in the organization.

5. _____ Day-to-day decision making of top leaders is strongly influenced by information collected about our quality performance.

6. _____ Official communications in our organization always contain quality improvement messages.

7. _____ Regular assessments are conducted in our organization of the extent to which employees are improving quality.

8. _____ Many aspects of my unit's work are "benchmarked;" that is, the best processes and practices in the world are studied and used to improve our own organization.

**6 - Agree Strongly**
**5 - Agree Moderately**
**4 - Agree Slightly**
**3 - Disagree Slightly**
**2 - Disagree Moderately**
**1 - Disagree Strongly**

9.____ We have made quality improvements in our processes and practices as a result of the data we collect through benchmarking.

**In order to determine where quality improvement is needed in our organization, we (#10-#18):**

10.____ survey organization members
11.____ interview organization members
12.____ rely on informal suggestions from employees
13.____ establish teams to report regularly
14.____ seek senior management's ideas
15.____ analyze outside organizations' performance
16.____ monitor customer complaints
17.____ use outside consultants or researchers

**We collect on-going quality data in the following areas(#18-#28):**

18.____ customer expectations
29.____ customer satisfaction levels
20.____ employee attitudes and morale
21.____ domestic competitors' performance
22.____ global competitors' performance
23.____ supplier quality
24.____ things-gone-wrong
25.____ things-gone-right
26.____ unit costs
27.____ timeliness of our work
28.____ new ideas for improvement

**We <u>use</u> the data we collect in these areas in our day-to-day work (#29-#39):**

29.____ customer expectations
30.____ customer satisfaction levels
31.____ employee attitudes and morale
32.____ domestic competitors' performance
33.____ global competitors' performance
34.____ supplier quality
35.____ things-gone-wrong
36.____ things-gone-right
37.____ unit costs
38.____ timeliness of our work
39.____ new ideas for improvement

40.____ The types of quality data collected and our analyses of them are continually improving.

41.____ We have taken steps to shorten the time it takes to gather data, analyze it, and disseminate it throughout the organization.

42.____ We use several types of quality assessments (such as benchmarks, independent evaluations, customer surveys, internal audits) to measure our quality performance.

43.____ We have plans in place to exceed the performance and capabilities of our best competitors.

44.____ Customers and suppliers, as well as employees, are actively involved in helping us form quality improvement plans.

45.____ Improving quality is our number one priority in both the short-run and the long-run.

46.____ We provide opportunities for <u>all</u> employees to participate in quality improvement efforts through activities such as cross-functional teams, cross-level teams, suggestion systems, and hotlines.

47.____ Every person in our organization knows our quality philosophy, can explain it, and uses it to guide work performance.

48.____ We have a clear short-term (1 year) and long-term (3-5 years) plan to improve quality in this organization.

49.____ All employees have been given the charge to improve quality processes in their own areas of responsibility.

50.____ All employees have received training in quality concepts, techniques, and problem solving methods.

51.____ All employees receive on-going training related to quality every year.

52.____ We have well-defined recognition and reward systems to acknowledge group and individual quality improvements.

53.____ Creative thinking and innovation related to quality improvement are encouraged in this organization.

6 - Agree Strongly
5 - Agree Moderately
4 - Agree Slightly
3 - Disagree Slightly
2 - Disagree Moderately
1 - Disagree Strongly

54.____ People who come up with good ideas for quality improvement are formally recognized and/or rewarded by the organization.

55.____ All employees have goals related to quality improvement that are included in their formal performance appraisal.

56.____ We have a well-developed system for translating customer expectations into quality standards for our products and services.

57.____ In designing new products or services, we have a well-developed method for assuring that they will meet customer expectations and specifications.

58.____ We have a process in place to constantly reduce the time required to do our work (i.e., response time, cycle time, wait time).

59.____ When asked, "How do you know you're improving quality," all our employees can give an informed answer based on evidence.

60.____ All employees have access to our own and our competitors' quality performance data, and they use it to improve quality in their own work.

61.____ Our support services and staff functions are totally involved in quality improvement activities.

62.____ We have an on-going audit system that reviews the quality of our support systems and staff functions.

63.____ We have an on-going monitoring system that helps identify what needs improving in the organization.

64.____ The quality data we collect is put in a useable format so that everyone who sees it can understand and use it.

65.____ Employees who deal with external customers are empowered to resolve customer problems on the spot.

66.____ Information about customer complaints is provided to those most responsible in order to assure future improvements.

67.____ The decisions and actions of people in this organization indicate that they really care about customers.

68.____ Information is collected regularly on adverse indicators of quality such as complaints, claims, refunds, recalls, returns, repeat services, replacements, warranty costs, and so on.

69.____ Awards, ceremonies, and/or recognition is provided to individuals who provide outstanding customer service.

70.____ Awards, ceremonies, and/or recognition is provided to teams or units who provide outstanding customer service.

71.____ Stories or examples of quality improvement are regularly and widely shared throughout the organization.

**SECTION 3: Quality Management**

Please use the same response scale in the following questions.

72.____ Rewards and recognition are given to our employees for *improvement*, not just for achieving a target or goal.

73.____ When the pressure is on in this organization, staying within budget gets higher priority than quality.

74.____ We are willing to make radical organizational changes if necessary in order to achieve best-in-class quality.

75.____ Training and developing employees in continuous quality improvement receives high priority, even in tight financial times.

76.____ Resources and services are made available to employees to foster their personal development.

77.____ Quality improvement carries over into the non-work (personal) life of the employees in the organization.

6 - Agree Strongly
5 - Agree Moderately
4 - Agree Slightly
3 - Disagree Slightly
2 - Disagree Moderately
1 - Disagree Strongly

78.____ Everyone in this organization is very clear about who our internal and external customers are.

80.____ Everyone in this organization knows the score all the time; that is, they know how we're doing relative to our quality improvement and *customer satisfaction indicators on a continual* basis.

80.____ We do not collect too much data; that is, we don't collect data and require reports that are not used.

81.____ We are continually reducing our costs and resource requirements without sacrificing quality. That is, we have adopted a continuous downsizing mentality.

82.____ Continuous downsizing (doing more with less) is viewed as a prerequisite to long-term success.

83.____ The organizational structure inhibits the achievement of our quality objectives.

84.____ We have adequate tools, equipment, and materials to achieve our quality objectives.

85.____ We have good communication, coordination, and teamwork across units in this organization.

86.____ There is a special sense of pride and "mission" shared among employees in this organization.

87.____ It is easy for our customers to give us feedback and to make suggestions.

SECTION 4: Quality Tools

In this section, please indicate the frequency with which your unit uses these quality improvement tools. Use the following scale for your responses.

6 - Constantly use
5 - Frequently use
4 - Sometimes use
3 - Rarely use
2 - Used once or twice
1 - Never use

88.____ SPC (Statistical Process Control)
89.____ *QFD (Quality Function Deployment)*
90.____ DOE (Design of Experiments)
91.____ 8-D (8 Step Problem Solving Process)
92.____ Pareto Processes
93.____ Fault Tree or Root-Cause Analysis
94.____ Kaizen
95.____ Cross Functional Teams
96.____ PIM (Process Improvement Methods)
97.____ Suggestion Systems

SECTION 5: Quality Results

Please rate your organization's performance in the following areas. Use the following scale in your ratings. Place the appropriate number in the blank.

6 - Much higher
5 - Moderately higher
4 - Slightly higher
3 - Slightly lower
2 - Moderately lower
1 - Much lower

98. We have _____ errors or defects than the industry average.
99. We have _____ errors or defects than our best competitor.
100. We have _____ errors or defects than our customers expect.
101. We have _____ errors or defects than our own goals specify.

102. Our rate of quality improvement is _____ than the industry average.
103. Our rate of quality improvement is _____ than our best competitor.
104. Our rate of quality improvement is _____ than our customers expect.
105. Our rate of quality improvement is _____ than our own goals specify.

106. We have _____ overall organizational effectiveness than the industry average.
107. We have _____ overall organizational effectiveness than our best competitor.
108. We have _____ overall organizational effectiveness than our customers expect.
109. We have _____ overall organizational effectiveness than our own goals specify.

For the following questions, indicate your level of agreement using the following scale.

6 - Agree Strongly
5 - Agree Moderately
4 - Agree Slightly
3 - Disagree Slightly
2 - Disagree Moderately
1 - Disagree Strongly

110. _____ Our customers would go nowhere else even if they were given a choice.

111. _____ Our employees rarely re-do work because of errors.

112. _____ Missed deadlines are very uncommon around here.

113. _____ Absenteeism is minimal in this organization.

114. _____ We have very little waste and excess.

115. _____ Our work is consistent and reliable.

116. _____ We fully expect to have the best quality products and services in the world within this decade.

117. _____ We are experiencing a decline in grievances, complaints, absenteeism, and safety violations.

118. _____ The amount of time it takes us to introduce new products, services, and ideas is decreasing.

119. _____ We are increasing both the number and the loyalty of our customers.

120. What do you need, or what else should be done, to improve quality in this organization?

_____
_____
_____
_____

## Appendix E

INTERVIEW SUMMARY SHEET

Rater:_____

Interview ID_____

### 1. WHAT QUALITY ACTIVITIES WERE USED FOR SOLVING PROBLEMS?

| | | | How many mentioned? |
|---|---|---|---|
| 1 | MON-CUS | Monitor customer complaints | ____ |
| 2 | MON-ON | Ongoing monitoring + staff/service | ____ |
| 3 | SUR-EMP | Survey employees (organization members) | ____ |
| 4 | IV-EMP | Interview employees (organization members) | ____ |
| 5 | SUG-EMP | Informal suggestions from employees | ____ |
| 6 | EXSTOR | Share stories or examples of QI | ____ |
| 7 | SRMGT | Seek senior management's ideas | ____ |
| 8 | TRAIN | Conduct training and development in quality | ____ |
| 9 | TOOLS | Use quality improvement tools | ____ |
| 10 | TEAMS | Establish x-functional and x-level teams | ____ |
| 11 | CUS-SUP | Involve customers and suppliers | ____ |
| 12 | ADVIND | Collect information on adverse indicators | ____ |
| 13 | COLL-1 | Collect data: customer expectations | ____ |
| 14 | COLL-2 | Collect data: customer satisfaction | ____ |
| 15 | COLL-3 | Collect data: employee attitudes and morale | ____ |
| 16 | COLL-4 | Collect data: domestic competitors' performance | ____ |
| 17 | COLL-5 | Collect data: global competitors' performance | ____ |
| 18 | COLL-6 | Collect data: supplier quality | ____ |
| 19 | COLL-7 | Collect data: things-gone-wrong ("TGW") | ____ |
| 20 | COLL-8 | Collect data: things-gone-right ("TGR") | ____ |
| 21 | COLL-9 | Collect data: unit costs | ____ |
| 22 | COLL-10 | Collect data: timeliness of our work | ____ |
| 23 | COLL-11 | Collect data: new ideas for improvement | ____ |
| 24 | USE-1 | Use data: customer expectations | ____ |
| 25 | USE-2 | Use data: customer satisfaction | ____ |
| 26 | USE-3 | Use data: employee attitudes and morale | ____ |
| 27 | USE-4 | Use data: domestic competitors' performance | ____ |
| 28 | USE-5 | Use data: global competitors' performance | ____ |
| 29 | USE-6 | Use data: supplier quality | ____ |
| 30 | USE-7 | Use data: things-gone-wrong ("TGW") | ____ |
| 31 | USE-8 | Use data: things-gone-right ("TGR") | ____ |
| 32 | USE-9 | Use data: unit costs | ____ |
| 33 | USE-10 | Use data: timeliness of our work | ____ |
| 34 | USE-11 | Use data: new ideas for improvement | ____ |
| 35 | PERS | QI transfers to personal life | ____ |
| 36 | ANORGO | Analyze outside organization | ____ |
| 37 | ANORGI | Analyze internal organization | ____ |
| 38 | BEN | Benchmarking | ____ |
| 39 | CONRES | Use outside consults/research | ____ |

[continued--next page]

INTERVIEW SUMMARY SHEET [continued] p.2

**OTHER:**

How many mentioned?

40 _____
41 _____
42 _____
43 _____
44 _____
45 _____
46 _____
47 _____
48 _____
49 _____
50 _____

**2. WHAT LEARNING PROCESSES WERE USED IN SOLVING PROBLEMS?**

How many mentioned?

| | | |
|---|---|---|
| 1 MOD | Modeling | ____ |
| 2 IMIT | Imitation | ____ |
| 3 PERS | Personnel movements | ____ |
| 4 INSI | Insight | ____ |
| 5 EXPER | Experiments | ____ |
| 6 TRIAL | Trial-and-error | ____ |
| 7 SIMS | Simulations | ____ |
| 8 OTH | Other (specify below) | ____ |

INTERVIEW SUMMARY SHEET [continued] p. 3

**3. FOR STORY #1:**

| **Sequence of events (if indicated):** | | **Chronological Order** | | | |
|---|---|---|---|---|---|
| 1 MOD | Modeling | 01____ | 02____ | 03____ | 04____ |
| 2 IMIT | Imitation | 05____ | 06____ | 07____ | 08____ |
| 3 PERS | Personnel movements | 09____ | 10____ | 11____ | 12____ |
| 4 INSI | Insight | 13____ | 14____ | 15____ | 16____ |
| 5 EXPER | Experiments | 17____ | 18____ | 19____ | 20____ |
| 6 TRIAL | Trial-and-error | 21____ | 22____ | 23____ | 24____ |
| 7 SIMS | Simulations | 25____ | 26____ | 27____ | 28____ |
| 8 OTH | Other (specify below) | | | | |

(Fill in # of CODE name above, e.g. use #4 to indicate "INSI".)

NOTES:_____

_____

**4. FOR STORY #2:**

| **Sequence of events (if indicated):** | | **Chronological Order** | | | |
|---|---|---|---|---|---|
| 1 MOD | Modeling | 01____ | 02____ | 03____ | 04____ |
| 2 IMIT | Imitation | 05____ | 06____ | 07____ | 08____ |
| 3 PERS | Personnel movements | 09____ | 10____ | 11____ | 12____ |
| 4 INSI | Insight | 13____ | 14____ | 15____ | 16____ |
| 5 EXPER | Experiments | 17____ | 18____ | 19____ | 20____ |
| 6 TRIAL | Trial-and-error | 21____ | 22____ | 23____ | 24____ |
| 7 SIMS | Simulations | 25____ | 26____ | 27____ | 28____ |

(Fill in # of CODE name above, e.g. use #4 to indicate "INSI".)

NOTES:_____

_____

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