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# A case study of organizational change

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# A CASE STUDY OF ORGANIZATIONAL CHANGE

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# CHAPTER I

# INTRODUCTION

This dissertation summarizes a qualitative investigation of organizational change. In this study, the researcher focused on a manufacturing company's attempts to improve organizational capacity for problem solving. More specifically, the research focused on intitial organizational efforts to learn, apply, and support the use of problem solving tools introduced through an instructor-led training program. Over a six-month period, the researcher conducted surveys and interviews to gather data relating to the impact of the training, as well as organizational efforts to support use of the problem solving tools. Because the company was attempting to develop and implement technologically-advanced production lines, and improve the efficiency and effectiveness of its semi-automated production line, the organizational need for improved problem solving was widely recognized.

The data were analyzed in terms of behavioral changes and tangible results from the training, using Levels 3 and 4 of Kirkpatrick's evaluation model (Kirkpatrick, 1987). And from a broader perspective, because the company hoped to proceduralize problem solving within the organization through use of the tools, the data were also analyzed in terms of a research-based model for organizational learning, using Senge's conceptual framework for a Learning Organization.

## Background

The world of work in the 1990s is more complex and diverse than ever before. The pace is swifter, demands are greater, and competition is stronger in most business

markets. As Hammer and Champy (1993) point out, American corporations face enourmous challenges today:

> Advanced technologies, the disappearance between national markets, and the altered expectations of customers who now have more choices than ever before have combined to make the goals, methods, and basic organizing principles of the classical American corporation sadly obsolete. Renewing their competitive capabilities isn't an issue of getting the people in these companies working harder, but of learning to work differently. (Hammer & Champy, 1993, p. 11)

To succeed in the ever-changing environments in which they find themselves today, organizations are discovering the importance of learning "how to learn." Marshall and Tucker (1992) contend that "the key to both productivity and competitiveness is the skills of our people and our capacity to use highly educated and trained people to maximum advantage in the workplace" (Marshall and Tucker, 1992, p. xvi). As they explain:

> For much of this century, and indeed, right up to the present, American enterprise has been organized on the principle that most of us do not need to know much to do the work that has to be done. This system may have worked brilliantly for us until recently, but it will do so no longer.
>
> The future now belongs to societies that organize themselves for learning. What we know and can do holds the key to economic progress, just as command of natural resources once did. Everything depends on what firms can learn from and teach to their customers and suppliers, on what countries can learn from one another, on what workers can learn from each other and the work they do, on the learning environment that families provide, and, of course, on what we learn in school. More than ever before, nations that want high incomes and full employment must develop policies that emphasize the acquisition of knowledge and skills by everyone, not just a select few. The prize will go to those countries that are organized as national learning systems, and where all institutions are organized to learn and to act on what they learn. (p. xiii)

Senge (1990) expresses a similar viewpoint:

> As the world becomes more interconnected and business becomes more complex and dynamic, work must become more "learningful." It is no longer sufficient to have one person learning for the organization, a Ford or a Sloan or a Watson. It's just not possible any longer to "figure it out" from the top, and have everyone else following the orders of the "grand strategist." The organizations that will truly excel in the future will be the organizations that discover how to tap people's commitment and capacity to learn at *all* levels in an organization. . . .
>
> One could argue that the entire global business community is learning together, becoming a learning community. Whereas once many industries were dominated by a single, undisputed leader–one IBM, one Kodak, one Procter & Gamble, one Xerox–today industries, especially in manufacturing, have dozens of excellent companies.

> American and European corporations are pulled forward by the example of the Japanese; the Japanese, in turn, are pulled forward by the Koreans and Europeans. Dramatic improvements take place in corporations in Italy, Australia, Singapore–and quickly become influential around the world." (Senge, 1990, p. 4)

Marsick and Watkins (1993) contend that the rapidly changing nature of work requires a commitment to lifelong learning in a variety of skill areas:

> The need for lifelong learning is clearly evident in most people's jobs. The information that people need to perform effectively changes almost as quickly as it is produced. The intelligent technology on which many jobs are based requires a greater grasp of elementary and advanced mathematical and scientific principles. Enhanced needs for communication in today's flattened, participatory organizations call for new interpersonal skills as well as high levels of ability in reading, writing, and speaking. Most important, people must learn to learn collaboratively. (Marsick & Watkins, 1993, pp. 6, 7)

Senge argues, however, that *learning* and *taking in information* are not the same thing:

> The schoolroom is a pretty powerful metaphor for the idea of learning as taking in information. Most of our formal education reinforces this perspective–we are taught to believe that there is some information that the "expert" has that we don't have, and once we can repeat it back to her or him with some fidelity and reliability, then we have "learned" it. But of course none of us learned to ride a bicycle that way, or to walk, or to talk, or any of the other things that are genuinely called "learning." So learning has very little to do with taking in information. Most fundamentally, learning is about enhancing capacity. Learning is about building the capacity to create that which you previously couldn't create. It is intimately related to action, which taking in information is not. One of the reasons traditional learning is so boring is that taking in information is very boring; it's very passive. But real learning is always "in the body." It is intimately connected to action. (Innovation Associates, 1990, pp. 1, 2)

Learning organizations, as Senge explains, cannot merely focus on survival, or adaptive learning. A learning organization "is continuously expanding its capacity to create its future" (Senge, 1990 p. 14). Similarly, Marsick and Watkins (1993) contend that "organizational learning is changed organizational capacity for doing something new" (Marsick & Watkins, 1993, p. 152). Marsick and Watkins also agree with Senge that organizational learning is an ongoing process:

> The learning organization is one that learns continuously and transforms itself. Learning takes place in individuals, teams, the organization, and even the communities with which the organization interacts. Learning is a continuous, strategically used process–integrated with, and running parallel to, work. Learning results in changes in knowledge, beliefs, and behaviors. Learning also enhances organizational capacity for innovation and growth. The learning organization has

embedded systems to capture and share learning. (Marsick & Watkins, 1993, pp. 8, 9).

Unfortunately, as Senge points out, a number of "learning disabilities" persist among organizations today:

1. ***I am my position.*** As Senge explains, "when people in organizations focus only on their position, they have little sense of responsibility for the results produced when all positions interact. Moreover, when results are disappointing, it can be very difficult to know why. All you can do is assume that *someone screwed up*"(p. 19).
2. ***The enemy is out there.*** Senge suggests that "there is in each of us a propensity to find someone or something outside ourselves to blame when things go wrong" (p. 19).
3. ***The illusion of taking charge.*** According to Senge, "*all too often, 'proactiveness' is reactiveness in disguise.* If we simply become more aggressive fighting the 'enemy out there,' we are reacting–regardless of what we call it. *True proactiveness come from seeing how we contribute to our own problems*" (p. 21).
4. ***The fixation on events.*** Senge argues that "today, the primary threats to our survival, both of our organizations and of our societies, come not from sudden events, but from slow, gradual processes"–e.g., the arms race, environmental decay, increasingly obsolete physical capital, and decline in design or product quality relative to competitor's quality (pp. 22, 23). As he explains, "generative learning cannot be sustained in an organization if people's thinking is dominated by short-term events. If we focus on events, the best we can ever do is predict an event before it happens so that we can react to it optimally. But we cannot learn to create" (p. 23).
5. ***The parable of the boiled frog.*** "Maladaptation to gradually building threats to survival is so pervasive in systems studies of corporate failure that it has given rise to the parable of the *boiled frog*" (p. 22):

> If you place a frog in a pot of boiling water, it will imediately try to scramble out. But if you place the frog in room temperature water, and don't scare him, he'll stay put. Now, if the pot sits on a heat source, and if you gradually turn up the temperature, something very interesting happens. As the temperature gradually rises from 70 to 80 degrees F., the frog will do nothing. In fact, he will show every sign of enjoying himself. As the temperature gradually increases, the frog will become groggier and groggier, until he is unable to climb out of the pot. Though there is nothing restraining him, the frog will sit there and boil. Why? Because the frog's internal apparatus for sensing threats to survival is geared to sudden changes in his environment, not to slow, gradual changes. (p. 22)

6. ***The delusion of learning from experience.*** A core learning dilemma confronting organizations today, according to Senge, is that "*we learn best from experience but we never directly experience the consequences of many of our most important decisions*" (p. 23).

7. ***The myth of the management team.*** "All too often, teams in business today tend to spend their time fighting for turf, avoiding anything that will make them look bad personally, and pretending that everyone is behind the team's collective strategy–maintaining the *appearance* of a cohesive team" (p. 24). Collective inquiry, according to Senge, is threatening to many managers: "School trains us never to admit that we do no know the answer, and most corporations reinforce that lesson by rewarding the people who excel in advocating their views, not inquiring into complex issues" (p. 25).

## Focus of the Study

In this qualitative investigation, Senge's conceptual framework served as the theoretical construct for analyzing one organization's efforts to change. The organization was a manufacturing company in the process of developing more technologically-advanced production lines. The company faced the challenge of maintaining adequate levels of productivity, quality, and profitability on the existing production line while channeling sufficient resources to innovation efforts. Consequently, as the organization

realized, solving problems as efficiently and effectively as possible is more important for them today than ever before.

The researcher examined organizational efforts to learn and apply a systematic approach to problem-solving. The company piloted a professionally-developed training program which included a problem-solving tool designed to identify and address "root causes" of problems. Before implementing the program system-wide, the company wanted to evaluate its impact on the organization. This researcher was asked to help the organization to assess the impact of the training, although the company agreed to allow the information to be analyzed in a broader context for this dissertation study. From the company's perspective, two important questions were to be addressed in the investigation:

1. *Did individuals change the way they approach problem-solving on their jobs after the training?*
2. *Were individuals/teams better able to meet organizational goals and/or priorities after the problem-solving training (e.g., profitability, productivity, service, or quality)?*

These research questions correspond to Levels 3 and 4 of Kirkpatrick's evaluation model (Kirkpatrick, 1987). An overview of Kirkpatrick's model is provided in the following section. However, from a broader perspective–i.e., examination of the organization's capacity for change–this researcher also addressed a third question in this investigation:

3. *What mechanisms and/or strategies facilitated this change effort, and how do these mechanisms and/or strategies and their effects compare to Senge's conceptual framework?*

During this initial phase in which the problem solving training was introduced into the organization, two sessions of the training were conducted. The pilot session was conducted first, a management session was conducted approximately two months later to

better equip managers to support the training. To gather data relating to the research questions, the researcher:

1. Interviewed organizational management before the training
2. Interviewed pilot session participants
3. Conducted observations
4. Surveyed pilot session participants
5. Conducted follow-up interviews with pilot session participants approximately six and twelve weeks after the training
6. Conducted follow-up interviews with pilot session participants' managers
7. Surveyed management session participants
8. Conducted follow-up interviews with management session participants
9. Interviewed cross-functional team leaders (for teams containing one or more members who had attended the training)
10. Surveyed cross-functional team members (after interviews with their team leaders).

Data collected to address the research questions through the methods outlined above were then analyzed in terms of Senge's conceptual framework for creating and sustaining a learning organization. Assessing the impact of training is a difficult task. Challenges associated with it include isolating other factors, maintaining objectivity, ascertaining the validity and accuracy of the data, etc. However, by recording and compiling employees' and managers' perceptions over time regarding individual and collective problem solving abilities within the company, as well as behavioral changes and tangible results from the training, the researcher was able to provide the organization with information relating to the impact of the training.

Further, by analyzing the data in terms of Senge's conceptual framework for a learning organization, the researcher was able to test the utility and practicality of Senge's framework, to provide the company with recommendations for enhancing the

organization's capacity to problem solve, and to offer observations regarding the organization's strengths in terms of facilitating learning, as well as areas in which the company may have an opportunity to enhance its capacity for learning.

## Kirkpatrick's Evaluation Model

Kirkpatrick's model describes four distinct levels of training evaluation:

1. ***Reaction.*** Did training session attendees like the training?
2. ***Learning.*** Did training session participants learn from the training?
3. ***Behavior.*** Did training session participants change the way they performed their jobs as a result of the training?
4. ***Results.*** Were there tangible results from the program–in terms of reduced cost, improved quality, improved quantity, etc.? (Kirkpatrick, p. 302)

In effect, assessing participants' reactions involves measuring "customer satisfaction" (p. 302). *Learning,* as Kirkpatrick explains, is defined in terms of changes in attitudes, knowledge, and skills (Kirkpatrick, 1987, p. 309). But this "does not include the on-the-job use of the attitudes, knowledge, and skills" (ibid.). A company's training program could produce favorable results in terms of the first two levels of Kirkpatrick's model, yet have no impact on either employee performance or results. That is why Kirkpatrick argues that training programs should measure behavioral changes and results (Levels 3, and 4, respectively).

According to Kirkpatrick (1987), "five requirements must be met for change in behavior to occur: (1) Desire to change; (2) Know-how of what to do and how to do it; (3) The right job climate; (4) Help in applying the classroom learning; (5) Rewards for changing behavior" (pp. 312, 313).

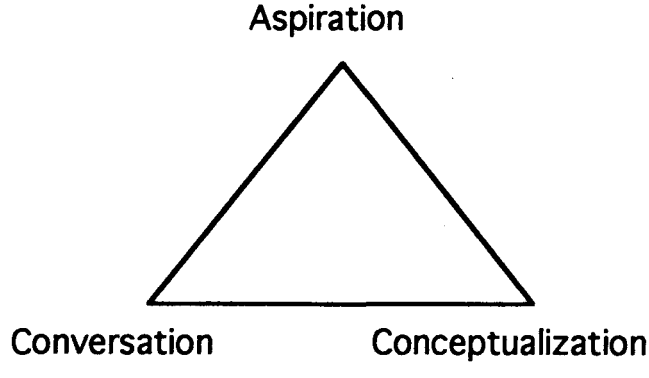
As Kirkpatrick explains, "The results of most training programs can be stated in terms of results such as reduced turnover, reduced costs, improved efficiency, reduction in grievances, increase in quality and quantity of production, or improved morale" (Kirkpatrick, 1987, p. 315). According to Kirkpatrick, "it would be best to evaluate training programs directly in terms of results desired" (p. 315). In discussing methods for evaluating results of training programs, Kirkpatrick (1987) describes a study in which

two techniques were used to measure results: (1) Conducting interviews with employees and their supervisors several weeks after they attended training; and (2) Mailing questionnaires to employees and their supervisors. As he explains, "the results on the questionnaire were not nearly as specific and useful as the ones obtained by personal interview. The study concluded that it is probably better to use the personal interview rather than a questionnaire to measure results" (p. 317).

In this investigation, a series of personal interviews were conducted over a period of several months. Interviews were conducted with pilot session participants on three separate occasions: at the outset of the investigation, approximately six weeks after their training, and approximately three months after their training. Further, pilot session participants' managers were interviewed to confirm data from pilot session participant interviews, and to gain their perspectives relating to the impact of the training. In these interviews, the researcher focused on behavioral changes and use of the problem solving tools on the job as well as tangible results from the training (e.g., faster resolution to problems, more effective resolution to problems, improved communications, cost savings/cost avoidance), and/or other benefits from the training.

## Senge's Conceptual Framework

Senge (1993) describes three cornerstones of a learning organization:



To build these cornerstones, according to Senge, organizations must focus on five new "*component technologies*" which "are gradually converging to innovate learning organizations" (Senge, 1990, p. 6). As he explains, "each provides a vital dimension in building organizations that can truly *learn*, that can continually enhance their capacity to realize their highest aspirations" (Senge, 1990, p. 6).

Senge suggests, however, that it may be more useful to think of these "component technologies" as *disciplines*:

> If a learning organization were an engineering innovation, such as the airplane or the personal computer, the components would be called "technologies." For an innovation in human behavior, the components need to be seen as disciplines. By "discipline," I do not mean an "enforced order" or "means of punishment," but a body of theory and technique that must be studied and mastered to be put into practice. A discipline is a developmental path for acquiring certain skills or competencies. As with any discipline, from playing the piano to electrical engineering, some people have an innate "gift," but anyone can develop proficiency through practice. (Senge, 1990, p. 10)

The term "discipline," as Senge further explains, implies *perpetual* development:

> When the five component technologies converged to create the DC-3 the commercial airline industry began. But the DC-3 was not the end of the process. Rather, it was the precursor of a new industry. Similarly, as the five component learning disciplines converge they will not create *the* learning organization but rather a new wave of experimentation and advancement. (Senge, 1990, p. 11)

Aspiration

The first cornerstone of a learning organization, aspiration, involves focusing on two disciplines: Personal Mastery and Shared Vision. "Personal mastery is the discipline of continually clarifying and deepening our personal vision, of focusing our energies, of developing patience, and of seeing reality objectively" (Senge, 1990, p. 7).

As Senge explains, "people with high levels of personal mastery are continually expanding their ability to create the results in life they truly seek" (Senge, 1990, p. 141). According to Senge, the discipline of personal mastery "embodies two underlying movements. The first is continually clarifying what is important to us. . . . The second is continually learning how to see current reality more clearly" (ibid.):

> The juxtaposition of vision (what we want) and a clear picture of current. reality (where we are relative to what we want) generates what we call "creative tension": a force to bring them together, caused by the natural tendency of tension to seek resolution. The essence of personal mastery is learning how to generate and sustain creative tension in our lives. (p. 142)

Developing personal mastery, requires clarifying one's personal vision, and holding creative tension. Senge argues that it also requires making a commitment to the truth:

> Commitment to the truth does not mean seeking the "Truth," the absolute final word or ultimate cause. Rather, it means a relentless willingness to root out the ways we limit or deceive ourselves from seeing what is, and to continually challenge our theories of why things are the way they are. It means continually broadening our awareness, just as the great athlete with extraordinary peripheral vision keeps trying to "see more of the playing field." It also means continually deepening our understanding of the structures underlying current events. Specifically, people with high levels of personal mastery see more of the structural conflicts underlying their own behavior. (p. 159)

Shared vision is the discipline of continuously building and refining a collective vision for the organization. "Shared vision is vital for the learning organization because it provides the focus and energy for learning" (Senge, 1990, p. 206). As Senge explains:

> A vision is truly shared when you and I have a similar picture and are committed to one another having it, not just to each of us, individually, having it. When people truly share a vision they are connected, bound together by a common aspiration. Personal visions derive their power from an individual's deep caring for the vision. Shared visions derive their power from a common caring. (p. 206)

"Visions are exhilarating. They create the spark, the excitement that lifts an organization out of the mundane" (p. 208). According to Senge, "you cannot have a learning organization without shared vision. Without a pull toward some goal which people truly want to achieve, the forces in support of the status quo can be overwhelming" (p. 191).

Senge points out, however, that visions cannot be dictated: "Today, it is common to hear managers talk of getting people to *buy into* the vision. For many, I fear, this suggests a sales process, where I sell and you buy. Yet, there is a world of difference between *selling* and *enrolling*" (p. 218). Senge suggests there are a actually a number of possible attitudes toward a vision:

***Commitment:*** Wants it. Will make it happen. Creates whatever "laws" (structures) are needed.
***Enrollment:*** Wants it. Will do whatever can be done within the "spirit of the law."
***Genuine compliance:*** See the benefits of the vision. Does everything expected and more. Follows the "letter of the law." "Good soldiers."
***Formal compliance:*** On the whole, sees the benefits of the vision. Does what's expected and no more. "Pretty good soldier."
***Grudging compliance:*** Does not see the benefits of the vision. But, also, does not want to lose job. Does enough of what's expected because he has to, but also lets it be known that he is not really on board.
***Noncompliance:*** Does not see benefits of vision and will not do what's expected. "I won't do it; you can't make me."
***Apathy:*** Neither for nor against vision. No interest. No energy. "Is it five o'clock yet?" (pp. 219, 220)

Conversation

Senge contends that conversation is an art that is seldom appreciated for its practical utility in the hectic business environment today (Senge, 1993). But the highly interactive nature of work today requires skillful conversation. According to Senge, organizational conversation can be enhanced by focusing on two disciplines: Mental Models, and Team Learning.

"*Mental models* are deeply ingrained assumptions, generalizations, or even pictures or images that influence how we understand the world and how we take action" (Senge, 1990, p. 8). As Senge explains, "many insights into new markets or outmoded organizational practices fail to get put into practice because they conflict with powerful, tacit mental models" (ibid).

Developing skills in examining and refining mental models involves focusing on skills of *reflection* and skills of *inquiry*. "Skills of reflection concern slowing down our own thinking processes so that we can become more aware of how we form mental models and the ways they influence our actions" (Senge, 1990, p. 191). As Senge explains, "reflection starts with recognizing *leaps of abstraction*" (p. 192).

"Inquiry skills concern how we operate in face-to-face interactions with others, especially in dealing with complex and conflictual issues" (p. 191). Inquiry must be balanced, however, with advocacy:

> Most managers are trained to be advocates. In fact, in many companies, what it means to be a competent manager is to be able to solve problems–to figure out what needs to be done, and enlist whatever support is needed to get it done. Individuals became successful in part because of their abilities to debate forcefully and influence others. Inquiry skills, meanwhile, go unrecognized and unrewarded.
>
> But as managers rise to senior positions, they confront issues more complex and diverse than their personal experience. Suddenly, they need to tap insights from other people. They need to learn. Now, the manager's advocacy skills become counterproductive; they can close us off from actually learning from one another. What is needed is blending advocacy and inquiry to promote collaborative learning. (p. 198)

Senge contends that focusing on the discipline of team learning is also vital to improving conversation within organizations today (Senge, 1993). "Team learning is vital because teams, not individuals, are the fundamental learning unit in modern organizations. This is where the 'the rubber meets the road'; unless teams can learn, the organization cannot learn" (Senge, 1990, p. 10).

According to Senge (1990), team learning has three critical dimensions:

1. "The need to think insightfully about complex issues (tapping the potential for many minds to be more intelligent than one mind)"
2. "The need for innovative, coordinated action"
3. "The role of team members on other teams within the organization" (p. 236)

In approaching team learning as a discipline, Senge argues that organizations must master the practices of *dialogue* and *discussion*. "In dialogue, there is the free and creative exploration of complex and subtle issues, a deep 'listening' to one another and suspending of one's own views" (p. 237). In discussion, however, "different views are presented and defended and there is a search for the best view to support decisions that must be made at the time" (p. 237). Although dialogue and discussion can be complementary, Senge suggests that "most teams lack the ability to distinguish between the two and to move consciously between them" (p. 237).

"Team learning also involves learning how to deal creatively with the powerful forces opposing productive dialogue and discussion in working teams" (p. 237).

Defensiveness, as Senge explains, is often a powerful, non-productive force that prevents learning: "The difference between great teams and mediocre teams lies in how they face conflict and deal with the defensiveness that invariably surrounds conflict" (p. 249):

> It is not the absence of defensiveness that characterizes learning teams but the way defensiveness is faced. A team committed to learning must be committed not only to telling the truth about what's going on "out there," in their business reality, but also about what's going on "in here," within the team itself. To see reality more clearly, we must also see our strategies for obscuring reality.
>
> The power and insight that start to emerge when this happens are considerable. In effect, defensive routines are like safes within which we "lock up" energy that could be directed toward collective learning. As defensiveness becomes "unlocked," that insight and energy are released, becoming available for building shared understanding and advancing toward what the team members truly want to create. (p. 257)

Conceptualization, or "Systems Thinking"

Senge (1993) contends that systems thinking is the conceptual cornerstone of a learning organization. As he explains, "systems thinking is a discipline for seeing wholes. It is a framework for seeing interrelationships rather than things, for seeing patterns of change rather than static *snapshots* " (Senge, 1990, p. 68). Senge argues that systems thinking is vital in today's increasingly complex and interdependent world:

> Today, systems thinking is needed more than ever because we are becoming overwhelmed by complexity. Perhaps for the first time in history, humankind has the capacity to create far more information than anyone can manage, and to accelerate change far faster than anyone's ability to keep pace. Certainly the scale of complexity is without precedent. (Senge, 1990, p. 69).

According to Senge, systems thinking is actually the conceptual cornerstone for all of the learning disciplines (Senge, 1990, p. 69). "All are concerned with a shift of mind from seeing parts to seeing wholes, from seeing people as helpless reactors to seeing them as active participants in shaping their reality, from reacting to the present to creating the future." (ibid)

An important aspect of systems thinking, according to Senge, is focusing on *dynamic complexity* rather than *detail complexity*. As he argues, "sophisticated tools of forecasting and business analysis, as well as elegant strategic plans, usually fail to

produce dramatic breakthroughs in managing a business" (p. 71). The reason: "they are all designed to handle the sort of complexity in which there are many variables: *detail complexity.*"

*Dynamic complexity* occurs "in situations where cause and effect are subtle, and where the effects over time of interventions are not obvious" (p. 71). The dynamic interrelationships in organizations can be extremely complicated. In organizations, it can take "days to produce something, weeks to develop a new marketing promotion, months to hire and train new people, and years to develop new products, nurture management talent, and build a reputation for quality–and all of these processes interact continually" (p. 72).

Dynamic complexity is evidenced in a number of common business problems: "balancing market growth and capacity expansion . . . developing a profitable mix of price, product (or service), quality, design, and availability that make a strong market position . . . improving quality, lowering total costs, and satisfying customers in a sustainable manner" (p. 72). Senge argues that:

> *The real leverage in most management situations lies in understanding dynamic complexity, not detail complexity* (ibid.)

Solving dynamically complex problems, Senge argues, requires seeing the interrelationships between actions and their potential consequences, seeing the delays between actions and consequences, and seeing patterns of change–not just snapshots (Senge, 1990, p. 72).

Chapter II provides an overview of theoretical frameworks useful in conceptualizing the complexities inherent in efforts to promote organizational learning. The methodology and research design employed in this investigation are described in Chapter III. Study findings are reported in Chapter IV. In Chapter V, observations are noted regarding the organization's apparent strengths in terms of facilitating this change, as well as areas in which the company may have an opportunity to enhance its capacity

for change. Further, the researcher discusses the implications of the study results for industrial and educational systems.

# CHAPTER II

# LITERATURE REVIEW

In this qualitative investigation of organizational change, the researcher focused on the impact of one company's efforts to introduce a systematic, disciplined approach to solving problems as the organization was in the midst of a variety of changes–e.g., radical redesigns in production processes, development of a new pay system, and relocation from an urban to a suburban facility. To gather data relating to the impact of the training, interviews and surveys were conducted over a six month period. Pilot session participants, their direct managers, cross-functional team members, and organizational managers participated in the investigation.

Since the organization was attempting to improve its capacity to problem solve, the researcher reviewed models of organizational learning/change, then selected a theoretical framework to guide collection and analysis of the data for this study. As Marsick and Watkins (1990) point out, "there has been little empirical research on organizational learning, perhaps because this concept is more easily grasped as a metaphor than a reality." (Marsick & Watkins, 1990, p. 42). However, as explained in Chapter I, the need for organizational learning is becoming more evident in our increasingly complex, interdependent world. This chapter provides an overview of several theoretical frameworks for organizational learning/change, summarizes findings from studies relating to organizational learning, and explains the rationale for selection of the theoretical framework applied in this investigation.

## Organizational Learning/Change Models

The literature provides a variety of models and theoretical constructs that provide useful frameworks for conceptualizing the complexities inherent in any effort to orchestrate learning and/or changes in the way individuals or groups function within an organization. The following is an overview of several of these frameworks.

### Fullan's Change Model

Michael Fullan developed a model of change based on his research with educational systems. As he explains, "managing social change is indeed a multivariate business that requires us to think of and address more than one factor at a time" (Fullan, 1991, p. xii). According to Fullan, "most researchers see three broad phases to the change process. Phase I–variously labeled initiation, mobilization, or adoption–consists of the process that leads up to and includes a decision to adopt or proceed with a change" (p. 47). Phase II involves the first attempts to put ideas or proposed changed into practice. Phase III–called continuation, incorporation, routinization, or institutionalization–refers to whether the change gets built in as part of the system or disappears" (pp. 47, 48).

#### Initiation

According to Fullan, "the best beginnings combine the three R's of relevance, readiness, and resources" (p. 63). "*Relevance* includes the interaction of need, clarity of the innovation (and practitioner's understandings of it), and utility" (p. 63). *Readiness* involves the organization's "practical and conceptual capacity to intiate, develop, or adopt a given innovation" (p. 63). "*Resources* concern the accumulation of and provision of support as part of the change process" (p. 64). As Fullan cautions, "people often underestimate the resources needed to go forward with a change" (p. 64).

Fullan acknowledges, however, that sorting out the three elements of the initation phase in advance may not always be possible. As he explains:

> The relationship between initiation and implementation is loosely coupled and interactive. The process of initiation can generate meaning or confuction, commitment or alienation, or simply ignorance on the part of participants and others affected by the change. Poor beginnings can be turned into successes depending on what is done during implementation. Promising startups can be squandered by what happens afterward.

## Implementation

Fullan identified key factors in the implementation process, organized into three main categories: (1) the characteristics of the innovation or change project, (2) local factors, and (3) external factors" (p. 68). As he explains, key factors relating to the characteristics of the innovation or change include:

- Need. "Many innovations are attempted without a careful examination of whether or not they address what are perceived to be priority needs" (p. 69).
- Clarity. "There is little doubt that clarity is essential, but its meaning is subtle; too often we are left with false clarity instead (p. 70).
- Complexity. "Complexity refers to the difficulty and extent of change required of the individuals responsible for any implementation" (p. 71).
- Quality/practicality. The quality and practicality of intended changes are important, particularly for complex changes. But as Fullan explains, complex change and quality can only be combined through hard work, and over time: "It is what people develop in their minds and actions that counts. People do not learn or accomplish complex changes by being told or shown what to do. Deeper meaning and solid change must be born over time" (p. 73).

Local factors involve "the social conditions of change; the organization or setting in which people work, and the planned and unplanned events and activities that influence whether or not given change attempts will be productive" (p. 73). As Fullan explains, change is frequently "the result of system initiatives that live or die based on the strategies or support offered by the larger organization. This is especially true of multi-

level, complex system-oriented innovations where what is being changed is the organizational culture itself" (p. 73).

External factors influence implementation in a broader context. As Fullan explains, these are forces that impinge on organizational personnel, but are outside the organization directly involved in the change–e.g., governmental agencies (p. 70). From a business perspective, external factors might also include pressures from stockholders, parent companies, etc. Fullan also identified six "key themes" in the implementation process:

1. ***Vision-building***. According to Fullan, vision-building "permeates the organization with values, purpose, and integrity for both the what and how of improvement. It is not an easy concept to work with, largely because its formation, implementation, shaping, and reshaping in specific organizations is a constant process" (pp. 81, 82). "While everyone agrees that vision is crucial, the practice of vision-building is not well understood. It is a highly sophisticated dynamic process, which few organizations can sustain" (p. 83).
2. ***Evolutionary planning***. As Fullan explains, organizations attempting to improve must "foster an atmosphere of calculated risk-taking and constant multifaceted evolutionary development" (p. 83).
3. ***Initiative-taking and empowerment***. Fullan contends that "since implementation is doing, getting and supporting people who are acting and interacting in purposeful directions is a major route to change" (p. 83).
4. ***Staff development, resource assistance***. According to Fullan, "sustained *interaction and staff development* are crucial regardless of what the change is concerned with. The more complex the change, the more interaction is required *during* implementation. People can and do change, but it requires social energy" (p. 86).

5. ***Monitoring/problem-coping.*** Fullan suggests that it is important to monitor the results and process of change, and to gather data on implementation issues (p. 87).
6. ***Restructuring.*** The workplace must be organized to"explicitly build in working conditions that, so to speak, support and press for improvement" (p. 88).

## Continuation

"The problem of continuation is endemic to all new programs irrespective of whether they arise from external intiative or are internally developed" (p. 89). As Fullan cautions, "we talk about continuation as the third phase in a planned change process, but it should be clear that the process is not simply linear and that all phases must be thought about from the beginning and continually thereafter" (p. 90).

Reasons for lack of continuation, as Fullan explains, include lack of continued interest, support, and/or funding, as well as staff turnover (p. 88). Reasons for continuation include active leadership, sustained staff development, incorporation into key operational areas, and mobilization of broad-based support for the innovation. Further, as Fullan notes, in efforts to institutionalize an organization's "long-term capacity for continuous improvement, we need to make this goal more explicit" (p. 90).

## Marsick and Watkins' Frameworks Depicting Organizational Learning

Synthesizing the results of diverse qualititative research projects in a variety of countries (e.g., Sweden, Nepal, the Philippines, Taiwan, and the United States) with adults in a variety of positions (e.g., managers, educational field workers, doctoral students, administrators of innovation projects, human resource development professional), Victoria Marsick and Karen Watkins first developed a human resource model which characterizes learning in the workplace (Marsick & Watkins, 1990). Then, building on what they had learned in their previous research, Marsick and Watkins began "a quest to determine the differences between individual and organizational learning and to find people in organizations who believe they are working toward developing a

learning orgnaization" (Marsick & Watkins, 1993, p. xiv). Based on their investigations into organizational learning, Marsick and Watkins developed a framework for the learning organization, as well as a model for continuous learning.

## Marsick and Watkins' Human Resource Model

At the heart of Marsick and Watkins' human resource model are informal and incidental learning. "People learn in the workplace through interactions with others in their daily work environments when the need to learn is the greatest" (Marsick & Watkins, 1990, p. 4). Informal and incidental learning, they contend, are often unexamined and neglected–despite the fact that both play vital roles in organizational learning.

Informal learning "is predominantly experiential and non-institutional" (p. 7). It "can include many situations outside the classroom that are not designed in any detail, but that are planned"–e.g., self-directed learning, networking, coaching, mentoring, performance planning, and trial-and-error experimentation (ibid). Incidental learning "is unintentional, a byproduct of some other activity"–e.g., learning from mistakes, assumptions, beliefs, etc. (ibid).

Marsick and Watkins developed "the human resource learning cone as a framework for understanding various levels of formal, informal, and incidental learning in organizations" (p. 9). They argue that their cone can be used "to examine learning at the following four levels: (1) the individual, about whose learning we know the most; (2) the group in which many people naturally work; (3) the organization itself, influenced by top-level managers; (4) professional groups, whose learning is greatly influenced by norms set outside the organization" (p. 9).

The base of their learning cone, the human resource learning pie, "illustrates the relationship of learning to various areas of practice"–i.e., selection and staffing, human resource planning, personnel research and information systems, training and development, organization development, organization and job design, union/labor

relations, employee assistance, compensation and benefits (p. 5). The wheel is further subdivided into two concentric circles: formal learning (the inner circle) and informal and incidental learning (the outer circle). As they explain:

> The shape of the inner circle, formal learning, varies with the need for learning in different organizations and times. The learning pie is subdivided to show the approximate percentage of time and money spent on informal and incidental learning (83%), as opposed to formal learning (17%), based on annual estimates in Carnevale (1984).

## Marsick and Watkins' Framework for the Learning Organization

According to Marsick and Watkins, common features of learning organizations include:

- Leaders who model calculated risk taking and experimentation.
- Decentralized decision making and employee empowerment.
- Skills inventories and audits of learning capacity.
- Systems for sharing learning and using it in the business.
- Rewards and structures for employee initative.
- Consideration of long-term consequences and impact on the work of others.
- Frequent use of cross-functional work teams.
- Opportunities to learn from experience on a daily basis.
- A culture of feedback and disclosure. (Marsick & Watkins, 1993, p. 8)

In their conceptual framework for the learning organization, there are two critical characteristics of learning organizations: (1) Learning occurs at four interdependent levels (individual, team, organization, society); and (2) Learning transforms or changes the organization (p. 9).

As they had explained in their human resource model (see above), Marsick and Watkins contend that "learning takes place at successively more complex, collective learning levels in organizations: individuals, groups and teams, larger business units and networks, the organization itself, its network of customers and suppliers, and other societal groups" (ibid.). According to Marsick and Watkins (1993), six action imperatives drive learning organizations:

1. ***Create continuous learning opportunities.*** Continuous learning is opportunistic. It can be fostered by planning for informal learning, learning how to learn, and just-in-time learning. Further, "it is not enough for the *worker* to adapt; the nature

of *work* itself must change for continuous learning to be successful" (p. 12). Changing the work helps to motivate workers intrinsically.

2. ***Promote inquiry and dialogue.*** "Dialogue calls for open minds and open communication" (p. 13). "Inquiry is a dialogue in which people mutually explore ideas, questions, and potential actions" (p. 73). It "is based on open-minded curiosity that enables us to suspend our presuppositions and judgments in the interest of truth or a better solution" (p. 74).
3. ***Encourage collaboration and team learning.*** "Teams, groups, and networks can become the medium for moving new knowledge throughout the learning organization" (p. 14). However, as Marsick and Watkins explain, "two people may make essentially *accurate* assumptions about the meaning of a situation, but they cannot *share* meaning unless they make their assumptions public through talk" (p. 77). Action technologies, suggest Marsick and Watkins, can enhance team learning while also serving as a bridge to organizational learning–e.g., action research, action-reflection learning, and action science (p. 15).
4. ***Establish systems to capture and share learning.*** "Learning organizations find ways to preserve what is learned so that it will endure even when a highly mobile, temporary workforce does not and to also disseminate what is learned so that a widely dispersed workforce learns from its members, regardless of where they might be" (p. 15). Key features of embedded systems include "information collection, widespread access to that information, rewards and recognition for learning and improvement, and widespread sharing of what is learned collectively and continuously through access to information" (p. 157).
5. ***Empower people toward a collective vision.*** "A more participatory workplace affords both individuals and the organization more space for learning" (p. 17). "In a learning organization, leaders help people create a collective vision toward which the entire organization can work. Goals provide valence (attraction,

motivation, or affect), but they cannot be attained without the opportunity to try out new behaviors , to take calculated risks, and to experiment" (pp. 17, 18).

6. ***Connect the organization to its environment.*** "In a learning organization, interdependencies between the organization and its internal and external environment are acknowledged and worked through" (p. 18). "A systems perspective is needed to bring about this integration and connection" (ibid.).

## Marsick and Watkins' Continuous Learning Model

Marsick and Watkins (1993) have developed "a model of continuous learning based on the problem-solving cycle" (p. 26). As they explain, "people can learn at any time by converting ordinary challenges in their work into learning opportunities, exploring the experiences as they think about action, experimenting with solutions, examining results, and using new insights to plan for future similar experiences" (p. 26). However, Marsick and Watkins's model emphasizes "a deeper level of thinking that typically remains less conscious and that may not be carefully considered" (p. 26).:

> As people encounter a new situation, they frame or reframe it–that is, they assess what they see, fileter it through mental models from past experiences, and use their judgement to name what they see. They then assess the context itself. For example, they consider the people involved, expected ways of acting, anticipated resources, or anticipated impact. This helps them decide how they want to act. People can intentionally develop new skills, knowledge, and awareness as they act. Finally, they can assess unintended consequences along with those intended before planning future actions. The result is a continuous, upward spiral of learning. Learning is tied to each step of the problem-solving cycle, and it is enhanced by examining more closely the less conscious steps that lie between the conscious steps. In this model, learning is a continuous cycle of acting and reflecting that grows out of work. (pp. 26, 27)

## Senge's Conceptual Framework for a Learning Organization

Peter Senge (1993) has developed a conceptual framework for a learning organization centers on three cornerstones of a learning organization: Aspiration, Converation, and Conceptualization. According to Senge, organizations can develop these cornerstones by focusing on five inter-dependent "disciplines":

**Aspiration**

1. Personal Mastery. Personal mastery is "the discipline of personal growth and learning. People with high levels of personal mastery are continually expanding their ability to create the results in life they truly seek" (p. 141).
2. Building Shared Vision. "If any one idea about leadership has inspired organizations for thousands of years, it's the capacity to hold a shared picture of the future we seek to create" (Senge, 1990, p. 9).

**Conversation**

3. Mental Models. According to Senge, "new insights fail to get put into practice because they conflict with deeply held internal images of how the world works, images that limit us to familiar ways of thinking and acting" (p. 174). The discipline of Mental Models involves "surfacing, testing, and improving our internal pictures of how the world works" (ibid.).
4 Team Learning. "There has never been a greater need for mastering team learning in organizations than there is today. Whether they are management teams or product development teams or cross-functional task forces — teams . . . are becoming the key learning unit in organizations" (p. 236).

**Conceptualization**

5. Systems Thinking. Senge argues that "we tend to focus on snapshots of isolated parts of the system, and wonder why our deepest problems never seem to get solved" (p. 7). As he explains, "systems thinking is a conceptual framework, a body of knowledge and tools that has been developed over the past fifty years, to make the full patterns clearer, and to help us see how to change them effectively" (ibid.).

Senge contends that "it is vital that the disciplines develop as an ensemble" (Senge, 1990, p. 12). Further, as he explains, he uses the term "discipline" because it connotes lifelong learning:

> To practice a discipline is to be a lifelong learner. You "never arrive"; you spend your life mastering disciplines. You can never say, "We are a learning organization," any more than you can say, "I am an enlightened person." The more you learn, the more acutely aware you become of your ignorance. Thus, a corporation cannot be "excellent" in the sense of having arrived at a permanent excellence; it is always in the state of practicing the disciplines of learning, of becoming better or worse. (Senge, 1990, p. 11)

## Aspiration

The "Aspiration" cornerstone of learning organizations, as Senge (1993) explains, can be developed by focusing on two disciplines: Building Shared Vision and Personal Mastery.

### Personal Mastery

Personal mastery "embodies two underlying movements. The first is continually clarifying what is important to us. . . . The second is continually learning how to see current reality more clearly" (Senge, 1990, p. 141):

> The juxtaposition of vision (what we want) and a clear picture of current reality (where we are relative to what we want) generates what we call "creative tension": a force to bring them together, caused by the natural tendency of tension to seek resolution. The essence of personal mastery is learning how to generate and sustain creative tension in our lives. (p. 142)

Developing personal mastery involves clarifying one's personal vision, holding creative tension, and making "a commitment to the truth":

> Commitment to the truth does not mean seeking the "Truth," the absolute final word or ultimate cause. Rather, it means a relentless willingness to root out the ways we limit or deceive ourselves from seeing what is, and to continually challenge our theories of why things are the way they are. It means continually broadening our awareness, just as the great athlete with extraordinary peripheral vision keeps trying to "see more of the playing field." It also means continually deepening our understanding of the structures underlying current events. Specifically, people with high levels of personal mastery see more of the structural conflicts underlying their own behavior. (p. 159)

As Senge explains, "the learning process of the young child provides a beautiful metaphor for the learning challenge faced by us all: to continually expand our awareness

and understanding, to see more and more of the interdependencies between actions and our reality, to see more and more of our connectedness to the world around us" (p. 170). But he warns that "it must always be remembered that embarking on any path of personal growth is a matter of choice. No one can be forced to develop his or her personal mastery" (p. 172). However, Senge suggests that there are actions organization can take to promote the development of personal mastery:

> There is nothing more important to an individual committed to his or her own growth than a supportive environment. An organization committed to personal mastery can provide that environment by continually encouraging personal vision, commitment to the truth, and a willingness to face honestly the gaps between the two.
>
> Many of the practices most conducive to developing one's own personal mastery–developing a more systemic worldview, learning how to reflect on tacit assumptions, expressing one's vision and listening to others' visions, and joint inquiry into different people's views of current reality–are embedded in the disciplines for building learning organizations. So in many ways, the most positive actions that an organization can take to foster personal mastery involve working to develop all five disciplines in concert. The core leadership strategy is simple: be a model. (p. 173)

Building Shared Vision

> A vision is truly shared when you and I have a similar picture and are committed to one another having it, not just to each of us, individually, having it. When people truly share a vision they are connected, bound together by a common aspiration. Personal visions derive their power from an individual's deep caring for the vision. Shared visions derive their power from a common caring. . . . Shared vision is vital for the learning organization because it provides the focus and energy for learning. (Senge, 1990, p. 206)

"Visions are exhilarating. They create the spark, the excitement that lifts an organization out of the mundane" (Senge, 1990, p. 208). And as Senge explains, "you cannot have a learning organization without shared vision. Without a pull toward some goal which people truly want to achieve, the forces in support of the status quo can be overwhelming" (p. 191).

According to Senge (1990), "building shared vision is actually only one piece of a larger activity: developing the 'governing ideas' for the enterprise, its vision, purpose or mission, and core values" (p. 223). The governing ideas, as he explains, address three critical questions: *What?* (the vision), *Why?* (purpose or mission) and *How?* (core values that answer the question "How do we want to act, consistent with out mission, along the

path toward achieving our vision?" ((p. 224))). "Taken as a unit, all three governing ideas answer the question, *What do we believe in?*" (p. 224).

## Conversation

Organizational "conversation," as Senge (1993) explains, can be improved by focusing on two disciplines: Mental Models and Personal Mastery.

### Mental Models

> "In the traditional authoritarian organization, the dogma was managing, organizing, and controlling," says Hanover's CEO Bill O'Brien. "In the learning organization, the new 'dogma' will be vision, values, and mental models. The healthy organizations will be ones which can systematize ways to bring people together to develop the best possible mental models for facing any situations at hand." (Senge, 1990, p. 181)

According to Senge, "New insights fail to get put into practice because they conflict with deeply held internal images of how the world works, images that limit us to familiar ways of thinking and acting" (p. 174). As he explains, these internal images are our *mental models:*

> Mental models can be simple generalizations such as "people are untrustworthy," or they can be complex theories, such as my assumptions about why members of my family interact as they do. But what is most important to grasp is that mental models are *active*–they shape how we act. If we believe people are untrustworthy, we act differently from the way we would if we believed they were trustworthy. If I believe that my son lacks self-confidence and my daughter is highly aggressive, I will continually intervene in their exchanges to prevent her from damaging his ego. (p. 175)

Our mental models may be accurate or inaccurate, harmful or helpful. They tend to cause problems, as Senge explains, when they "are tacit–when they exist below the level of awareness" (p. 176). Therefore, as Senge explains, it is important for individuals to examine their mental models, and to refine them, as needed.

Developing skills in examining/refining mental models, according to Senge, involves focusing on skills of *reflection* and skills of *inquiry*. "Skills of reflection concern slowing down our own thinking processes so that we can become more aware of how we form mental models and the ways they influence our actions" (p. 191). "Reflection starts with recognizing *leaps of abstraction*" (p. 192).

"Inquiry skills concern how we operate in face-to-face interactions with others, especially in dealing with complex and conflictual issues" (p. 191). Inquiry must be balanced, however, with advocacy:

> Most managers are trained to be advocates. In fact, in many companies, what it means to be a competent manager is to be able to solve problems–to figure out what needs to be done, and enlist whatever support is needed to get it done. Individuals became successful in part because of their abilities to debate forcefully and influence others. Inquiry skills, meanwhile, go unrecognized and unrewarded.
>
> But as managers rise to senior positions, they confront issues more complex and diverse than their personal experience. Suddenly, they need to tap insights from other people. They need to learn. Now, the manager's advocacy skills become counterproductive; they can close us off from actually learning from one another. What is needed is blending advocacy and inquiry to promote collaborative learning. (p. 198)

Team Learning

> Team learning is the process of aligning and developing the capacity of a team to create the results its members truly desire. It builds on the discipline of developing shared vision. It also builds on personal mastery, for talented teams are made up of talented individuals. But shared vision and talent are not enough. The world is full of teams of talented individuals who share a vision for a while, yet fail to learn. The great jazz ensemble has talent and a shared vision (even if they don't discuss it), but what really matters is that the musicians know how to *play* together. (Senge, 1990, p. 236)

Senge suggests that alignment is a *necessary condition* before empowering teams (p. 236). He also argues that team learning has three critical dimensions:

- The need to think insightfully about complex issues (tapping the potential for many minds to be more intelligent than one mind)
- The need for innovative, coordinated action
- The role of team members on other teams within the organization (ibid.)

In approaching team learning as a discipline, Senge argues that organizations must master the practices of *dialogue* and *discussion.* "In dialogue, there is the free and creative exploration of complex and subtle issues, a deep 'listening' to one another and suspending of one's own views" (p. 237). In discussion, however, "different views are presented and defended and there is a search for the best view to support decisions that must be made at the time" (ibid.). Although dialogue and discussion can be complementary, Senge suggests that "most teams lack the ability to distinguish between the two and to move consciously between them" (ibid.). Consequently, Senge argues,

teams need a skilled facilitator. As he explains, "In the absence of a skilled facilitator, our habits of thought continually pull us toward discussion and away from dialogue" (p. 246).

Senge explains that David Bohm, "a leading quantum theorist, is developing a theory and method of dialogue'" (Senge, 1990, p. 239). According to Senge, Bohm has identified three basic conditions necessary for dialogue: (1) Participants must "suspend their assumptions"; (2) Participants must regard one another as colleagues; and (3) A facilitator must be present to "hold the context" of dialogue (Senge, 1990, p. 243).

"Team learning also involves learning how to deal creatively with the powerful forces opposing productive dialogue and discussion in working teams" (p. 237). Defensiveness, as Senge explains, is often a powerful, non-productive force that prevents learning: "The difference between great teams and mediocre teams lies in how they face conflict and deal with the defensiveness that invariably surrounds conflict" (p. 249).

> It is not the absence of defensiveness that characterizes learning teams but the way defensiveness is faced. A team committed to learning must be committed not only to telling the truth about what's going on "out there," in their business reality, but also about what's going on "in here," within the team itself. To see reality more clearly, we must also see our strategies for obscuring reality.
>
> The power and insight that start to emerge when this happens are considerable. In effect, defensive routines are like safes within which we "lock up" energy that could be directed toward collective learning. As defensiveness becomes "unlocked," that insight and energy are released, becoming available for building shared understanding and advancing toward what the team members truly want to create. (p. 257)

## Conceptualization

According to Senge (1993), Systems Thinking is the conceptual cornerstone of learning organizations. As he explains, "Systems thinking is needed more than ever because we are becoming overwhelmed by complexity. Perhaps for the first time in history, humankind has the capacity to create far more information than anyone can manage, and to accelerate change far faster than anyone's ability to keep pace. Certainly the scale of complexity is without precedent." (Senge, 1990, p. 69).

> I call systems thinking the fifth discipline because it is the conceptual cornerstone that underlies all of the five learning disciplines . . . All are concerned with a shift of mind from seeing parts to seeing wholes, from seeing people as helpless reactors to seeing them as active participants in shaping their reality, from reacting to the present to creating the future. (p. 69)

An important aspect of systems thinking, according to Senge, is focusing on *dynamic complexity* rather than *detail complexity*. As he argues, "sophisticated tools of forecasting and business analysis, as well as elegant strategic plans, usually fail to produce dramatic breakthroughs in managing a business" (p. 71). The reason: "they are all designed to handle the sort of complexity in which there are many variables: *detail complexity*."

*Dynamic complexity* occurs "in situations where cause and effect are subtle, and where the effects over time of interventions are not obvious" (p. 71). The dynamic interrelationships in organizations can be extremely complicated. In organizations, it can take "days to produce something, weeks to develop a new marketing promotion, months to hire and train new people, and years to develop new products, nurture management talent, and build a reputation for quality–and all of these processes interact continually" (p. 72).

Dynamic complexity is evidenced in a number of common business problems: "balancing market growth and capacity expansion . . . developing a profitable mix of price, product (or service), quality, design, and availability that make a strong market position . . . improving quality, lowering total costs, and satisfying customers in a sustainable manner" (p. 72). Senge argues that:

> *The real leverage in most management situations lies in understanding dynamic complexity, not detail complexity* (ibid.)

According to Senge, solving dynamically complex problems requires "seeing the interrelationships" (between actions and their potential consequences), "seeing the delay between action and consequence," and "seeing patterns of change, not just snapshots" (p. 72).

**Systems "Language"**

Senge argues that the English language is limiting, focusing us on linear thinking rather than systemic thinking. For example, "the practice of systems thinking starts with understanding a simple concept called 'feedback' that shows how actions can reinforce or counteract (balance) each other" (p. 75). In systems thinking, feedback "means any reciprocal flow of influence. . . every influence is both *cause* and and *effect.* Nothing is ever influenced in just one direction" (p, 75).

Structures cause behavior, as Senge points out: "seeing only individual actions and missing the structure underlying the actions . . . lies at the root of our powerlessness in complex situations" (p. 77). Further, "*from the systems perspective, the human actor is part of the feedback process, jot just standing apart from it.* This represents a profound shift of awareness. It allows us to see how we are continually both influence by and influencing our reality" (p. 78).

According to Senge, there are two types of feedback processes: reinforcing feedback and balancing feedback. "Reinforcing (or amplifying) feedback processes are the engines of growth" (p. 80). The Pygmalian effect is an example of a reinforcing feedback process. Balancing (or stabilizing) feedback operates whenever there is a goal-oriented behavior" (p. 80). "In a balancing (stabilizing) system, there is a self-correction that attempts to maintain some goal or target" (p. 84). Balancing feedback loops "are more difficult to see than reinforcing loops because it often *looks* like nothing is happening" (p. 88):

> Whenever there is "resistance to change," you can count on there being one or more "hidden" balancing processes. Resistance to change is neither capricious nor mysterious. It almost always arisis from threats to traditional norms and ways of doing things. Often these norms are woven into the fabric of established power relationships. The norm is entrenched because the distribution of authority and control is entrenched. Rather than pushing harder to overcome resistance to change, artful leaders discern the sourece of the resistance. They focus directly on the implicit norms and power relationships within which the norms are embedded. (p. 88)

Delays between actions and consequences complicate feedback processes. As Senge explains, "virtually all feedback processes have some form of delay. But often the

delays are either unrecognized or not well understood. This can result in 'overshoot,' going further than needed to achieve a desired result" (p. 89).

As Senge explains, reinforcing feedback, balancing feedback, and delays are at the heart of systems thinking. They are "the building blocks of the 'systems archetypes'–more elaborate structures that recur in our personal and work lives again and again" (p. 92).

**Systems Archetypes**

Senge contends that a relatively small number of systems archetypes "embody the key to learning to see structures in our personal and organizational lives" (p. 94). As he explains, "the bottom line of systems thinking is leverage–seeing where actions and changes in structures can lead to significant, enduring improvements (p. 114). The systems archetypes help us to "recondition our perceptions, so as to be more able to *see* structures at play, and to see the leverage in those structures" (p. 95). Although he explains that researchers have identified "about a dozen archetypes," two that he feels "recur frequently, and which are steppingstones to understanding other archetypes and more complex situations" (p. 95) are:

1) ***Limits to Growth*** – Definition: "A reinforcing (amplifying) process is set in motion to produce a desired result. It creates a spiral of success but also creates inadvertent secondary effects (manifested in a balancing process) which eventually slow down the success" (p. 95). Management Principle: "Don't push growth, remove the factors limiting growth" (p. 95). How to Achieve Leverage: "Leverage lies in the balancing loop–not the reinforcing loop. To change the behavior of the system, you must identify and change the limiting factor" (p. 101).
2) ***Shifting the Burden*** – Definition: "An underlying problem generates symptoms that demand attention. But the underlying problem is difficult for people to address, either because it it obscure or costly to confront. So people 'shift the burden' of their problem to other solutions–well-intentioned, easy fixes which

seem extremely efficient. Unfortunately, the easier 'solutions' only ameliorate the symptoms; they leave the underlying problem unaltered. The underlying problem grows worse, unnoticed because the symptoms apparently clear up, and the system loses whatever abilities it had to solve the underlying problem" (p. 104). Management Principle: "Beware the symptomatic solution. Solutions that address only the symptoms of a problem, not fundamental causes, tend to have short-term benefits at best. In the long term, the problem resurfaces and there is increased pressure for symptomatic response. Meanwhile, the capability for fundamental solutions can atrophy" (p. 104). How to Achieve Leverage: "Dealing effectively with shifting the burden structures requires a combination of strenthening the fundamental response and weakening the symptomatic response. The character of organizations is often revealed in their ability (or inability) to face shifting-the-burden structures. Strengthening fundamental responses requires a long-term orientation and a sense of shared vision. Without a vision of succeeding through new product innovation, pressures to divert investment into short-term problem-solving will be overwhelming" (pp. 110, 111).

Additional archetypes discussed by Senge are:

3) ***Balancing Process with Delay***. Description: A person, a group, or an organization, acting toward a goal, adjusts their behavior in response to delayed feedback. If they are not conscious of the delay, they end up taking more corrective action than needed, or (sometimes) just giving up because they cannot see that any progress is being made. Management Principle: In a sluggish system, aggressiveness produces instability. (pp. 378, 379)

4) ***Shifting the Burden to the Intervenor*** (a special case of the "Shifting the Burden" archetype). Description: One area where shifting the burden structures are so common and so pernicious that it warrants special notice is when outside 'intervenors' try to help solve problems. The intervention attempts to ameliorate obvious problem symptoms, and does so so successfully that the people within the system never learn how to deal with the problems themselves. Management Principle: "Teach people to fish rather than giving them fish." Focus on enhancing the capabilities of the "host system" to solve its own problems. If outside help is needed, "helpers" should be strictly limited to a one-time intervention (and everyone knows this in advance) or be able to help people develop their own skills, resources, and infrastructure to be more capable in the future. (p. 382)

5) ***Eroding Goals***. Description: A shifting the burden type of structure in which the short-term solution involves letting a long-term, fundamental goal decline. Management Principle: Hold the vision. (p. 383)

6) ***Escalation.*** Description: Two people or organizations each see their welfare as depending on a relative advantage over the other. Whenever one side gets ahead, the other is more threatened, leading it to act more aggressively to reestablish its advantage, which threatens the first, increasing its aggressiveness, and so on. Often each side sees its own aggressive behavior as a defensive response to the other's aggression; but each side acting "in defense" results in a buildup that goes far beyond either side's desires. Management Principle: Look for a way for both sides to "win," or to achieve their objectives. In many instances, one side can unilaterally reverse the vicious spiral by taking overtly aggressive "peaceful" actions that cause the other to feel less threatened. (p. 384)

7) ***Success to the Successful.*** Description: Two activities compete for limited support or resources. The more successful one becomes, the more support it gains, thereby starving the other. Management Principle: Look for the overarching goal for balanced achievement of both choices. In some cases, break or weaken the coupling between the two, so that they do not compete for the same limited resources. (pp. 385, 386)

8) ***Tragedy of the Commons.*** Description: Individuals use a commonly available but limited resource solely on the basis of individual need. At first they are rewarded for using it; eventually, they get diminishing returns, which causes them to intensify their efforts. Eventually, the resource is either significantly depletely, eroded, or entirely used up. Management Principle: Manage the "commons," either through educating everyone and creating forms of self-regulation and peer pressure, or through an official regulationg mechanism, ideally designed by participants. (p. 387)

9) ***Fixes that Fail.*** Description: A fix, effective in the short term, has unforeseen long-term consequences which may require even more use of the same fix. Management Principle: Maintain focus on the long term. Disregard the short-term "fix," if feasible, or use it only to "buy time" while working on a long-term remedy. (pp. 388, 389)

10) ***Growth and Underinvestment.*** Description: Growth approaches a limit which can be eliminated or pushed into the future if the firm, or individual, invests in additional "capacity." But the investment must be aggressive and sufficiently rapid to forestall reduced growth, or else it will never get made. Oftentimes, key goals or performance standards are lowered to justify underinvestment. When this happens, there is a self-fulfilling prophecy where lower goals lead to lower expectations, which are then borne out by poor performance caused by underinvestment. Management Principle: If there is a genuine potential for growth, build capacity in advance of demand, as a strategy for creating demand. Hold the vision, especially as regards assessing key performance standards and evaluating whether capacity to meet potential demand is adequate. (pp. 389, 390)

## Leadership

"Traditional views of leaders as special people who set the direction, make the key decisions, and energize the troops–are deeply rooted in an individualistic and nonsystemic worldview" (Senge, 1990, p. 340). According to Senge, "the traditional view of leadership is based on assumptions of people's powerlessness, their lack of personal vision and inability to master the forces of change, deficits which can be remedied only by a few great leaders" (ibid.)

Leaders in learning organizations, Senge argues, must take on new roles. They must act as designers, stewards, and teachers:

1. ***Leader as Designer.*** "In essence, the leaders' task is designing the learning processes whereby people throughout the organization can deal productively with the critical issues they face, and develop their mastery in the learning disciplines (p. 345)
2. ***Leader as Steward.*** Senge contends that successful leaders share a deep sense of commitment to their purpose, and they are able to relate their "purpose stories" in the context of "why they do what they do, how their organizations need to evolle, and how that evolution is part of something larger" (p. 346).
3. ***Leader as Teacher.*** Senge explains that "leaders can influence people to view reality at four distinct levels: events, patterns of behavior, systemic structures, and a "purpose story" (p. 353). According to Senge, most organizational leaders focus on the first two levels–"and under their influence, their organizations do likewise" (ibid.). "On the other hand, leaders in learning organizations pay attention to all four levels, but focus predominantly on purpose and systemic structure. Moreover, they teach people throughout the organization to do likewise" (ibid.)

## Research Relating to Organizational Learning

### Introduction

As discussed in Chapter One, survival in the ever-changing environments they face has caused many businesses to embrace new strategies for introducing and cultivating innovation. According to Kanter (1989): "We are witnessing a crumbling of hierarchy, a gradual replacement of the bureaucratic emphasis on order, uniformity, and repetition with an entrepreneurial emphasis on creativity and deal-making" (Kanter, 1989, p. 355).

In *Out of the Crisis* (1982), Deming presented a set of recommendations for transforming American industry. Among his points, Deming argued that businesses must focus on quality, and "improve constantly and forever" their production and service systems (Deming, 1982, p. 23). These ideas have been embraced by American businesses attempting to gain a competitive advantage in today's global economy. As Marsick and Watkins (1993) explain, "efforts to restore American competitiveness through a focus on quality are not new. Yet the establishment of a national award for quality–the Malcolm Baldridge Award–by Public Law 100-107, signed by President Reagan on August 20, 1987, has spurred American business to redouble its efforts" (p. 168).

Many organizations have implemented "quality" initiatives in one form or another (e.g., Total Quality Management, Continuous Quality Improvement). Peters (1989), for one, has championed the "quality revolution." According to Peters, "quality and flexibility will be the hallmark of the successful economy for the foreseeable future" (p. 14). And in *Workplace 2000*, Boyett and Conn (1992) point out that "quality, really perfection, will be so important in the American workplace that it will be drummed into employees' heads constantly" (p. 308).

Similarly, many organizations have focused on the idea of constant improvement. As Byham and Cox (1988) explain:

> To do business in the markets of the late 20th Century, in a global economy, and often against excellent competitors, it is essential to keep working for constant improvement, for what the Japanese call *kaizen.* This means in a world-class organization, everybody in the company has to be thinking about ways to make the business better in quality, output, costs, sales, and customer satisfaction" (Byham, W. & Cox, J., 1988, p. vii).

However, some researchers and practitioners argue that what is needed today is not fine-tuning of existing processes, but more revolutionary measures. Hammer and Champy (1993) contend that businesses must fundamentally rethink and radically redesign business processes to achieve dramatic improvements in critical, contemporary measures of performance–e.g., cost, quality, service, speed (p. 32). As they explain:

> It is no longer necessary or desirable for companies to organize their work around Adam Smith's division of labor. Task-oriented jobs in today's business world of customers, competition, and change are obsolete. Instead, companies must organize work around *process*" (Hammer & Champy, 1993, pp. 27, 28)

Similarly, Davenport (1993) argues that businesses must adopt a process focus, although he advocates incorporating innovation technologies in his approach. In *Process Innovation, Reengineering Work Though Information Technology* (1993), Davenport summarizes findings from more than four years of research, in both academic and consulting contexts. In this research, hundreds of interviews and discussions were conducted with executives and professionals in more than 50 companies. According to Davenport:

> The needed revolutionary approach to business performance improvement must emcompass both how a business is viewed and structured, and how it is improved. Business must be viewed not in terms of functions, divisions, or products, but of key processes. Achievement of order-of-magnitude levels of improvement in these processes means redesigning them from beginning to end, employing whatever innovative technologies and organizational resources are available.

Clearly, the magnitude of challenges facing businesses today is unprecedented. Unfortunately, solutions to the problems companies face require diligence and flexibility at all levels of the organization. It appears that American companies and their employees must learn to adopt multiple foci–including quality, process, and innovation–as they are learning new skills and roles.

The learning challenge is further compounded, as Hammer and Champy (1993) explain, because not only must companies and their employees learn new skills and roles, but they must also "unlearn many of the principles and techniques that brought them success for so long" (p. 11). In *Leadership. The Strategies for Taking Charge* (1985), Bennis and Nanus capture the feelings of many as they point out:

> This is an era marked with rapid and spastic change. The problems of organizations are increasingly complex. There are too many ironies, polarities, dichotomies, dualities, ambivalences, paradoxes, confusions, contradictions, contraries, and messes for any organization to understand and deal with. (p. 8)

How can organizations cope with the increasing complexity they face today? How can they change while remaining stable enough to deliver the products/services they were created to produce? The answer, according to numerous researchers and practioners (e.g., Bennis & Nanus, 1985; Marsick & Watkins, 1993; Senge, 1990; Weisbord, 1991), is to effectively orchestrate organizational learning. Learning organizations, as Senge explains, tap into our natural desire to learn and grow:

> Learning organizations are possible because, deep down, we are all learners. No one has to teach an infant to learn. In fact, no one has to teach infants anything. They are intrinsically inquisitive, masterful learners who learn to walk, speak, and pretty much run their households all on their own. Learning organizations are possible because not only is it our nature to learn but we love to learn. (Senge, 1990, p. 4)

## Organizational Learning

Marsick and Watkins (1990) explain that "there has been little empirical research on organizational learning, perhaps because this concept is more easily grasped as a metaphor than a reality." (Marsick & Watkins, 1990, p. 42).

However, Argyris' research helps to explain some of the difficulties inherent in efforts to promote organizational learning. In *On Organizational Learning* (1992), Argyris describes the results of action research in which he examined discrepancies and/or inconsistencies in what he refers to as individuals' "espoused theories" and their "theories-in-use" (p. 25). Further, he distinguishes between two types of organizational learning: single- and double-loop learning. As he explains, "individuals are walking

social structures who cannot undergo double-loop learning without reflecting on their actions" (p. 36). According to Argyris:

> Most people define learning too narrowly as mere 'problem-solving,' so they focus on identifying and correcting errors in the external environment. Solving problems is important. But if learning is to persist, managers and employees must also look inward. They need to reflect critically on their own behavior, identify ways they often inadvertandly contribute to the organization's problems, and then change how they act. In particular, they must learn how the very way they go about defining and solving problems can be a course of problems in its own right.
>
> I have coined the terms "single-loop" and double-loop" learning to capture this crucial distinction. . . . Highly skilled professionals are frequently very good at single-loop learning. . . But ironically, this very fact helps explain why professionals are often so bad at double-loop learning.
>
> Put simply, because many professionals are almost always successful at what they do, they rarely experience failure. And because they have rarely failed, they have never learned how to learn from failure. So whenever their single-loop learning strategies go wrong, they become defensive, screen out criticism, and put the "blame" on anyone and everyone but themselves. In short, their ability to learn shuts down precisely at the moment they need it the most. (Argyris, 1992, pp. 84, 85)

Bennis and Nanus (1985) distinguish between "maintenance learning" and innovative learning:

> In many organizations today, maintenance learning has been well developed and carefully institutionalized. This is necessary but not sufficient. In maintenance learning, current performance is compared only with past performance, not with what might have been or what is yet to be. Corrective action is designed to deal with perceived weaknesses and failures, not to build on strengths and new opportunities. And the work structures reinforce this entire tendency to restrict learning to what is necessary to maintain an existing system.
>
> Innovative learning is more difficult because it focuses on preparing organizations for action in new situations, requiring the anticipation of environments that have not yet appeared. There are no familiar contexts within which innovative learning can take place; indeed, the construction of new contexts is precisely one of its tasks. Innovative learning deals with emerging issues–issues that may be unique, so that there is no opportunity to learn by trial and error; issues for which solutions are not known; and issues whose very formulation may be a matter of controversy and doubt. Therefore, innovative learning has often been neglected, with the result that many organizations have serious problems in adapting to changes in their environment. (pp. 193, 194)

From their in-depth analyses of 90 top leaders–e.g., business executives, senators, governors, labor leaders, film producers–Bennis and Nanus concluded that "leaders can redesign organizations to become more receptive to learning. They can do this by

designing *open organizations* that are both *participative* and *anticipative"* (Bennis & Nanus, 1985, p. 209).

Senge argues that a learning organization "is continuously expanding its capacity to create its future" (Senge, 1990 p. 14). Similarly, Marsick and Watkins (1993) contend that "organizational learning is changed organizational capacity for doing something new" (Marsick & Watkins, 1993, p. 152). However, Marsick and Watkins warn that "a barrier to building organizational capacity is organizations' habit of exploiting superficial fads without making the investment in learning required to learn at a deeper level" (p. 154). As they explain, "exploration is needed to promote learning and growth" (p. 155):

> The payoff for changed capacity for exploration is invention and innovation. Individuals learn to innovate, and the results of their creativity are turned into profits when the organization has the capacity to foster and learn from its members. America used to lead in creativity, but tight budgets and pressure to focus only on what can be commercialized are among the reasons we are losing ground to other countries. *Business Week* reports that the United States held 59 percent of total world patents issued in 1981, whereas that lead dropped to 53% in 1991 ("American Inventors are Reinventing Themselves." *Business Week*, January 18, 1993, pp. 78-82). (Marsick and Watkins, 1993, p. 155)

## The Importance of Vision

The importance of creating and sustaining a vision in efforts to introduce change has been discussed by both researchers and practictioners–in business and educational settings (Bennis & Nanus, 1985; Boyett & Conn, 1992; Clemmer, 1992; Fullan, 1991; Hammer & Champy, 1993; Kanter, 1989; Marsick & Watkins, 1993; Miles & Louis, 1990; Pine, Victor & Boynton, 1993; Senge, 1990; Smith & O'Day, 1991; Weisbord, 1991; et al.). "A vision is a target that beckons" (Bennis & Nanus, 1985, p. 89). "With a vision, the leader provides the all-important bridge from the present to the future of the organization" (p. 90).

In *Workplace 2000*, Boyett and Conn (1992) explain that visions serve as "a powerful tool for mobilizing people to action. Leaders know that and use it" (p. 149). As Sungaila (1990) explains it, leaders provide the "vector of vision" for their organizations.

Indeed, Hammer and Champy (1993) contend that creating and sustaining a vision is one of the most important roles a leader plays:

> The leader's primary role is to act as visionary and motivator. By fashioning and articulating a vision of the kind of organization that he or she wants to create, the leader invests everyone in the company with a purpose and a sense of mission. . . . . From the leader's convictions and enthusiasm, the organization derives the spritual energy that it needs to embark on a voyage into the unknown. (Hammer & Champy, 1993, p. 103)

Pine, Victor, and Boynton (1993) warn that leaders committed to continuous improvement must develop and sustain a common vision in their organizations—or risk employee skepticism:

> Leaders of continuous-improvement organizations provide a vision of not just what is to be done today but also what needs to be realized tomorrow . . . The common vision provides everyone in the company with the movitation, direction, and control necessary to continue improving all the time. Without a sustained vision, a company's attempts at process improvement can become lost in "program-of-the-month" fads or lip service to quality. (p. 118)

However, developing common vision requires more than just leaders articulating their personal visions. Leaders must build common vision—so that all members of their organizations share them. Developing and sustaining a shared vision for the organization is not an easy task. Senge (1990) contends that building shared vision requires ongoing conversation. Similarly, based on their studies of educational reform efforts, Miles and Louis (1991) argue that developing a vision is vital, but it is a process that requires positive interaction among people. Fullan (1991) points out that organizational change requires the development of shared meaning over time: "Solutions must come through the development of *shared meaning*. The interface between individual and collective meaning and action in everyday situations is where change stands or falls" (Fullan, 1991, p. 5).

## Teamwork

In *Workplace 2000* (1992), Boyett and Conn explain that up until very recently, most American managers held Theory X (McGregor, 1960) assumptions about their workers. As they explain, Theory X managers assume that:

1. People, by their very nature, dislike work and will avoid it when possible.
2. They have little ambition, tend to shun responsibility, and like to be directed.
3. Above all else, they want security.
4. In order to get them to attain organizational objectives, it is necessary to use coercion, control, and threats of punishment. (Boyett & Conn, 1992, p. 105)

McGregor argued that these assumptions were incorrect–but because managers treated workers according to Theory X assumptions, they got Theory X behavior. Theory Y assumptions, however, were quite different:

1. The expenditure of physical and mental effort in work is as natural to people as is resting or playing.
2. External control and the threats of punishment are not the only ways of getting people to work toward organizational objectives. If people are committed to objectives, they will exercise self-direction and self-control.
3. Commitment to objectives is determined by the rewards associated with their achievement.
4. Under proper conditions, the average human being learns not only to accept, but to seek responsibility.
5. The capacity to exercise a relatively high degree of imagination, ingenuity, and creativity in the solutions of organizational problems is widely distributed throughout the population.
6. Under conditions of modern industrial life, the intellectual potential of the average human being are only partially utilized. (Boyett & Conn, 1992, p. 106)

According to Boyett and Conn, "up until the mid- and late 1980s, the debate over Theory X and Theory Y was largely academic" (p. 107). But as they explain, "by the end of the decade, we had moved past this academic debate to the practical necessity of Theory Y" (*ibid.*). Today's business environment, and that of the future, they argue, "requires that employees take initiative, respond rapidly to changing circumstances and situations, and be mentally alert and focused on the current organizational imperative" (p. 108). As they explain, "given those requirements, a Theory X 'scientifically' managed work force can't succeed" (p. 108).

Expressing a similar viewpoint, Bennis and Nanus point out that leaders empower, managers control: "Leadership stands in the same relationship to empowerment that management does to compliance. The former encourages a 'culture of pride,' while the latter suffers from the 'I only work here' syndrome" (Bennis & Nanus, 1985, p. 218). Many business researchers and practictioners advocate empowering

employees today (e.g., Boyett & Conn, 1992; Byham & Cox, 1988; Clemmer, 1992; Hammer & Champy, 1993; Johnston, K., 1993; Marsick and Watkins, 1993; Weisbord, 1991). Educational researchers also point to the importance of empowering rather than merely mandating change. For example, more than ten years after their initial study, one of the researchers from the Rand Change Agent Study writes: "We have learned that we cannot mandate what matters to effective practice; the challenge lies in understanding how policy can enable and facilitate it" (McLaughlin, 1990, p. 15).

Clearly, there is growing awareness that organizations must learn to involve employees in more meaningful ways to address the challenges and problems they face today. Weisbord (1991) traces the development of employee involvement back to findings from Kurt Lewin's "gatekeeper" study during World War II. Through experiments with Iowa housewives, Lewin, in collaboration with Margaret Mead, attempted to discern how to best reduce civilian consumption of rationed foods:

> Lewin's method was simple. He would identify the "gatekeepers" who control a situation, then he would recude the resisting forces by involving them in studying and planning the change. Mead pointed out that husbands, contrary to belief, ate foods their *wives* liked. Lewin charted the the flow of meats from store to table the way a systems analyst follows a shipping order from office to loading dock. It was obvious that Mead was right. The homemakers bought, stored, prepared, and served the food.
>
> The resistance to nonscarce meats must be reduced. If gatekeepers were given new information and participated in deciding what to do, it should be possible to get more nonrationed meats on the table. He set up a comparative experiment. An expert nutritionist lectured housewives on what they "should" do–a traditional, reasoned exhortation to change. Women in comparison groups were given the facts and invited to decide together what to do. With 20/20 hindsight it's easy to guess what happened. Groups that reached consensus through discussion changed their food habits much more than those given expert advice. (Weisbord, 1991, pp. 88, 89)

According to Weisbord, "Lewin found a core principle: *we are likely to modify our own behavior whem we participate in problem analysis and solution and likely to carry out decisions we have helped make*" (p. 89).

A form of employee involvement rapidly gaining popularity in organizations today is the creation of work teams. Boyett and Conn (1992) contend that two types of teams will dominate the workplace of the future: work-unit teams and self-managed

teams. Indeed, Katzenbach and Smith (1993) argue that "teams will become the primary unit of performance in high performance organizations" (p. 119). To study where and how teams work best, Katzenbach and Smith (1993) examined more than 50 teams in 30 different organizations—"from Motorola and Hewlett-Packard to Opeartion Desert Storm and the Girl Scouts" (ibid.). They suggest that there is "a working definition, or better still, an essential discipline that real teams share:

> *A team is a small number of people with complementary skills who are committed to a common purpose, set of performance goals, and approach for which they hold themselves accountable."* (Katzenbach & Smith, 1993, p. 112)

According to Senge, "Team learning is vital because teams, not individuals, are the fundamental learning unit in modern organizations. This is where 'the rubber meets the road'; unless teams can learn, the organization cannot learn (Senge, 1990, p. 10). Marsick and Watkins (1993) contend that "teamwork is not natural to our Lone Ranger culture except in sports" (p. 111). However, as they explain:

> When people know how to work and learn together, they spread new learning farther and faster because they form a critical mass. They generate more innovative results when they use the diversity in the group to see a problem and its solutions in new ways. This does not always ensure profitable results in the short run, but team learning is more likely to result in profitabe decisions and actions in the long run. (Marsick & Watkins, 1993, pp. 111, 112)

## Systems Thinking

"Systems thinking is a discipline for seeing wholes. It is a framework for seeing interrelationships rather than things, for seeing patterns of change rather than static *snapshots*" (Senge, 1990, p. 68). Systems thinking focuses awareness on underlying structures of a system. As Senge explains, "the bottom line of system thinking is leverage–seeing where actions and changes in structures can lead to significant, enduring improvements" (p. 114). According to Senge, linear thinking has limited our ability to improve the functioning of organizations.

Betts (1993) suggests that there are 10 shared values which are the *sine quae non* of systems thinking:

1. "Even though it may not be immediately evident, there is an underlying pattern that influences and organizes the observable behaviors of a system" (p. 13.2)
2. A limited number of recurring patterns or structures appear frequently and repeatedly as variations on a theme in all organizations.
3. The Second Law of Thermodynamics applies to social systems as well as to physical systems; that is, all systems are subject to *entropy*, moving from an ordered to a disordered state, and require the continual generation or importation of energy (negentropy) to maintain order in the system.
4. Natural systems, if left to their own devices, are self-organizing.
5. *Energy* is the glue that holds systems together.
6. Systems are hierarchically integrated structures that possess an implicate order.
7. All systems enhibit increasing complexity at each higher level of the hierarchy or supra-system.
8. Systems are *purposive*. The purpose is not always evident nor equivalent to the stated purpose.
9. Systems form generatiive wholes; a critical mass of elements, the organilation of which produces energy because of the relationships between the elements according to the property of synergy. The greater the exchange of energy between components within a system, the more tightly linked and enduring the system.
10. Systems have *boundaries*; the elements of the whole form a bounded set defined by relationships that are the links between elements that share a common purpose. (Betts, 1993, pp. 13.2-13.5)

Senge argues that adopting a "systems perspective" requires non-linear thinking. Similarly, Gleick (1987) espouses a non-linear view of reality in his explanation of chaos theory, a form of systems thinking. In a rather interesting, albeit unusual, application of this new form of systems thinking, Sungaila (1990) argues that chaos theory offers new insights into leadership in changing environments. According to Sungaila, the fundamental principle of the new science of chaos is "order through fluctuation" (Sungaila, 1990, p. 8). She suggests that organizations are open systems which cannot be in equilibrium: "An open system, of necessity far from equilibrium, is a dissipative structure. It can and does continuously renew itself" (ibid.). In open systems, according to Chaos theory:

> Tiny differences in input could quickly become overwhelming differences in output–a phenomenon given the name sensitive dependence on initial conditions. In weather, for example, this translated into what is only half-jokingly known as the Butterfly Effect–the notion that a butterfly stirring the air today in Peking can transform storm systems next month in New York" (Gleick, 1987, p. 8)

Because organizations are open systems, Sungaila argues, translating the Butterfly Effect implies that "second order change could readily be brought about by the creative input of a single individual" (Sungaila, 1990, p. 10). Similarly, Marsick and Watkins

(1993) appear to be eluding to the Butterfly Effect in their explanation of interdependencies between an organization and its internal and external environments: "The global village is not small but instead has far-reaching and complex interdependencies. Just as a cow can tip over a lantern and start the Chicago fire, tiny decisions in Latvia can set off major ripples in corporate life" (p. 18).

Barton (1994) argues that chaos theory may help to broaden psychologists' understanding of complex systems, and provide new ways to view old problems (p. 13). As he points out:

> The presence of chaos suggests that even if we are able to characterize all the variables in a nonlinear system completely, general patterns of future behavior may be the best we can hope to predict. In an insightful treatment of this problem as it relates to behavioral analysis, Hoyert (1992) explored the behavior of a hypothetical system designed to predict within-interval variablity in a fixed-interval reinforcement schedule. He demonstrated that chaotic behavior can arise even when the variables in such a system are completely determined. Hoyert went on to note that the interdependence of variables in a nonlinear system, along with sensitivity to initial conditions, lead to the implication that studying each factor in isolation may not lead to useful knowledge about the behavior of the system as a whole. This concept, long a tenet of general systems theory, has now been unequivocally demonstrated in complex non-linear systems.

The importance of adopting a "systems perspective" has been argued for by a variety of business professionals, scientists, psychologists, and educators (Barton, 1994; Bohm, 1980; Hoyert, 1992; Laszlo, 1972; Marsick & Watkins, 1993; Prigogine & Stengers, 1983; Steen, 1990; Weinberg, 1975; Wheately, 1992; et al.). Indeed, many now suggest that the problems facing American businesses and schools can only be solved through *systemic change* (Deming, 1982; Davenport, 1993; Fullan & Miles, 1992; Hammer & Champy, 1993; Senge, 1990; et al.). To illustrate the need for systemic change, Hammer and Champy point out the futility of merely integrating information technology into existing processes: "Automating existing processes with information technology is analogous to paving cow paths. Automation simply provides more efficient ways of doing the wrong kinds of things" (p. 48).

Marshall Smith, Undersecretary of the U.S. Department of Education, "is a leading proponent of systemic reform in schools" (O'Neil, 1993, p. 12). Smith explains

that systemic reform differs from comprehensive reform efforts over the last few years in that *systemic reform* requires aligning the system on a clear set of goals. An example of legislated systemic change was the Kentucky Education Reform Act (KERA) in April 1990. "One of the most comprehensive statewide restructuring efforts ever attempted in the United States, the reform called for top-down and bottom-up systemic change" (Steffy, 1993).

## Selection of the Theoretical Framework for this Investigation

There are many similarites among Fullan's Change Model (1991), Marsick & Watkins' Framework for the Learning Organization, and Senge's Framework for A Learning Organization (1990). For example, all three of these frameworks–Fullan's (1991), Marsick & Watkins' (1993), and Senge's (1990)–speak to the need for *vision-building*. All three also call for *ongoing interaction*. Senge (1990) and Marsick & Watkins (1993) advocate the use of action research technologies to enhance the effectiveness of team interactions, arguing that these technologies help to make individuals' thought processes more explicit. Further, both Senge's and Marsick & Watkins' frameworks explicitly speak to the need for *team learning*.

All three frameworks also point to the "personal" and "collective" nature of organizational learning/change. Senge explains that "organizations learn only through individuals who learn. Individual learning does not guarantee organizational learning. But without it, no organizational learning occurs" (Senge, 1990, p. 139). Marsick and Watkins (1990) also emphasize the personal and collective nature of organizational learning: "Learning is continually enhancing, and influenced by, the way in which people construct meaning" (p. 38). They argue that "people learn through interaction in bounded social groups that are connected by common organizational goals" (Marsick & Watkins, 1990, p. 39). Similarly, based on his research into educational reform efforts, Fullan (1991) argues that real change "represents a a serious personal and collective experience characterized by ambivalence and uncertainty" (p. 32). As he points out: "Neglect of the phenomenology of change–that is, how people actually experience change as distinct from how it might have been intended–is at the heart of the spectacular lack of succes of most social reforms" (Fullan, 1991, p. 4).

Both Senge's and Marsick & Watkins' frameworks also advocate adopting a "systems perspective," although the degree to which they emphasize this perspective

differs greatly. Marsick and Watkins (1993) point out that "in a learning organization, interdependencies between the organization and its internal and external environment are acknowledged and worked through" (p. 18). They also point out that "a systems perspective is needed to bring about this integration and connection" (ibid.), although they offer relatively few suggestions as to how organizations can learn to look at situations from a systems perspective.

In Senge's framework, however, systems thinking is the "conceptual cornerstone" that underlies all of the learning disciplines (Senge, 1990, p. 69). As Senge explains, "the bottom line of systems thinking is leverage–seeing where actions and changes in structures can lead to significant improvements" (p. 114). Consequently, Senge spends considerable time describing and illustrating the "building blocks" of systems thinking, and the "systems archetypes" or "generic structures" that recur again and again. "Just as in literature there are common themes and recurring plot lines that get recast with different characters and settings, a relatively small number of these archetypes are common to a very large variety of management situations" (p. 94). According to Senge, the systems archetypes can help individuals to learn to approach situations from a systems perspective:

> Our nonsystemic ways of thinking are so damaging specifically because they consistently lead us to focus on low-leverage changes: we focus on symptoms where the stress is greatest. We repair or ameliorate the symptoms. But such efforts only make matters better in the short run, at best, and worse in the long run. It's hard to disagree with the principle of leverage. But the leverage in most real-life systems, such as most organizations, is not obvious to most of the actors in those systems. They don't see the structures underlying their actions. The purpose of the systems archetypes . . . is to help see those structures and thus find the leverage, especially amid the pressures and crosscurrents of real-life business situations. (Senge, 1990, p. 114)

Clearly, all three of the models presented at the beginning of this chapter offer a comprehensive view of organizational learning/change. However, Senge's framework emphasizes "systems thinking," which in our increasingly complex, yet interdependent world, appears to be more important than ever before. Further, Senge provides a strategy for learning to <u>think</u> more *systemically*–to <u>see</u> the underlying structures in complex

situations. The system archetypes "recondition our perceptions, so as to be more able to *see* structures at play, and to see the leverage in those structures" (Senge, 1990, p. 95). Consequently, the researcher selected Senge's framework to guide analysis of the data in this study of organizational change.

# CHAPTER III

# METHODOLOGY

In this qualitative study, a theoretical construct was applied to the analysis of one organization's attempts to change. More specifically, the utility and practicality of Senge's conceptual framework for a learning organization was tested as the researcher gathered and analyzed data relating to the impact of one company's attempts to learn and apply new skills. The focus of this investigation was the impact of the company's efforts to introduce, pilot, and support a training program designed to equip individuals with the information and skill practice needed to enable application of the program's systematic problem-solving tools. Use of these tools within the company, it was hoped, would lead to more rapid identification and resolution of problems, thereby improving the organization's capacity for problem solving.

The manufacturing company involved in this investigation was in transition. A variety of changes were in process. These changes included the development and introduction of two highly automated production lines, refinement efforts for the older semi-automated production line, process improvements driven by the company's Total Quality Management program, development of a "pay-for-knowledge" system, and relocation of employees from an urban to a suburban facility. In particular, the development and implementation of the new production lines, as well as refinement efforts on the semi-automated production line, had pointed to the need for a systematic, disciplined approach to problem solving within the organization.

In light of the costs associated with the change efforts in progress, there was heightened awareness within the organization of the need to maximize organizational

efforts and control expenses. The problem solving training was requested by Operations management; a training manager within the company responded to this request by contracting for the delivery of a formal problem-solving program from an established training firm. At the same time, the training manager contacted a local university for support in assessing the impact of the training on the organization. The training manager's desire to assess the impact of the training provided the opportunity for this qualitative investigation of organizational change.

Assessing the impact of training on an organization is a difficult task. There are a number of challenges associated with it, including isolating other factors, maintaining objectivity, ascertaining the validity and accuracy of the data, etc. However, by recording and compiling employees' and managers' assessments of the training, as well as their perceptions of individual and collective problem solving abilities within the company over time, this researcher was able to "hold up a mirror" for the organization. "Reflecting back" employees' perceptions regarding the impact of the training on the organization over a period of time provided the company with feedback regarding the appropriateness of the training for the organization, the effectiveness of implementation efforts, and suggestions for improving problem solving within the company. In addition, the researcher provided company managers with an analysis of the data in terms of Senge's conceptual framework for organizational learning, as well as recommendations for enhancing the company's capacity to innovate.

As this study resulted from a "real-time" response to an expressed need, there were severe time and availability constraints imposed at its outset. Nonetheless, the situation presented a unique opportunity for a qualitative investigation of organizational learning and change.

## Research Design

As Krathwohl (1993) points out, "qualitative data may be gathered from situations as diverse as human imagination permits" (p. 314). The methodological design of this qualitative study, including development of the instruments to be used in data collection and analysis, drew from two models: Kirkpatrick's evaluation model, and Senge's conceptual framework for a Learning Organization.

Kirkpatrick's evaluation model focused the investigation, while Senge's conceptual framework was used to supplement data collection, guide analysis of the data, and serve as the basis for developing recommendations regarding how the organization might be able to increase its capacity for innovation. To gather data relating to the impact of the training, the researcher:

1. Interviewed organizational management before the training to determine why they felt the training was important, and what their specific expectations of the training were. Because of the tight time frames, there was not time for all managers of employees attending the training to be interviewed. Therefore, the training manager involved in this project helped to select managers from a variety of positions, and with varying levels of responsibility, to be interviewed.
2. Interviewed pilot session participants to determine why they were attending the training, and if/how they thought the training would contribute to "bottom-line" results for the organization. Session participants were also asked to rate the organization's current ability to problem-solve, as well as their own.
3. Conducted observations during the pilot session of the training to gather data relating to participants' perceptions as to the appropriateness of the training for themselves and/or others within the organization, as well as data relating to any concerns they had about implementation. Attending this training also demonstrated the researcher's commitment to the investigation, and set an appropriate tone for follow-up meetings. Later, based on input from the training

manager, the researcher also attended company meetings relating to organizational implementation of the training, and attended the training session for organizational managers. From information gained in these meetings, and informal conversations with company employees, the researcher created a timeline of organizational activty relating to the training.

4. Surveyed pilot session participants immediately following the pilot of the training to determine their reactions to the training–their perceptions as to the effectiveness and importance of the training, how they felt the training would help them on the job, potential problems or barriers to implementing the problem-solving approaches presented in the training, etc.
5. Conducted follow-up interviews with pilot session participants approximately six (and twelve weeks) after the training to gather data relating to the impact of the training–to what extent they felt it changed the way they performed their jobs, and what tangible outcomes they attributed to the training.
6. Conducted follow-up interviews with pilot session participants' managers to discern to what extent they felt the training had changed the way their subordinates performed their jobs, and what tangible outcomes they attributed to the training.
7. Surveyed management session participants immediately following their training to determine their reactions to the training–their perceptions as to the effectiveness and importance of the training, how they felt the training would help the organization, potential problems or barriers to implementing the problem-solving approaches presented in the training, etc.
8. Conducted follow-up interviews with management session participants approximately one month after their training to gather data relating to the impact of the training–i.e., their perceptions regarding the effectiveness and importance of the training, the extent to which they had been able to apply or support use of

the training, potential problems or barriers to implementing the approaches presented in the training, etc.

9. Interviewed cross-functional team leaders approximately five months after the pilot session of the training (three months after the management training session) as part of an effort to assess employees' perceptions regarding teams' problem solving skills, as well as team functioning capabilities. Each team surveyed had at least one member that had been through the training.
10. Surveyed cross-functional team members approximately one week after completing the interviews with the team leaders to discern employees' perceptions regarding teams' problem solving skills, as well as team functioning capabilities. Each team surveyed had at least one member that had been through the training.

The instruments used for the data collection methods outlined above are included as appendices. To supplement the data collected from these tools, the researcher developed a timeline of organizational activity relating to the training (see Appendix A). This timeline was developed from data collected in structured interviews, observations, and informal discussions with training session participants, organization managers, and training staff personnel. It was created to:

- Summarize organizational efforts to introduce and support the training.
- Indicate the timing of data collection instruments employed in this investigation.
- Provide background information describing the "context" of this change study.
- Describe organizational efforts to address perceived "barriers" to implementation of the training.

The data collection instruments used for interviews in this study were designed to be completed by this researcher during one-on-one, informal interviews. Supplementing researcher transcriptions by tape-recording the interviews would probably have made the interviews simpler for the researcher, and faster for the interviewees. However, because

tape recording can be perceived as threatening, it was decided that the integrity of the interviews would more easily be maintained if the interviews were not taped.

Kirkpatrick (1987) recommends that data-collection instruments "be designed so that tabulations can be readily made" (Kirkpatrick, 1987, p. 304). As he points out, free-response forms make "it very difficult to summarize comments and to determine patterns" (ibid.). Taking that into consideration, the instruments designed for this investigation employed both numerical rating scales and open-ended questions . Numerical ratings were particularly useful in the surveys for this study, as they were faster and simpler for respondents to complete.

Following is a detailed discussion of the specific data collection methods employed in this investigation.

## Pre-training Management Interviews

Seven interviews with company managers were conducted during the week before the pilot training session. Additionally, based on information collected in these interviews, a Statistical/TQM consultant working with the company's Operations managers was also interviewed (several interviewees indicated that the consultant had been instrumental in highlighting the need for the training).

Initially, the researcher had requested to talk with managers who were sending their employees to training. However, as the class list had not yet been fully confirmed when the interview schedules were set, the training manager selected managers from the cross-functional management team that had been created to improve the efficiency and effectiveness of the production lines (managers interviewed included the senior Operations manager, three of his direct managers, and an R&D manager). Recognizing that their time was precious, the researcher volunteered to conduct the interviews by phone or over lunch. More than half of these interviews were conducted over lunch, with the training manager present; two were conducted by phone.

The intent of these interviews was to discern why company managers were sending employees to the training–what led them to the conclusion that the training was necessary, and how they decided who would attend. Additionally, managers were asked what criteria they would use to determine whether or not they were satisfied with the results of the training, and what strategies or tools could be used to evaluate training results. The specific questions asked in these interviews are included as Appendix B.

**Pilot Session Participant Interviews**

All eleven of the pilot session participants were individually interviewed as soon as the interviews could be scheduled. It should be noted, however, that one of the pilot session participants was 8-and-1/2 months pregnant. As she delivered the baby shortly after the training, and was on maternity leave during most of this investigation, data from her interview and post-training survey (discussed below) were not compiled, reported, or summarized in this investigation.

The ten remaining pilot session participants involved in this study came from different areas (e.g., R&D, Operations) within the company, and had varying levels of responsibility (e.g., one manager, two supervisors). Their positions within the organization also varied (e.g., three engineers, a lead technician, a chemist, an inventory analyst, a buyer).

Due to training scheduling changes, the earliest any of these interviews could be conducted was one-half hour before the class began. As a result, the researcher, along with a graduate student who volunteered to assist in conducting these interviews, scheduled as many of them as possible before the training, then conducted the remaining interviews during morning breaks and lunch of the first day. The interviews took approximately five-to-seven minutes to conduct.

Participants were told that: (1) The researcher and graduate student assisting in conducting the initial interviews were not affiliated with the training; (2) Follow-up interviews would be conducted over time to provide data on the impact of the training;

(3) Data collected would be aggregated (to protect the anonymity of respondents); and (4) They did not have to participate in the study.

These initial interviews were intended to provide information relating to why employees were attending the training, how important they felt it was for the organization to improve its problem solving ability, if/how they thought the training would contribute to "bottom line" results for the organization, and how they rated the organization's–as well as their own–problem solving skills. The specific questions asked in these interviews are included as Appendix C.

**Researcher Observations**

At the outset of the investigation, the researcher asked to be allowed to attend the training sessions, and to be informed of (or allowed to attend) any meetings regarding implementation.

Attending the training enabled the researcher to gather data relating to participants' initial perceptions regarding the appropriateness of the training and/or others within the organization, as well as data relating to concerns or issues relating to implementation. Attending meetings relating to the training gave the researcher an opportunity to gather data relating to implementation activities, to demonstrate the researcher's commitment to the investigation, and to provide opportunities for the researcher to interact informally with company managers.

Based on information gained in the training sessions, management meetings, and informal conversations with company employees, the researcher created a timeline of organizational activity relating to the training (see Appendix A). Some information in the timeline directly relates to the training, describing organizational efforts to introduce, support, or follow up on the training. Additionally, the timeline provides background information relating to the context of this change and describes organizational efforts to address peceived "barriers" to implementation of the training.

**Pilot Session Participant Survey**

Immediately following the training, participants were asked to complete a brief post-training questionnaire designed to provide information relating to their reactions to the training. Pilot session participants actually completed two post-training questionnaires: one created for this investigation, and one standard form created by the consulting firm delivering the training.

Approximately two weeks before the training, the training manager and this researcher had met with the consultant delivering the training to discuss the proposed study. From the company's point of view, as the training manager explained, this study would help in assessing the impact of the training on the organization. From this researcher's point of view, this study would provide information that could then be applied to test the utility and practicality of a theoretical change model/construct–the researcher stressed that the study was intended to provide information relating to the impact of organizational efforts to introduce and support the training, it was not intended as an evaluation of the training. The consultant was supportive of the study.

On the "impact" questionnaire, participants were asked to rate the effectiveness of the training, as well as its importance. They were also asked to rate their problem solving skills before and after the training, what might prevent or inhibit implementation of the problem solving approaches presented in the training, and how they thought the training would help them. The post-training survey form is included as Appendix D.

**Follow-up Interviews with Pilot Session Participants**

Follow-up interviews with the ten pilot session participants involved in this study were conducted twice: approximately six weeks after the training, and approximately twelve weeks after the training. The instruments used for these interviews are included as appendices (see Appendix E, Appendix I).

The interviews took approximately fifteen minutes to conduct; they were scheduled at the convenience of the interviewees, to the extent possible. Most of the

interviews were conducted away from employees' desks to avoid distractions, although some interviewees had offices that provided a quiet, uninterrupted environment for the interviews. Interviews conducted away from employees' desks were either conducted in the company library or in a conference room.

The intent of the first round of interviews was to gather specific data relating to the impact of the training (e.g., if/how the pilot session participants were approaching problem solving differently as a result of the training, how they felt the training had helped them on their jobs, examples of successful applications of the tools, etc.). Additionally, the interviews were intended to provide data relating to implementation efforts (e.g., management efforts that had supported the training, participants' implementation concerns or issues, etc.).

In the second interviews, participants were asked again to rate their problem solving skills, as well as the effectiveness and importance of the training. They were also asked if the training had changed the way they solve problems on the job, and what impact their use of the tools had on the company. Further, pilot session participants were asked what factors that had most affected their ability to use the tools, how management had supported their use of the tools, and what was needed to improve the company's problem solving ability.

**Follow-up Interviews with Pilot Session Participants' Managers**

Approximately six weeks after the training, the managers of the pilot session participants were also interviewed to gather data relating to the impact of the training. As two managers had two employees who had participated in the pilot, eight interviews were conducted. Interestingly, another manager had also been a participant in the training. Therefore, the manager was interviewed as part of the follow up with session participants, and also as a manager of a session participant. In all three of these cases, the researcher used both instruments during the same interview to save time (and to ensure that all interviews would be completed).

The time needed to complete these individual interviews varied considerably; some interviews took approximately five minutes, others lasted almost twenty minutes. As with the pilot session participants, these interviews were conducted either at the individual's work station, in the library, or in a conference room. The managers selected the place where they felt their interviews could be conducted in as "distraction-free" an environment as possible.

To gather data relating to the impact of the training, managers were asked how their subordinates were approaching problem solving differently, how the training had helped their subordinates on their jobs, and what benefits had been realized from use of the tools. To gather data relating to implementation of the training, these managers were asked to explain how the training "fit in" to what the company was trying to do (and their specific departments), if their employees had been using the tools appropriately, and if/how they had been able to support the training. The instrument used for these interviews is included as Appendix F.

**Management Session Participant Survey**

Approximately two months after the pilot session of the training, Operations managers attended a "management session" of the training. The management session was 2-1/2 days in length (the original training was 3 days). Managers attending the training included the senior Operations manager, and most of his direct managers. Fourteen managers started the training, but during the first morning one manager dropped out.

Immediately following their session, managers were surveyed to discern their reactions to the training. As with the pilot session participants, managers were told not to put their names on the surveys, and that the data would be aggregated to protect the anonymity of employees completing it.

The survey asked managers to rate how important they felt it was for the company to improve its problem-solving ability, as well as the relevance, effectiveness, and importance of the training. Further, the survey asked for managers' perceptions regarding

implementation of the training—i.e., benefits to the company's using the training tools, strategic or organizational changes/actions needed to support use of the tools, their roles in supporting implementation. The survey instrument is included as Appendix G.

**Follow-up Interviews with Management Session Participants**

Approximately one month after the management training session, all but one of the managers who had attended the management session were interviewed. The senior Operations manager was not contacted to schedule a follow-up interview. The researcher decided that since he was extremely busy, and the "executive owner" of the training, it would probably be more important/useful for him to receive a summary of the data collected in the investigation. Because comparisons were made between the survey and follow-up interview data in the analysis, the data from his survey were not included in any data summary. Fortunately, he had identified himself in describing his role on the survey.

The interviews took approximately 15-20 minutes to complete, and were conducted in managers' offices. To gather data relating to the impact of the training, managers were asked for specific information regarding results/benefits from use of the tools within the organization. To gather data relating to implementation of the training, managers were asked to explain how the training related to what the company was trying to accomplish (and their specific departments), to rate the effectiveness and importance of the training, to identify factors that might limit effective use of the problem solving tools within the organization, and to identify what was required for the organization to improve its problem solving ability. The instrument used in these interviews in included as Appendix H.

**Interviews with Cross-functional Team Leaders**

As part of an effort to discern what, if any, impact the training had on the functioning of teams within the company, the researcher asked the training manager to watch for an opportunity to follow up with teams containing employees who had attended

the training. At that time, the researcher reviewed a draft of a potential "team functioning" survey that could be used with the training manager.

Approximately five and one-half months after the pilot session of the training, the training manager contacted the researcher regarding a potential opportunity to use the survey. Under the direction of the strategic management team responsible for improving the efficiency and effectiveness of the production lines, four cross-functional "spin off" teams had been recently created (or re-formulated, in some cases) to address problem areas identified as critically important to the success of the lines. Each of the teams had one or more members who had been through the problem solving training.

The team leaders were contacted directly by the researcher. By this time, all had seen or met the researcher at some point over the course of the investigation. In the initial contacts with the four team leaders during this final phase of data collection, the team leaders were: (1) Reminded/informed that the researcher was helping the organization to assess the impact of the problem solving training; (2) Asked if they would be willing to take 15 minutes to discuss the investigation, and what role they might play in it. All four interviews were scheduled and conducted within the next week.

A questionnaire was used to guide these interviews (see Appendix J). At the beginning of the interviews, the researcher reminded team leaders that the company has asked for help in assessing the impact of the problem solving training. The researcher explained that intended outcomes of the training, as expressed by senior managers of the company, included helping to develop a more standardized approach to problem solving, as well as a common language for problem solving. Team leaders then confirmed that their teams contained members who had been through the problem solving training.

The intended investigative approach for this final phase of the investigation, as the researcher explained, was a brief questionnaire to be administered by each of four team leaders at their next team meetings. Team leaders were assured that the survey data would remain anonymous; however, they were told that they would be provided with a

summary of the survey results for their own teams–no one else would be shown team-specific data.

The interview questions asked team leaders to explain the purpose and development of their teams, as well as whether or not they had used, or intended to use, the problem solving tools presented in the training. Team leaders were then asked: (1) To review the draft of the team functioning survey; and, (2) If there was anything else they would like to include on it. After modifying the survey based on their input, the researcher met with the team leaders once again to review the revised form and discuss when (and how) it would be administered.

**Cross-functional Team Survey**

Approximately six months after the pilot session of the training (four months after the management training session), a "team functioning" survey was administered to members of four cross-functional teams (see Appendix K). The surveys were administered within two weeks of the interviews with their team leaders (see above). In total, there were 39 members on the four teams; the number of completed surveys returned to the researcher was 23.

As explained in the description of the team leader interviews, team leaders had helped to review and refine the instrument, and to set the schedules for administering it. It was thought that the surveys would take approximately five minutes to complete. Initially, the researcher suggested that team leaders briefly explain and distribute the surveys at the beginning of their meetings, allow team members time to complete them, then have the researcher collect and compile the results (thereby protecting the anonymity of team members' responses).

In the first meeting, the researcher was present at the outset and the team leader distributed the survey, as planned. However, team members asked if they could complete the survey by the end of the meeting instead of completing it at that time (the researcher then returned at the end of the meeting to collect the completed forms). Administration

of the survey was also altered in the second team meeting, as team members asked to return the forms at a later date so that they could take more time to complete them. Consequently, the researcher took the names and phone numbers of individuals present in the meeting, then followed up with each team member to schedule a time to collect the completed surveys.

After the second team meeting, the researcher spoke with the two remaining team leaders about the administration approaches the other teams had employed. Both opted to distribute the surveys for completion outside of their meetings. With one team, the researcher was able to individually contact the team members to schedule survey collection times. The other team used the company's internal mail system to return completed surveys for the researcher to collect at a later date (the surveys were mailed to a training staff member who had agreed to set the forms aside for the researcher).

# CHAPTER IV

# RESULTS

Results from this investigation are summarized on the following pages. The data are organized *chronologically* by data source (i.e., pre-training management interviews, post-training surveys, follow-up interviews, etc.) in three sections that address each of the research questions:

1. Employee Perceptions Regarding the Impact of the Training in Terms of Behavioral Changes (Research Question #1: *Did individuals change the way they approach problem-solving on their jobs after the training?*)
2. Employee Perceptions Regarding the Organizational Impact of the Training (Research Question #2: *Were individuals/teams better able to meet organizational goals and/or priorities after the problem-solving training (e.g., profitability, productivity, service, or quality)?*)
3. Implementation (Research Question #3: *What mechanisms and/or strategies facilitated this change effort, and how do these mechanisms and/or strategies and their effects compare to Senge's conceptual framework?*
    - Perceptions Regarding Efforts to Facilitate Implementation of the Training
    - Analysis of the Data in Terms of Senge's Framework for a Learning Organization

Instruments used for data collection are provided as appendices. Specific references are indicated, as appropriate.

## Employee Perceptions Regarding the Impact of the Training in Terms of Behavioral Changes

Research Question #1 *Did individuals change the way they approach problem-solving on their jobs after the training?*

Pilot Session Participants' Initial Perceptions and Reactions to the Training

In initial interviews with the pilot session participants (see Appendix C), they were asked to rate the organization's current ability to problem solve (on a scale of 1-4; 1=low, 4=high), as well as their own. Participants rated themselves more than 20% higher than they did the organization (the mean rating for the organization was 2.4, the mean "self-rating" was 2.9).

When asked why they were attending the training, 80% of the pilot session participants said they were there because they were asked to attend. However, all session participants said they spend 25% or more of their time on the job solving problems; three of the ten said they spend 80% or more of their time solving problems.

As part of the training session introduction/orientation, the consultant asked course participants to share their expectations of the training. Their responses were recorded on a flip chart, then taped them to the wall. At the end of the training, the consultant reviewed them, asking if participants felt their expectations had been met. All agreed that they had. Their expectations were:

- Break the habit of looking at problems with preconceived notions or ideas.
- If I follow suggestions in the book, I should come up with solutions to problems.
- Become a better listener in the problem-solving process to better isolate key variables.
- Ability to solve whatever problems come up–and continue to know about the problem.
- Receive tools and techniques to approach problem solving in a systematic way.

- Due to the rush nature of everything around here, the ability to dig in depth into problems and to solve whatever problems come up–permanently.
- Develop a standardized approach to problem solving.
- Accurately define a problem and critical aspects as they relate to each other.
- Learn a systematic approach to problem solving that will help broaden my perspective.
- Standardize our approach to problem solving.

During the latter part of the training the pilot group was led through a "preventing problems" exercise in which they were asked to identify potential barriers to using the tools presented in the training on the job. After initial brainstorming, all participants were asked to indicate which were most likely to prevent them from using the problem solving tools on the job (each participant was asked to place three checkmarks by these items). Their responses follow; the numbers in parenthesis correspond to the number of checkmarks the items received:

- Availability of proper data (10)
- Getting the support and help of other departments (5)
- Shortage of time for proper analysis (4)
- Lack of cross-functioning teams/representation (4)
- Management making use of these skills a higher priority (3)
- Lack of interest by others to implement follow-up actions (2)
- May impact production output (1)
- Not properly following [tool] steps (1)

However, when asked on the post-training questionnaire (see Appendix D) what, if anything, might prevent or inhibit implementation of the problem solving approaches presented in the training, their responses were different from those they had expressed in the "preventing problems" exercise during the training: six pilot session participants mentioned management support (other factors mentioned were time and resource

constraints, doing something new/different, and lack of data). The reason for the discrepancy is not clear. However, possible explanations include: (1) Because participants knew the researcher was present for the during-class activity, they did not feel a need to repeat their responses; or (2) Management support was perceived as the way to overcome the barriers they had identified during class.

Participants were also asked to rate the effectiveness of the training, as well as its importance (on a scale of 1-4; 1=not, 4=very). Pilot session participants perceived the training to be both effective are important (the mean rating of the training in terms of its effectiveness was 3.6; the mean rating in terms of its importance was 3.7).

To see if their perceptions regarding their problem solving skill levels changed upon completion of the training, pilot session participants were asked again to rate their problem-solving skills; this time, however, they rated their skill levels both before *and* after the training. Participants rated their skill levels before the training differently after having gone through the training (the mean was 2.6 this time; 10% lower than their initial self-ratings). The self-ratings of their skill levels after the training, however, were higher (the mean was 3.4, 17% higher than their initial self-ratings).

Follow-up Interview #1 with Pilot Session Participants (see Appendix E)

After six weeks, pilot session participants were asked if they were approaching problem-solving differently as a result of the training. All of them said they were. When asked specifically *how*, they offered a variety of responses, including: (1) Trying to avoid emotions/first instincts/immediate reactions; (2) Trying to gather information first/to ask more "in-depth" questions/to look at things "more openly"/to look at "changes" more–and intended system operation; and (3) Trying to look from a "broader perspective"/to look at "the whole picture, not small pieces of it."

When asked approximately how many times in the past month they had used the "root cause" and "preventing problems" tools which were presented in the training on their jobs, pilot session participants' responses varied (see Table 1). Half of the pilot

session participants interviewed had used the "root cause" tool once or twice, while one participant had been using it every 2-3 days. Half had not used the "preventing problems" tool at all.

An important step in applying the "root cause" tool was clear identification of assumptions in problem solving. To discern whether or not this aspect of the training had an impact on the way they thought about problems, participants were asked if they found this useful, and whether or not they had been able to apply it to other aspects of their jobs. Half of the pilot session participants said "yes." However, the other half said: "I've always tried to avoid assumptions"; "Haven't gotten that far through the entire process"; "Haven't used it"; "It's useful, but I haven't been able to apply it"; and "We do this sub-consciously."

Table 1

**Pilot Session Participants' Use of the Problem Solving Tools on the Job**

| "Root cause" tool | | "Preventing Problems" tool | |
|---|---|---|---|
| Response | Frequency | Response | Frequency |
| "Haven't used it | 0 | "Haven't used it" | 5 |
| 1-2 times | 5 | 1-2 times | 3 |
| 3-4 times | 4 | 3-4 times | 1 |
| "Every 2-3 days" | 1 | "Ten times" | 1 |

Follow-up Interviews with Pilot Session Participants' Managers (see Appendix F)

The eight direct managers of the ten pilot session participants were also interviewed approximately six weeks after the training (two managers had two employees involved in the training). When asked how their employees were approaching problem solving differently as a result of the training, their responses varied. Five managers' responses were favorable (accounting for seven employees); an analytical, systematic approach and improved communications were common responses. However, two

managers said they were unable to answer the question, and another said there were no "marked changes" in the employee's approach.

Perceptions and Reactions to the Management Training Session (see Appendix G)

Managers of the company attended a "slightly condensed" version of the training two months after the pilot session (instead of the standard, 3-day version, their training was 2-1/2 days). On a post-training questionnaire (distributed at the end of the session), these managers were asked to rate how important they felt it was for the company to improve its problem-solving ability (from "not important" to "very important"). All session participants rated it "very important."

Managers were also asked to rate the effectiveness of the training, as well as its importance (on a scale of 1-4; 1=not, 4=very). Their ratings were similar to the ratings of the pilot session participants. The mean of management session participants' "effectiveness" ratings was 3.4; the mean of their "importance" ratings was 3.6.

When asked how they viewed their roles in implementing the tools within their organizations, most managers' responses related to coaching subordinates as they used the tools; over half also mentioned their using the tools themselves.

Follow-up Interviews with Management Session Participants (see Appendix H)

Managers involved in the management training were interviewed approximately one month after the session. When asked if they had been able to use the training tools themselves on the job, two-thirds of the managers said they had used one of the tools with others. All of these managers felt using the tools was helpful, although two said their application was not completed because senior management stopped the process and took a different path to address the problem they were attempting to resolve.

Responses varied from the one third who had not used the training tools themselves. One offered no explanation as to why the tools had not been used. One manager said, "We've been out there with fire hoses over the last month." Another said, "I personally won't have as many opportunities to use it as technical people will." And

one explained, "It isn't that I didn't want to use it, but because I haven't had a chance to–the problems I've had lately have been obvious."

These managers were also asked once again to rate the effectiveness and importance of the training (on a scale of 1-4; 1=not, 4=very). Interestingly, the mean of their ratings regarding the effectiveness of the training dropped slightly (from 3.4 to 3.3), but the mean of their ratings regarding the *importance* of the training increased (from 3.6 to 3.9). Table 3 summarizes the mean ratings of both pilot session participants' and management session participants pertaining to the effectiveness and importance of the training (in initial and subsequent ratings).

Table 2

**Participant Ratings of the Training**

| | Effectiveness | Importance |
|---|---|---|
| Pilot Session (Mean of Initial Ratings) | 3.6 | 3.7 |
| Pilot Session (Mean of Subsequent Ratings) | 3.6 | 3.9 |
| Management Session (Mean of Initial Ratings) | 3.4 | 3.6 |
| Management Session (Mean of Subsequent Ratings) | 3.3 | 3.9 |

Explanations for the favorableness of their "effectiveness" ratings frequently pointed to the utility and practicality of the course content. Two managers highlighted the "shift of mind" the training helped to provide (e.g., "It made a lot of people look at things in a different manner; it helped everybody to think as one"; "It provides another way of looking at things–a shift of paradigm").

Only two rated the effectiveness of the training below "3," although one-third of these managers were less than satisfied with the way the material was presented. Perhaps much more importantly, however, a number of managers cited lack of time to use the tools on the job as a reason for the training not being as effective as it could be. As one manager explained: "It's been effective in identifying where we do shotgun. It's not been effective in application, except that we're more aware that we're doing it the wrong way."

As indicated in their "importance" ratings, there was widespread agreement among these managers that the training was very important (the mean of their ratings was 3.9). When asked to explain their ratings, over half mentioned the need for improving problem solving skills within the organization. The logical, disciplined process and a common approach were also frequently cited as reasons for the training's importance (e.g., "Solving problems is what many of us spend most of our time doing. The training provides common ground–a common theme, common language–that's an immediate advantage. The systematic, disciplined approach helps us all.").

Follow-up Interview #2 with Pilot Session Participants (see Appendix I)

Approximately three months after their training, pilot session participants were interviewed once more. As they had been asked twice before, they were asked to rate their problem solving skills (on a scale of 1-4; 1=low, 4=high). Table 3 summarizes the means of their self-ratings on all three occasions. Participants' self-ratings increased by 17% immediately after the training; however, their self-ratings dropped over time. After three months, participants' self-ratings were only 3% higher than their initial ratings.

Table 3

**Pilot Session Participants' Ratings of their Problem Solving Skills**

| | Mean |
|---|---|
| Self-ratings Before the Training | 2.9 |
| Self-ratings Immediately After the Training | 3.4 |
| Self-ratings Three Months After the Training | 3.0 |

Once again, pilot session participants were also asked to rate the effectiveness and importance of the training. As before, they indicated that the training was effective (the mean of their "effectiveness" ratings was the same on both occasions–3.6). Reasons cited for its effectiveness varied–e.g., broadened perspective, successful resolution to problems, analytical process. As one person explained, "It made me think differently."

The mean of their "importance" ratings increased from 3.7 to 3.9. Even slightly more so than they had before, pilot session participants felt the training was important. The pilot session participants were also asked to rate how important it is for them to *improve* their ability to solve problems on the job; all said it was important (the mean rating was 3.7). Most explained that they regularly problem solve on their jobs.

When asked once more if the training had changed the way they solved problems on their jobs, seven of the ten pilot session participants said, "Yes"; one said, "Somewhat"; one said, "I haven't used it in a while because I've been busy with other work on the new production line"; and one said "No." When asked if they thought the training would (or would continue to) impact the way they solved problems on the job, nine of the ten said "Yes" (the other said "Maybe").

The most frequently cited way in which pilot session participants felt the training had changed the way they solved problems on the job was that it increased their focus on facts (rather than making assumptions or jumping to conclusions). As one explained, "We all say we don't have time, and make assumptions. I catch myself now and try to use the process." Using a more methodical, objective approach and having a broader perspective were also ways in which participants felt they had changed as a result of the training. It should be noted, however, that two of these pilot session participants said their use of the problem solving tools was limited by time constraints.

Pilot session participants were also asked if the tools presented in the training were of more benefit individually or in team situations. Eight of the ten said in teams; the other two said both individually and in teams. Most explained that in teams, particularly cross-functional teams, there is more "brain power." And two argued that it is better to use the tools with teams because "it takes discipline to use the tools individually"/"it's human nature to skip steps."

Interestingly, however, three individuals who said they thought it would be more beneficial to use the tools in teams said they had not used them with a team since the

training. Further, two others who said the tools were of more benefit in team situations said they hadn't used them with a team in over two months. As several pilot session participants explained, two of the three "cross-functional teams" formed during the training to address company problems continued to meet for several weeks after the training; but due to time constraints/other priorities, these "teams" did not last.

## Employee Perceptions Regarding the Organizational Impact of the Training

Research Question #2 *Were individuals/teams better able to meet organizational goals and/or priorities after the problem-solving training (e.g., profitability, productivity, service, or quality)?*

Pre-Training Management Interviews (see Appendix B)

Before the training began, eight managers (including a member of senior management) were asked why employees were attending the training. The senior manager described the need for a proceduralized approach to problem solving, particularly as the organization was growing and changing; he explained that problem solving was currently based on individual talents–there was no "standardized road map" for it. Three others described the need for a systematic, disciplined approach to problem solving. Four mentioned the need for faster problem solving. Two said the organization was not good at identifying "root causes." One pointed to creating a common language for problem solving, and one said "There are many ways to solve problems; some are good, others are not. I don't know if employees are good problem solvers."

When asked what criteria they would use to determine whether or not they were satisfied with the results of the training, as well as how they could measure or evaluate results against these criteria, managers' answers varied. The member of senior management said he expected managers to be better able to answer his questions regarding problems, and he expected to see results faster (getting started faster, knowing what to do faster). One other manager mentioned that employees' should be better

equipped to answer questions about problems, and one other mentioned shortening the time for problem solving.

Four managers' responses referred to the quality of "solutions" to problems. One said he expected to see chronic problems being solved, and people resisting jumping to problem solving without data. Another pointed to sustainable yield improvements on the production lines. One also mentioned that he expected to see employees use the techniques learned in the training. However, another expressed the belief that the environment wasn't conducive to systematic problem-solving, that the organization had a "quick-fix" mentality: "The pressure, workload is great. But quick, cheap solutions don't work. Now, a philosophy change and this training are coming together–patience will increase with success. Sometimes, though, things can't be done in the time allowed!"

Two managers indicated they were not sure how they would determine whether or not they were satisfied with the training; another said, "Only if I see problem-solving in a written form to come to a solution."

Pilot Session Participants' Initial Perceptions and Reactions to the Training

In initial interviews, pilot session participants were asked to list the top three priorities of their positions. Their responses varied, although three mentioned improving yields on the production lines, and three others mentioned getting/keeping the production lines running. When asked what percentage of the time they spent solving problems on their jobs, four said they spend between 25-50%, three said they spend 60-75%, and three said they spend 80-100% of their time solving problems.

As described in the data for Question One, pilot session participants were also asked to rate the importance of the organization improving its problem solving ability. All said it was "very important." When asked if they thought the training would contribute to "bottom-line" results for the company, eight said "Yes," one said "Can't answer yet–it's too early," and one said, "If used properly." When asked to explain their answers, most participants said problem solving was an important aspect of their jobs.

However, one of the pilot session participants mentioned that time was an issue–that they would need to be given the time "to do the job thoroughly rather than give band-aid fixes" to problems. The individual that said, "If used properly" also alluded to the time issue, pointing to the need for the organization to "reduce fire drills." Further, as described in the data for Question One, several pilot session participants expressed frustration and concern relating to the perceived lack of clarity as to organizational priorities (see Question One).

During the training, session participants expressed some frustrations and concerns relating to the organization's ability to apply the course content:

- Establishment of organizational priorities: (1) "A lot of people are running around here with 5-6 priorities which are all important. What do we do?" (2) "We want *everything* here." (3) "We all have the same goals, but we're not focused on the same objectives. Our organization is in transition now."
- Documentation, data collection and distribution. (1) "Getting facts isn't easy–changes aren't always well documented. (2) "Historical archives aren't easily accessible." (3) "When changes are made, we aren't always told about them. Then, we have to go back and try to figure out what happened, and when." (4) "We need to do a better job of documenting process changes. Lots of people are trying to do the right things. Decisions get made, but everyone is not always informed. Because changes aren't always documented and/or communicated, baseline information isn't always easy to get."
- Applicability of the training for a "start-up" environment. (1) "The ["root cause" problem solving tool] focuses on deviations from standard, not start-up deviations. Right now, start-up deviations are our most important problems. The training should focus more on these."

On the post-training survey distributed immediately after the training, participants were asked how the training would help them on the job (see Appendix D). Nine of the

ten participants identified ways in which they felt their performance on the job would change as a result of the training. Four pilot session participants said they would be faster at problem solving. Two said they would be more systematic in their approach. One said the tools could be used on a daily basis, another said the training would help to communicate the problem solving process to others, and another described the broader perspective the tools helped to provide: "I would get a better look at all possible causes rather than a few." The other participant said, "I'm not sure due to the lack of required data" (the lack of data was a problem that was highlighted during the training).

Follow-up Interview #1 with Pilot Session Participants (see Appendix E)

Pilot session participants were asked for specific information relating to how the training had helped them on their jobs. Three mentioned the broadened perspective they gained from the training; three described results (i.e., "In the team I'm on, we've almost got the results we've been looking for"; "Ultimately, it's helped in solving things the first time"; and "It's helped to resolve issues I've had"); and two mentioned that the training had given them a systematic approach to the problem solving process. One explained that the training "changes your mindset" (to gathering facts before trying to solve problems); another said the training had given him a tool to use on the job, as needed. Another had used the "root cause" tool on two problems, explaining that although the training had not changed the way [the pilot session participant] approached problems, it had helped to increase confidence in their solutions (the individual then added, "I actually don't use it formally very often, but it has helped to 'enlighten' me").

When asked if their on-the-job use of the tools presented in the training had contributed to bottom-line savings for the company, half of the pilot participants said, "Yes" (two cited specific problems they had used "root cause" tool on). Three others said they felt the tools would be more relevant in the future (they explained that it is difficult to use the "root cause" tool in a start-up operation). The other two said "Not yet" (although they felt it would, if they continued using it).

Follow-up Interviews with Pilot Session Participants' Managers (see Appendix F)

When managers were asked how the training had helped their employees on the job, two described what appeared to be a successful application of the "root cause" tool (their employees had continued to work together on a chronic problem, although they were unable to quantify the impact on the "bottom line" at this time). According to their managers, four other employees were now more systematic, and one was more efficient. Another said, "I can't answer that; I don't know." And one manager said that although he thought his employee had a better understanding of the importance of dealing with facts rather than opinions, the employee was unable to apply the training yet because the pace was too fast–the time, data collection required was not available.

When managers were asked what specific benefits had been realized as a result of their employees using the tools, three managers cited improved communications, two described applications that appeared to have resolved problems (although they felt it was too soon to be sure), and two cited improved team functioning. One described what he felt was an important benefit: that his employee was better equipped to approach difficult problems. However, three of the eight managers' responses were less favorable: two said they didn't know of any benefits, and one said there had been no benefits to the training.

Management Session Participants' Reactions to the Training (see Appendix G)

As explained in the data for Question One, on a post-training survey completed at the end of their training session, management session participants were asked to rate how important it was for the company to improve its problem-solving ability–on a scale of 1-4 (1=not, 4=very). All indicated it was "very important." They were also asked to rate the effectiveness of the training, as well as its importance. All managers felt the training was effective (the mean of their "effectiveness" ratings was 3.4), and all managers felt the training was important (the mean of their "importance" ratings was 3.6).

Similarly, these managers were asked to rate how relevant use of the tools presented in the training was in terms of organizational goals and/or priorities. All felt it was relevant (the mean of their ratings was 3.5). When asked to describe benefits they saw to the company's applying the tools presented in the training on the job, five managers referred to the common language or approach to problem solving. Four referred to the discovery of root causes of problems (one mentioned prevention of problems, too). One manager said the training would provide the company with a new tool; one said "a culture change to provide a quality product on time"; another said, "the ability to view things differently"; and one said, "move into prevention versus fire-fighting."

Follow-up Interviews with Management Session Participants (see Appendix H)

Approximately one month after their training, managers were asked if they had used any of the tools presented in the training themselves; and if they had, whether or not they felt using the tools had contributed to "bottom-line" results on any of their projects (ultimately leading to increased profitability for the company). Two-thirds of the managers said they had used one of the tools with others on a company problem. Although most of these managers said using the tools had helped them, only two felt that their applications had led to any "bottom-line" savings for the company (however, neither could quantify the savings).

When asked to describe (other) benefits they had realized from the training, two managers said the common language/approach; and three mentioned the logical, structured approach the training provided (one added that "the tools could be of great benefit if front-line people are brought into the process, since they are the ones who know when something doesn't work"). One manager said the training helped him to keep focused on facts; one said the training helped in working with subordinates; and another said the training was "a confidence booster–providing employees with a level of assurance that there are ways to get through things."

However, one-third of the managers interviewed felt there had not yet been any significant benefits to the training. The explanations they offered for this varied: "I haven't had the time (which isn't right)"; "Potentially, the training can help–but not until we have reached enough people to have a critical mass"; and "The tool has the potential, but if there isn't more than 'lip-service' given to its use. . ."

When asked what results had been achieved through their supporting others' use of the tools, their responses varied. Two managers described results that had been achieved through others' use of the tools (one said there had been a 3% yield improvement through one team's application of the "root cause" tool, the other said one of his employees may have found an issue that had not been considered before). Two managers described their efforts to apply/teach others how to use the "root cause" tool (although they pointed out that no results were achieved because the process was stopped by senior management), and two explained how they had recommended others' use of the tools (e.g., one manager suggested that the "root cause" tool would be useful for supervisors who work with front-line employees; as he explained: "Deming is philosophy, this tool is more practical").

Follow-up Interview #2 with Pilot Session Participants (see Appendix I)

Approximately three months after the training, pilot session participants were asked if they thought the problem solving tools presented in the training were of more benefit individually or in team situations–80% said in teams (the others said both in teams and individually). Working in teams, as many explained, provides more problem solving "brain power" (or as one person explained, "it broadens the data base"). However, 30% of the pilot session participants said they had not used the tools with a team since the training, 50% said they had not used the tools with a team within the last six weeks.

When asked if their use of the tools had contributed to results or savings for the company (ultimately leading to increased profitability), 40% of the pilot session

participants said, "Yes," although they were unable to quantify the impact in any way. Two were not sure (one said it was too soon to tell, the other said that use of the tools had led to greater efficiency). Another thought that results would have been realized on a project in which the individual was using one of the tools, but responsibility for the project had then been given to another. Two people said, "No."

As explained in the data for Question One, pilot session participants were also asked once more to rate the importance of the training (on a scale of 1-4; 1=Not, 4=Very). Almost all said the training was "very important"–the mean of their ratings was 3.9 (see Table 2). As one of the participants explained, "The training has helped us to solve problems faster. If everyone used it, it would be even more helpful."

## Implementation

Research Question #3 *What mechanisms and/or strategies facilitated this change effort, and how do these mechanisms and/or strategies and their effects compare to Senge's conceptual framework?*

As this is a two-part question, the data are also organized into two parts. First, data relating to facilitation efforts from the interviews, surveys, etc. are summarized (as before, organized chronologically by data source). Then, data relating to Senge's conceptual framework for a learning organization are summarized.

### Employee Perceptions Regarding Efforts to Facilitate Implementation

#### Pre-training Management Interviews (see Appendix A)

Before the pilot session of the training, managers were asked who they thought should attend the training, and how they decided upon who to send to the pilot. Most felt technical people should attend the training–those who were expected to problem solve on the production line. One manager suggested that it would be important to have a "cross-section of the organization" involved in the training to get "true pollination." Another expressed a concern about having too much skill diversity in a given class: "With varying

levels of intellect in the room, will the training be at the 'right level' so people don't get bored, lose focus, feel the training is patronizing or condescending?"

In deciding who to send, one manager said, "who we could afford to send at this time." Another manager said, "I selected who I felt would be the best coach/ apostle/preacher."

Pilot Session Participants' Initial Perceptions and Reactions to the Training (see Appendix D)

As explained in the data for Question One, during the training pilot session participants were led through an exercise in which they identified potential barriers to applying the problem solving tools. By far, the most frequently cited barrier was "availability of proper data." "Getting the support and help of other departments," "shortage of time for proper analysis" and "Lack of cross-functioning teams/representation" were also common responses in this exercise. However, when asked on the post-training questionnaire (see Appendix D) what, if anything, might prevent or inhibit implementation of the problem solving approaches presented in the training, their responses were different from those they had expressed in the "preventing problems" exercise during the training: six pilot session participants mentioned management support. Other factors mentioned were time and resource constraints, doing something new/different, and lack of data.

Follow-up Interview #1 with Pilot Session Participants (see Appendix E)

Approximately six weeks after the training, pilot session participants were asked how management had supported their use of the problem solving tools. Half identified at least one way in which their managers had supported them. Two felt they had been encouraged to use the tools; three said they had been given the time to work through the problem solving process (two added that they had also been given the information they needed). However, half of the pilot session participants did not feel they had been supported in using the tools (e.g., "I have no idea"; "Not much"; "They haven't).

When asked what (else) management could do that would be helpful, responses varied. Half mentioned the need for an organizational commitment to using the tools or getting more people exposed to them (e.g., "Commit to seeing this as the way to solve problems"; "My lack of knowledge of the hierarchy–what we're doing and what we're trying to do with the problem-solving training. Am I supposed to use it? Are others supposed to? If there were a commitment to using the tool, I think we would have had a more definite solution–faster–on a problem I worked on with others not too long ago.").

Four pilot session participants felt management could help by addressing a barrier to applying the tools–the company's data collection, distribution system (e.g., "Identify what's lacking in data collection, find a way to adequately document changes–perhaps we could develop a strategic team to improve it. Until that happens, I wouldn't recommend any more training."). Two mentioned the problem of time (e.g., "If we can get off 'emergency fix' mentality, it would help"). And one pilot session participant said, "With so many priorities, I often can't get what I need".

As explained in the previous section (and in the data for Question One), during an exercise within the training, participants had been asked to anticipate barriers to applying the problem solving tools on the job. Following up on these, pilot session participants were asked if, indeed, they had found any of these to be a problem (and if they had, how significant of a problem, and to what extent they had been able to overcome them). Table 4 summarizes their responses.

All pilot session participants felt the availability of data was a problem–80% indicated that it was a significant problem, although only two individuals felt it was one they were unable to overcome. Additionally, 70% felt that lack of interest by others to implement follow-up actions was also a problem (again, most found it was a significant problem). Shortage of time for proper analysis and lack of cross-functioning team representation were also perceived as significant problems by half of the pilot session

participants. Further, management making the skills a higher priority was considered a highly significant problem by 40% of the pilot session participants.

Table 4

**Follow-up on Potential Barriers to Applying the Training**

| | A Was this a problem? (If yes, see see Columns B and C) | | B How significant of a problem? (1=LOW, 4=HIGHLY) | | | | C To what extent were you able to overcome it? (1=NOT ABLE 4=ABLE) | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | YES | NO | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| Availability of proper data | 10 | | 1 | 1 | 3 | 5 | 2 | 2 | 3 | 3 |
| Getting support, help of other depts. | 4 | 6 | | 1 | 1 | 2 | 1 | 1 | 1 | 1 |
| Shortage of time for proper analysis | 6 | 4 | | 1 | 4 | 1 | 1 | 2 | 3 | |
| Lack of cross-functioning team/rep. | 6 | 4 | | 1 | 1 | 4 | 3 | | 2 | 1 |
| Mgt. making the [tool] skills a higher priority | 4 | 6 | | | | 4 | 2 | 1 | 1 | |
| Lack of interest by others to implement follow-up actions | 7 | 3 | 1 | 1 | 4 | 1 | 3 | | 3 | 1 |
| May impact production output | 5 | 5 | | 1 | 1 | 3 | | 1 | 2 | 2 |
| Not properly following [tool] steps | 5 | 5 | 1 | 3 | 1 | | | | 2 | 3 |

When participants indicated they were unable to overcome these problems, they were asked to explain what it would take to overcome them. Their responses frequently referred to the establishment, communication of priorities (e.g., "Honest commitment instead of 'lip service'–we need to be honest about resources"; "No one has time, so people don't show up to meetings"; "People need to be informed as to priorities because if you're stretched, it's hard to take on team tasks that aren't necessarily departmental goals.").

Follow-up Interviews with Pilot Session Participants' Managers (see Appendix F)

Approximately six weeks after the pilot session, managers of the pilot session participants were asked if their employees were using the problem solving tools appropriately. Half of them said either "I don't know" or "I can't answer because I haven't been through the training." Two of these managers referred to time pressures: "Although I only see [employee] three times a week, goals are being met and things are going smoother–given the severe time constraints we're under"; "If there were time, [employee] would, but [s/he] can't now" (elaborating on the point, this manager said, "In this organization, the pace is too fast to manage!").

When asked if they had been able to support their employees' use of the tools, three said "Yes," two said "I try to," two said, "No," and one said, "In general, yes, but without knowledge of the training, it's hard to." Actions taken to support their employees included providing information, ideas, encouragement, time and using terms from the training. One suggestion that emerged from these interviews was to put "committed" teams through the training together.

Management Session Post-training Survey (see Appendix G)

Immediately after their training session, managers completed a post-training survey in which they were asked what "non-training" strategic or organizational changes/actions were needed to support use of the problem solving tools in the organization. Most managers acknowledged the need for "management support" for the training (e.g., "Concrete buy-in from the top"; "Support from management"; "Senior management in departments other than Operations need to jump on the bandwagon."). Over one-third of the managers referred to time pressures (e.g., "Removal of pressure to shotgun"; "Time, resources"; "Move into prevention vs. fire-fighting"). When asked how they viewed their roles in implementing the tools, most managers said to use the tools themselves, and to encourage/coach others.

Follow-up Interviews with Management Session Participants (see Appendix H)

As explained in reporting findings for Question Two, one month after the management training session, managers were asked if they had been able to encourage or support others' use of the training tools. Three-fourths of the managers said they had, although some were able to provide more specificity than others as to *how* they had encouraged or supported others. Two managers described results from others' application of the "root cause" tool. But most managers' comments were less specific (e.g., "Informally; I can't remember the specifics, exactly what I said to whom, but I've said things in meetings"; "In general, yes"; "To some degree–not as much as I'd like, though. For 'soft problems,' I've challenged everyone to look at what we're doing, and why. I've been asking questions like: Is there a need? Is there an easier way to do this? Who should be doing it?").

One of the managers who had not been able to encourage or support others' use of the tools expressed a concern about the implementation process: "We haven't rolled this out. I see that as a problem. I was hoping we would be further along now. Not enough people have been trained; we have the momentum now. But the energy will fade, and people will lose interest." Two other managers expressed a concern that there was not an organizational commitment to using a methodical approach. These managers had used the "root cause" tool on a production problem, with others. After two days of working on the problem using the tool, senior management put an end to their investigation by directing that certain actions be taken to address the problem.

Managers were also asked what factors might limit effective use of the problem solving tools at the company. Three-fourths of their responses related to a "time" problem (e.g., "People don't take the time to really get to the root cause of problems here"; "Pressure to have 'instant answers' because we're driving toward artificial deadlines–'wish dates,' not realistic ones"; "Continuing to reward fire fighting/band-

aids/quick-fixes"; "Management support–true patience, and allowing the techniques to be utilized without losing that patience. We can't give up on it!").

When asked if they had been able to address or prevent the factors they identified, more than half of the managers said "no" (as one manager explained, "I voice my opinion, but it doesn't help"; another said, "We run around here for 12-14 hours/day right now. We've been trying to survive rather than using a systematic approach"; "We've had problems . . . I've been buried."). Another third said to some extent (i.e.., "To some extent–limited"; "To some extent; I can control my department and use it with peers"; "A little bit, but not as much as I'd like").

The managers were then directly asked what needed to happen in order for the organization to improve its problem solving ability. One third of the managers mentioned training. One third mentioned addressing the time pressure (e.g., "Technical people must be allowed the opportunity and time to do a systematic approach–if we tried now we'd be run over by a steam roller"). As one of these managers explained, the time pressure was caused by unrealistic deadlines: "Unrealistic commitments have made everyone work with such intensity that we're not able to do things the right way".

Another problem area, according to two managers, was lack of adequate attention to career path planning for employees: "There is no career path planning here–people need to know what might be available in the future. They need mentors, and opportunities"; "Many people are working very hard right now–they need to know that their efforts are valued, and how they might 'fit in' in the future". Further, one of these managers pointed to two other problems that were limiting effective problem solving in the organization: (1) Cross-functional team functioning (cross-functional teams created to address problem areas lacked clarity of purpose, as well as a common methodology for accomplishing their purposes); and (2) Fear (i.e., "There is too much fear here. Our organization has to know that its leaders aren't afraid"). The degree to which others felt fear was limiting effective problem solving was not known. However, the criticality of

successful implementation of the new lines appeared to be understood by most of the employees with whom the researcher spoke. For example, during the management training session the senior manager remarked that if the new production lines were not successfully implemented, they would all–including himself–need to update their resumes . . . ).

Follow-up Interview #2 with Pilot Session Participants (see Appendix I)

Approximately three months after the training, pilot session participants were asked what factors most affected their ability to use the training tools. Three of the ten people interviewed said management support. Three also mentioned time, although one of the three positioned this as a positive factor, not a negative one: "Time is of the essence here. We want to do things right the first time, so we need to make the right decisions, and avoid jumping to conclusions. If we misdiagnose a problem, we'll spend a lot longer on it."

Two of the pilot session participants said the lack of data was a significant problem, one they were unable to overcome. Another said that using the tools in team situations had been a reinforcing factor, while another said there had not yet been an opportunity for use the tools.

When asked what else management could do to support the training, pilot session participants' responses varied. Three said they needed to be given the time to use the tools, two said they needed to be given the resources (i.e., people) to use the tools (e.g., "The training without a commitment to providing resources won't work"), and two said that management should lead by example (e.g., "In general, in the mode we're operating in, we shoot from the hip–even though we don't have data to support what we're doing. Leadership should lead by example, modeling, forcing data-driven analysis").

The pilot session participants were also asked what needed to happen for the organization to improve its problem solving ability. Four of the ten referred to the need for organizational commitment to using a systematic approach (e.g., "We have to get out

of 'get things done today' mode–we have too many 'rush' things happening around here!"; "Leadership should be using the tools, allowing people to perform the process without a 'quick results' mentality"). Four people suggested that more people needed to be training, three pointed to the need to address the lack of data, and two suggested that organizational priorities needed to be defined.

## Analysis of the Data in Terms of Senge's Framework for a Learning Organization

In this section, study findings are analyzed in terms of Senge's conceptual framework for a learning organization. As explained in previous chapters, Senge (1993) describes three cornerstones of a learning organization: Aspiration, Conversation, and Conceptualization. Organizations can develop these cornerstones, as he explains, by focusing on five inter-dependent disciplines: (1) Building Shared Vision; (2) Personal Mastery; (3) Mental Models; (4) Team Learning; and Systems Thinking.

### Aspiration

According to Senge (1993), organizations can build this cornerstone by focusing on two disciplines: Personal Mastery and Building Shared Vision.

#### Personal Mastery

As explained in Chapter II, Personal Mastery embodies two underlying movements: (1) Continually clarifying what is important to us; and (2) Continually learning how to see current reality more clearly" (Senge, 1990, p. 141). To see current reality as clearly as possible, according to Senge, individuals have to make a "commitment to the truth" (p. 159).

As explained in the data for Question One, when asked why they were attending the training, 80% of the pilot session participants said they were there because they were asked to attend. When asked to rate the organization's current ability to problem solve, as well as their own, participants rated *themselves* more than 20% higher than they did the organization. Further, in a "preventing problems" exercise during the training,

participants were asked to identify potential barriers to using the problem solving tools on the job, and which were most likely to prevent them from using them. Of the eight potential barriers identified by the session participants, only one was controllable by them, and only one participant indicated they thought this barrier was likely to prevent use of the tools.

However, when asked six weeks later if they were approaching problem solving differently as a result of the training, all of the pilot session participants said they were. And when asked this same question after three months, seven of the ten said "yes," and another said "somewhat." The most frequently cited way in which pilot session participants felt the training had changed the way they solved problems on the job was that it increased their focus on facts (rather than making assumptions or jumping to conclusions).

Building Shared Vision

In addition to collecting specific data regarding the impact of the training, the researcher also collected data relating to the extent to which the organization shared a common vision in personal interviews. Positioning it as an "orienting question" in the interviews, the researcher asked pilot session participants, pilot session participants' direct managers, and managers who attended the management session of the training to describe the company's vision, or "the picture of the future the organization was trying to create."

Table 5 provides a summary of the terms in which these twenty-six employees expressed the company's vision. The data in this table are organized according to the three groups: (1) Pilot session participants–Operations and R&D personnel from a variety of positions: three engineers, two supervisors, a manager, a technician, a chemist, an inventory analyst, and a buyer; (2) Direct managers of pilot session participants; and (3) Managers who participated in the management session of the training. It should be noted, however, that some managers fit into more than one group. In these cases, managers' data were included in the lowest-numbered group (e.g., one "direct manager"

was also a pilot session participant, so the manager's perceptions regarding the organization's vision are included within the pilot session participant data).

Table 5

**Terms in which Employees Explained the Company's Vision**

| | n |
|---|---|
| Pilot Session Participants (N = 10) | |
| 1. (Marketplace) | 6 |
| • World-class company/world-wide leadership (4) | |
| Value to consumers ((1)) | |
| Best [industry] company in the world ((1)) | |
| Using highly automated technology ((1)) | |
| Doing things "right" at least cost ((1)) | |
| • #1–Service and Quality (2) | |
| 2. (Product line) | 3 |
| • Produce high-quality [products] ((1)) | |
| • [Products] ((1)) | |
| • Getting [products] out ((1)) | |
| 3. "Create a working environment in which people are happy, problems get solved and we meet sales, product goals set by [parent company]" | 1 |
| Managers of Pilot Session Participants (N = 7) | |
| 1. (Marketplace) | 7 |
| • World-class company (3) | |
| Using TQM principles--customer-oriented ((1)) | |
| Achieving market share goals, quality in our processes ((1)) | |
| Products ((1)) | |
| • #1 (3) | |
| Customer service, cost, quality ((1)) | |
| Quality and customer satisfaction ((1)) | |
| Highest product yield ((1)) | |
| • An industry leader–the best we can to employees and customers ((1)) | |
| Management Session Participants (N = 9) | |
| 1. Marketplace | 5 |
| • World-leaders, customers (4) | |
| Employee involvement and process management ((1)) | |
| Profitability ((1)) | |
| Most profitable, highest volume ((1)) | |
| Quality ((1)) | |
| • Among best in market, best in facilities, people development (1) | |
| 2. "Customers." | 1 |
| 3. "To become profitable." | 1 |
| 4. "Growth is valued above all. . . and making our new production line work" | 1 |
| 5. "We aren't clear on this--that's part of the problem!" | 1 |

As the table shows, there is little agreement either among or within the three groups regarding the company's vision. When asked to describe the company's vision, one of the managers explained: "We aren't clear on this–that's part of the problem!" The most common terms in which employees expressed the vision was in relationship to the marketplace (60% of the pilot session participants, all of their direct managers, and 56% of the management training session participants described the vision in terms of the company's relative position in the marketplace). Most frequently, employees described the vision in terms of "being world-class/world leaders" or "being #1."

Interestingly, only 38% of the employees interviewed directly mentioned "customers" or "consumers" in their descriptions (i.e., 10% of the pilot session participants, 57% of their direct managers, and 56% of the management session participants). Similarly, 31% directly mentioned "quality" in their descriptions (i.e., 30% of the pilot session participants, 57% of their direct managers, and 11% of the management session participants). Further, 15% included "employee satisfaction/ employee involvement" in their descriptions (one of the pilot session participants, one of the pilot session participants' managers, and two of the management session participants interviewed).

## Conversation

According to Senge (1993), organizations can build this cornerstone by focusing on two disciplines: Mental Models and Team Learning.

### Mental Models

According to Senge, the discipline of mental models involves "surfacing, testing, and improving our internal pictures of how the world works" (Senge, 1990, p. 174). Interestingly, the problem solving tool emphasized in the training was a "root cause" tool. Providing a systematic approach to identifying root causes, this tool specifically directed individuals to flag their assumptions in the analysis process.

In follow-up interviews six weeks after the training, the researcher asked interviewees if they had found "identifying assumptions" useful, and if so, if they had been able to apply it to other aspects of their jobs. Half of the participants said, "Yes," and provided explanations as to how they were able to apply it. Explanations offered by the other participants, however, varied: "I've always tried to avoid assumptions"; "Haven't gotten that far through the entire process"; "Haven't used it"; "It's useful, but I haven't been able to apply it"; and "We do this subconsciously."

Further evidence of refinement of some pilot session participants' mental models can be seen in follow-up interview data. Three months after their training, the researcher asked if the training had changed the way pilot session participants solved problems on the job; seven of the ten pilot session participants said, "Yes"; another said, "Somewhat." The most frequently cited way in which they felt the training had changed the way they solved problems was that it increased their focus on facts (rather than making assumptions or jumping to conclusions). As one explained, "We all say we don't have time, and make assumptions. I catch myself now and try to use the process." Using a more methodical, objective approach and having a broader perspective were also ways in which participants felt they had changed as a result of the training. It should be noted, however, that two of these pilot session participants said their use of the problem solving tools was limited by time constraints.

However, a mental model that surfaced repeatedly throughout this investigation was the belief that the organization too often relied on "fire fighting/shot gunning" rather than adequately addressing "root causes" of problems because of the time pressure. In pre-training interviews with organizational managers, for example, one individual said, "We want instant answers instead of allowing time to work through the process . . ."; another said, "This environment isn't conducive to {a systematic approach}–the pressure, workload is great. But quick, cheap solutions don't work. Now, a philosophy change and

this training are coming together–patience will increase with success. Sometimes, though, things can't be done in the time allowed!"

In follow-up interviews with pilot session participants, 60% said they found that shortage of time to conduct a proper analysis was a barrier to using the "root cause" tool. And when asked what management could do to support the training, one participant said, "If we could get off of 'emergency fix' mentality, it would help."

In the post-training survey, several of the managers who attended the management training session also referred to this problem. When asked what (non-training) strategic or organizational changes/actions were needed to support use of the problem solving tools in the organization, three mentioned the problem of time. Another said, "Move into prevention vs. fire-fighting"; and another said, "Removal of pressure to shotgun." Further, in follow-up interviews with management training session participants, a number of these managers appeared to hold this belief. For example:

- *Was the training effective?* (1) "It's been effective in identifying where we do shotgun. It's not been effective in application, except that we're more aware that we're doing it the wrong way"; (2) "Because I haven't had time to use it, it hasn't been as effective as it could be"; (3) "It wasn't as effective as it could have been because we haven't had the time to use it (we're under pressure to make product, we're limited in terms of resources and time)."
- *What factors might limit effective use of the problem solving tools here at [company]?* (1) "Lack of management signaling, lack of management use. And continuing to reward fire fighting, band-aids, quick-fixes"; (2) "People don't take the time to really get to the "root cause" of problems here. . . Senior management needs to recognize that getting to the root cause is important. We think we know, then act–so we never get there. We have to take the time to use the process. It's easy in a stable environment. We have so much pressure that we don't take the time to do things right"; (3) "Management support–true patience, and allowing

the techniques to be utilized without losing that patience. We can't give up on it! We're in a high-pressure situation in terms of time. We think that excuses us from using analytical methods. As a team (and from the top) we have to recognize that this is the way to go: Doing it right the first time!" (4) "Time, strong personalities. . . But time is a precious commodity around here"; (5) "Pressure to have "instant answers" because we're driving toward artificial deadlines ("wish" dates, not realistic ones)"; (6) Being in a start-up mode (in steady state, you can easily use the techniques). . . We run around here for 12-14 hrs./day right now. We've been trying to survive rather than using a systematic approach. Upper management is compressing time. We can't use the tools, we have to use shortcuts to get things done quickly. Until upper management allows the environment to change into a "Do it right," systematic approach, it can't happen. We're in a panic situation now (containing fires)"; (7) "Time pressure for any systematic approach . . . Leaders must support this by allowing time (not fire fighting)"; (8) "Resource availability and upper management commitment . . . {we need to} commit to real, not false deadlines"; (9) "Time pressure . . . As an organization, we need to tell people to solve problems rather than giving deadlines. Deadlines encourage "band-aids," not problem solving"

The concern about organizational "fire-fighting" because of the time pressure was brought up in the final phase of data collection for this study as well. When reviewing the survey, for example, one of the team leaders asked that an item be included to gather team members' perceptions regarding whether or not the organization adequately addressed "root causes" of problems; in fact, the leader helped to write the survey item– "As a team, we spend adequate time developing long-term solutions to root causes of problems (not just "putting out fires")." As explained in the next section, survey respondents were asked to rate a series of twelve items on a scale of 1-4 (1=Seldom, 4=Always). The mean of this "problem solving" item was 2.7, lower than any other.

Team Learning

To gather data relating to the impact of the training on team functioning within the organization (and team functioning in general within the organization), the researcher developed a survey to be used with teams containing one or more members who had been through the problem solving training (see Appendix K). Before implementing the survey, however, team leaders were interviewed to gain their approval and support for this final phase of data collection (see Appendix J). All four team leaders contacted by the researcher agreed to participate in the study. They provided specific information regarding the formation of their teams as well as input into the survey content and implementation strategy. Of the thirty-nine team members from the four teams, twenty-three completed surveys were returned to the researcher.

Both team leaders and team members were asked about their teams' specific purpose and goals. As these cross-functional teams were created to address critical areas in which there were problems in the production process or process management, their responses related to improved functioning or problem solving within their designated problem areas. As both team leaders and team members explained, three of the four teams' goals were set by the strategic team that directed the creation of these spin-off teams.

Interestingly, when asked whether or not the functional areas needed to achieve the goals were represented in their teams, only slightly more than three-fourths of the survey respondents said, "Yes" (i.e., 76%). Further, when asked whether or not their teams would successfully achieve their goals, 82% of the survey respondents said, "Yes," 9% said, "Most," and 9% said, "No."

One open-ended item was included at the end the survey (i.e., "My team would function more effectively if:"); however, of the twenty-three surveys returned to the researcher, only twelve responded to this item. The most frequently mentioned concern related to team purpose (33% of those responding to this survey item). Three of these

individuals expressed concerns related to the need for a more *strategic* rather than tactical focus (i.e., "We had more specific operating guidelines and overall goals. Too much fire fighting"; "We could get out of 'stop the bleeding' mode"; "We are very focused right now on tactical problems and individual contributors. We are managing a 'hit' list of activities. We need some team-oriented strategic objectives"). Another individual indicated that the team should have a larger part in determining the goals.

Additionally, twelve "numerical rating" survey items were included on the survey. The "1-4" ratings indicated the extent to which the behaviors were evident in their teams (1="Seldom," 4="Always"). The specific items, and means of survey respondents' ratings for these items, are provided in Table 6. As the table shows, nine of the twelve means fell between 2.9 and 3.1. The means of two items were above this range (i.e., the mean for "All team members are treated as colleagues on my team" was 3.4; the mean for "I feel I am respected and 'listened to' by other members of my team" was 3.2). As explained in the previous section, the mean of one item was 2.7, below the "2.9-3.1" range–"As a team, we spend adequate time developing long-term solutions to root causes of problems (not just "putting out fires")."

As the team leaders explained, none of the teams had a designated facilitator. To find out whether or not any of the teams were using the problem solving tools presented in the training (or if any intended to use them), the researcher asked the team leaders in personal interviews. They indicated that none of the teams were currently using any of the tools, and none had any specific plans to use them in the future (i.e., "If they're appropriate. As we get into implementation more, we'll be solving problems more. Now, we're buying time by developing partial solutions"; "Not sure at this point"; Possibly"; and "We may have to look at these later on–possibly").

Table 6

**Team Functioning Survey Results**

| | | SELDOM 1 2 3 4 ALWAYS Mean |
|---|---|---|
| a. | My team functions efficiently and effectively as a group. | 2.9 |
| b. | Our team leader acts as a facilitator, as needed, to help us to maintain ownership of the process and outcomes in my team's meetings. | 2.9 |
| c. | All team members are treated as colleagues on my team. | 3.4 |
| d. | When differences of opinion arise on my team, we objectively explore the "truth" in each other's views. | 3.0 |
| e. | Team members can drop their departmental perspectives and think from an organization-wide perspective. | 2.9 |
| f. | My team takes the time to fully explore complex issues before deciding what actions to take. | 2.9 |
| g. | Team members are willing to question their own assumptions and viewpoints. | 2.9 |
| h. | As a team, we spend adequate time developing long-term solutions to root causes of problems (not just "putting out fires"). | 2.7 |
| i. | On my team, we hold ourselves responsible and accountable for the team's performance. | 2.9 |
| j. | We are committed to "exploring the truth" on my team– we rely on facts and analyze assumptions rather than defending opinions or jumping to conclusions. | 3.1 |
| k. | I feel I am respected and "listened to" by other members of my team. | 3.2 |
| l. | Team members value and actively seek diverse viewpoints. | 2.9 |

## Conceptualization

According to Senge (1993), organizations can build this cornerstone by focusing on Systems Thinking. As he explains, "Systems thinking finds its greatest benefits in helping us distinguish high- from low-leverage changes in highly complex situations. In

effect, the art of systems thinking lies in seeing *through* complexity to the underlying structures generating change" (Senge, 1990, p. 128).

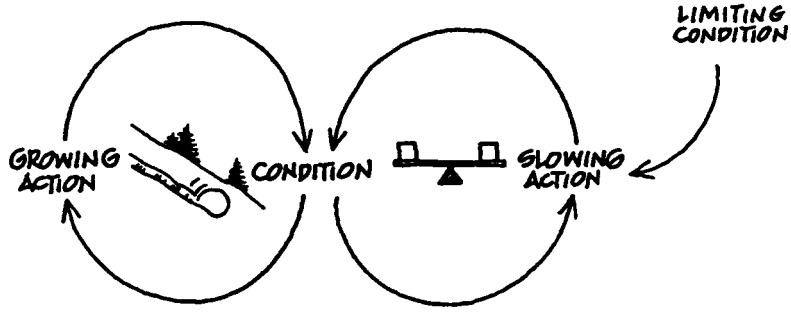
Senge contends that a relatively small number of system archetypes "embody the key to learning to see structures in our personal and organizational lives" (p. 94). "The purpose of the systems archetypes is to recondition our perceptions, so as to be more able to *see* structures at play, and to see the leverage in those structures. Once a systems archetype is identified, it will always suggest areas of high- and low-leverage change" (p. 95).

Following are the results of an analysis of the data relating to efforts to improve problem solving within the organization in terms of relevant system archetypes discussed by Senge.

Limits to Growth

> Definition: A reinforcing (amplifying) process is set in motion to produce a desired result. It creates a spiral of success but also creates inadvertent secondary effects (manifested in a balancing process) which eventually slow down the success. (p. 95).
>
> In each case of limits to growth, there is a reinforcing (amplifying) process of growth or improvement that operates on its own for a period of time. Then it runs up against a balancing (or stabilizing) process, which operates to limit the growth. When that happens, the rate of improvement slows down, or even comes to a standstill. (p. 97)

**Structure:**




As this investigation focused on the impact of problem solving training, it is not surprising that several examples of the "limits to growth" archetype could be seen. Two emerged during the pilot session of the training, another in follow-up interviews with

pilot session participants, and another in follow-up interviews with management session participants.

***Example #1.*** During the training, pilot session participants were provided with an opportunity to apply the "root cause" problem solving tool to actual company problems (everyone had been asked to identify a problem they would like to work on during the training; the class focused on three of these problems in teams). In the two extended work sessions in which they used the tool, session participants were actively engaged–they made phone calls and visited production/work areas to gather data, brainstormed, discussed, debated, etc. Participants found the tool to be very helpful. However, a barrier that emerged from their in-class use of the tool was the lack of data (see previous sections of this chapter, i.e., data for Question One, Question Two). Lack of data continued to be a problem for all of the session participants when they attempted to use the tool on the job–half indicated they found it to be a "highly significant" problem (see data for Question Three, i.e., Table 4).

As session participants acknowledged, the problem solving tools were helpful. The "growing action" (reinforcing process) in this case was use of the newly-learned problem solving tools. The "slowing action" (balancing process limiting growth) was the lack of data.

***Example #2.*** As explained in the data for Question Two, during the training pilot session participants expressed some frustrations regarding the organization's ability to use the problem solving tools. One of their concerns related to establishment, communication of organizational priorities (e.g., "A lot of people are running around here with 5-6 priorities which are all important. What do we do?"; "We want *everything* here."; "We all have the same goals, but we're not focused on the same objectives. Our organization is in transition now." Another indication that there may be a lack of clarity as to organizational priorities came from data in follow-up interviews six weeks after the training. Following up on potential barriers to applying the training (pilot session

participants had identified a list of "potential barriers to using the tools" during the training–see Table 4), the researcher asked whether "management making the [tool] skills a higher priority" had actually been a problem. Forty percent indicated it was a "highly significant" problem. Further, 40% of the pilot session participants indicated that "lack of cross-functioning team representation" was a "highly significant" problem.

It may be that a lack of system-wide clarity as to organizational priorities limits the effectiveness of problem solving efforts within the company. A "growing action" (reinforcing process) may have been the application of newly-learned problem solving tools. A "slowing action" (balancing process limiting growth) may be the system's lack of clarity as to organizational priorities.

***Example #3.*** As mentioned in Example #1, cross-functional teams were formed during the training to tackle "real" company problems. The teams' efforts generated dialogue, discussion, and collaboration. Team members felt the tool, and opportunity to apply it in cross-functional teams, had been helpful (e.g., "By using this tool together we've eliminated personal/territorial concerns"; "We were fortunate to have different disciplines represented on our team"). Two teams continued to meet for several weeks after the training. However, due to demands on their time from their own individual responsibilities, the "teams" did not last. In follow-up interviews, some team members expressed frustration with this. Further, when asked in follow-up interviews whether the problem solving tools were of more benefit individually or in team situations, 80% said in teams (the others said both individually and in teams).

Training session participants found that the problem solving tools worked very well when used with cross-functional teams. The "growing action" (reinforcing process) in this case was *team problem solving*. Using the tool in teams, according to session participants, increases motivation, improves communication, channels more "brain power" toward problem resolution, broadens the data base, and provides a disciplined, systematic approach to solving problems within the organization. The "slowing action"

(balancing process limiting growth) related to demands on team members' time from their own individual responsibilities.

***Example #4***. On the post-training survey, managers were asked to describe their roles in implementing the tools within the organization, including what specific actions they would take to support implementation of the tools. In addition to coaching subordinates' use of the tools, over half of the managers indicated they intended to use the tools themselves. However, in follow-up interviews one month later, a number of the managers expressed frustration with their ability to apply the problem solving tools from the training. As explained earlier, some managers appeared to believe that because of the pressure imposed to meet deadlines/targets, the organization too often relied on "shot gunning/fire fighting" rather than a systematic approach to identifying and addressing "root causes" of production problems.

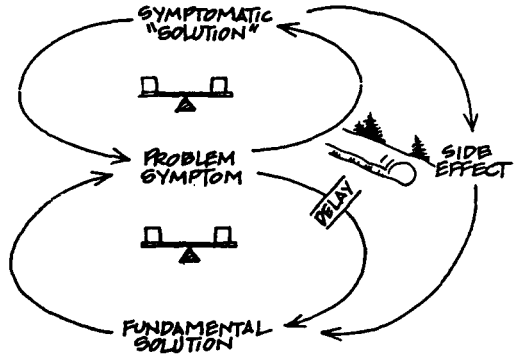
As indicated on the post-training survey, and in follow-up interviews, managers felt the training was effective, and important. The "growing action" (reinforcing process) in this case was management's attending the training (a senior manager in the company, and twelve members of his management team, took 2-1/2 days during an extremely hectic time to attend the training themselves in order to better model and support use of the problem solving tools within the organization). The "slowing action" (balancing process limiting growth), according to a number of managers, was pressure imposed toward meeting deadlines/targets (see previous discussion on Mental Models).

Shifting the Burden

> Definition: An underlying problem generates symptoms that demand attention. But the underlying problem is difficult for people to address, either because it is obscure or costly to confront. So people 'shift the burden' of their problem to other solutions–well-intentioned, easy fixes which seem extremely efficient. Unfortunately, the easier "solutions" only ameliorate the symptoms; they leave the underlying problem unaltered. The underlying problem grows worse, unnoticed because the symptoms apparently clear up, and the system loses whatever abilities it had to solve the underlying problem. (Senge, 1990, p. 104)

The shifting-the-burden structure is composed of two balancing (stabilizing) processes. Both are trying to adjust or correct the same problem symptom. The top circle represents the symptomatic intervention; the "quick fix." It solves the problem quickly, but only temporarily. The bottom circle has a delay. It represents a more fundamental response to the problem, one whose effects take longer to become evident. . . . Often (but not always), in shifting the burden structures there is also an additional reinforcing (amplifying) process created by "side effects" of the symptomatic solution. (p. 106)

**Structure:**

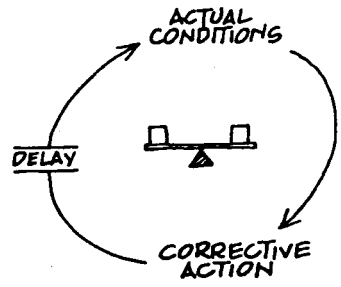



As explained in previous sections of this chapter (see "Limits to Growth" Example #4, Mental Models, survey/interview findings reported for Questions Two and Three), data collected throughout this investigation indicate that a number of employees appear to believe that the organization too often relies on "fire fighting/shot gunning" (quick fixes) rather than systematically identifying and addressing "root causes" of problems within the organization. It is possible that a "shifting the burden" structure is at play in organizational efforts to improve the efficiency and effectiveness of the production lines. And as the production lines are complex and highly interactive, it may also be possible that "side effects" from symptomatic solutions are adversely impacting the capability for fundamental solutions to be employed.

Balancing Process with Delay

Description: A person, a group, or an organization, acting toward a goal, adjusts their behavior in response to delayed feedback. If they are not conscious of the delay, they end up taking more corrective action than needed, or (sometimes) just giving up because they cannot see that any progress is being made. (Senge, 1990, p. 378).

**Structure:**

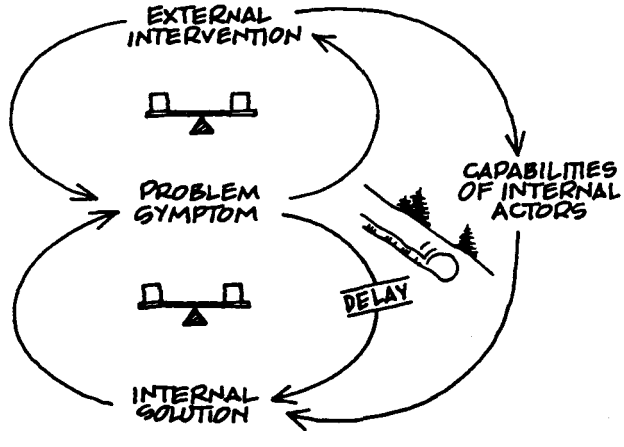



As explained in the shifting the burden example (above), some employees appear to believe that the organization too often relies on "fire fighting/shot gunning" rather than systematically identifying and addressing the "root causes" of production problems. If feedback is delayed, aggressive actions taken to address problems may result in overcompensation for the problems. Further, because of the highly interactive, complex nature of the production systems, aggressive actions taken to address problems ("fire fighting") may be detrimental to the integrity of those systems.

Shifting the Burden to the Intervenor

> One area where shifting the burden structures are so common and so pernicious that it warrants special notice is when outside "intervenors" try to help solve problems. The intervention attempts to ameliorate obvious problem symptoms, and does so so successfully that the people within the system never learn how to deal with the problems themselves. (Senge, 1990, p. 382).

**Structure:**




Like the shifting-the-burden structure, the shifting-the-burden-to-the-intervenor structure is composed of two balancing (stabilizing) processes. In this case, however, the top circle represents the external intervention. It may be able to "solve" the problem

quickly, but neglects the need for the host system to develop problem-solving *and* problem-prevention capabilities. The bottom circle has a delay. It represents a more fundamental response to the problem, one whose effects take longer to become evident.

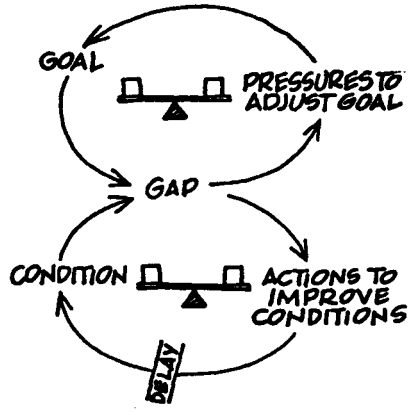
Some evidence indicating that this structure may exist was uncovered in this investigation (e.g., two managers explained that they attempted to use the "root cause" tool on a production problem, but their application was stopped–senior management directed actions to be taken to address the problem; and when asked how to address factors that might limit effective use of the tools within the organization another manager said, "We need to be left alone to get our jobs done–we're professionals"). The external intervenor, in this case, may be senior management.

Eroding Goals

Description: A shifting the burden type of structure in which the short-term solution involves letting a long-term, fundamental goal decline.

Early Warning Symptom: "It's okay if our performance standards slide a little, just until the crisis is over. (Senge, 1990, p. 383)

**Structure:**

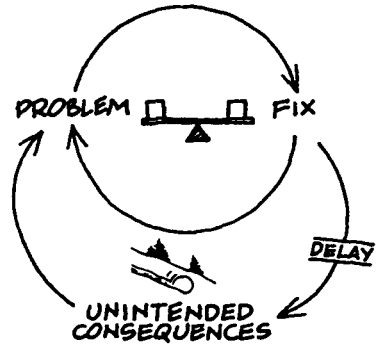



As explained in the Limits to Growth Example #4, it may be that unrealistic deadlines are sometimes causing the organization to "fire fight/shotgun" rather than systematically identify and address production problems. If unrealistic deadlines are driving decision making in the organization, performance standards could slide in efforts to meet the deadlines.

Fixes that Fail

Description: A fix, effective in the short term, has unforeseen long-term consequences which may require even more use of the same fix. (Senge, 1990, p. 388).

**Structure:**




As explained previously, a number of employees appear to believe that the organization too often relies on "fire fighting/shot gunning" rather than systematically identifying and addressing the root causes of production problems. It is possible that actions taken to quickly "fix" production problems may not only fail to address the root causes of some problems, but also have "unforeseen long-term consequences" (ibid).

In this chapter, results from this investigation were reported. The data were organized into three sections, addressing each of the three research questions. Data relating to efforts to facilitate implementation were sub-divided into two sections: (1) Employee perceptions regarding the effectiveness of implementation efforts; and (2) Analysis of the Data in terms of Senge's framework for a learning organization. The analysis of the data in terms of Senge's framework included an analysis in terms of systems archetypes described by Senge (1990).

In the next chapter, findings from this investigation are discussed in terms of Senge's framework for a learning organization. The research questions are addressed, and recommendations are provided relating to how the company may be able to further facilitate organizational problem solving, and enhance its capacity for "organizational learning."

# CHAPTER V

# DISCUSSION

This chapter is divided into three sections. In the first section, Organizational Problem Solving, the research questions are addressed, and based on the principles outlined by Senge (1990) in his discussion of the system archetypes, recommendations are provided relating to how the company may be able to further facilitate organizational problem solving. In the second section, Organizational Learning, implications of the data are discussed in terms of Senge's conceptual framework for a learning organization, and recommendations are provided relating to how the company may be able to enhance its capacity for "organizational learning." The final section provides a discussion of study limitations , suggestions for further research, and a summary of the study.

## Organizational Problem Solving

As explained in Chapter I, the company involved in this investigation had asked for support in assessing the impact of problem solving training. Based on Levels 3 and 4 of Kirkpatrick's evaluation model, the first two research questions were designed to gather data relating to the impact of the training. The third research question examined organizational efforts that facilitated implementation of the training. The theoretical construct applied was Senge's framework for a Learning Organization. Findings from the study relating to the research questions are discussed below.

### Employee Perceptions Regarding the Impact of the Training in Terms of Behavioral Changes

Question #1 *Did individuals change the way they approached problem-solving on their jobs after the training?*

In follow-up interviews six weeks after the training pilot session participants were asked if they were approaching problem-solving differently as a result of the training. All of them said they were. When asked specifically *how*, they offered a variety of responses, including: (1) Trying to avoid emotions/first instincts/immediate reactions; (2) Trying to gather information first/to ask more "in-depth" questions/to look at things "more openly"/to look at "changes" more–and intended system operation; and (3) Trying to look from a "broader perspective"/to look at "the whole picture, not small pieces of it." However, when asked in these interviews approximately how many times in the past month they had used the "root cause" and "preventing problems" tools which were presented in the training on their jobs, pilot session participants' responses varied (see Table 1). Half had used the "root cause" tool only once or twice; and half had not used the "preventing problems" tool at all.

The eight direct managers of the ten pilot session participants were also interviewed approximately six weeks after the training (two managers each had two

employees involved in the training). When asked if/how their employees were approaching problem solving differently as a result of the training, five managers indicated there had been a positive change in their employees' approaches to problem solving (accounting for seven employees). An analytical, systematic approach and improved communications were common responses.

Further, in follow-up interviews approximately three months after the training, pilot session participants were asked once more if the training had changed the way they solved problems on their jobs. Seven of the ten pilot session participants said, "Yes"; one said, "Somewhat." The most frequently cited way in which pilot session participants felt the training had changed the way they solved problems on the job was that it increased their focus on facts (rather than making assumptions or jumping to conclusions). As one explained, "We all say we don't have time, and make assumptions. I catch myself now and try to use the process." Using a more methodical, objective approach and having a broader perspective were also ways in which participants felt they had changed as a result of the training.

## Employee Perceptions Regarding the Organizational Impact of the Training

Question #2 *Were individuals/teams better able to meet organizational goals and/or priorities after the problem-solving training (e.g., profitability, productivity, service, or quality)?*

All training session participants–from the pilot session and management session–indicated they thought it was "very important" for the company to improve its problem solving ability. Further, all management session participants indicated the training was relevant in terms of organizational goals and priorities. And immediately after the training, as well as in follow-up interviews, all training session participants indicated the training was effective, and important.

Six weeks after the training, pilot session participants were asked if their on-the-job use of the tools presented in the training had contributed to "bottom-line" savings for

the company. Half of the pilot participants said, "Yes" (two cited specific problems they had used "root cause" tool on). Two said "Not yet," although they felt it would. When these session participants were interviewed once more (three months after the training), they were again asked if their on-the-job used of the tools had contributed to results of savings for the company; 40% said "Yes," although they were unable to quantify it in any way.

In follow-up interviews with pilot session participants' managers six weeks after the training, the managers were asked what specific benefits had been realized as a result of their employees using the tools. Five of the eight managers interviewed cited benefits of the training. Two described applications that appeared to have resolved problems (although they felt it was too soon to be sure). Improved communications, improved team functioning, and improved skill at tackling difficult problems were other benefits cited.

Approximately one month after the management training session, managers were asked if they had used any of the tools presented in the training themselves; and if they had, whether or not they felt using the tools had contributed to "bottom-line" results on any of their projects (ultimately leading to increased profitability for the company). Two-thirds of the managers said they had used one of the tools with others on a company problem. Most of these managers said using the tools had helped them. Two felt that their applications had led to "bottom-line" savings for the company (however, neither could quantify the savings).

When asked to describe benefits they had realized from the training, two managers said the common language/approach; and three mentioned the logical, structured approach the training provided. One manager said the training helped him to keep focused on facts; one said the training helped in working with subordinates; and another said the training was "a confidence booster–providing employees with a level of

assurance that there are ways to get through things." However, one-third of the managers interviewed felt there had not yet been any significant benefits to the training.

When asked what results had been achieved through their supporting others' use of the tools, two managers described specific results that had been achieved through pilot session participants' use of the tools (one said there had been a 3% yield improvement through a team's application of the "root cause" tool, the other described an issue one of his subordinates may have found that had not been considered before).

Clearly, employees felt the training was important, and effective. It not only helped to change employee behaviors, but also led to tangible results. However, data collected in this investigation indicate the company may have opportunities to increase the impact of the training, and enhance organizational problem solving. In the next section, areas of opportunity in terms of facilitating organizational problem solving are discussed.

## Facilitating Organizational Problem Solving

Question #3 *What mechanisms and/or strategies facilitated this change effort, and how do these mechanisms and/or strategies and their effects compare to Senge's conceptual framework?*

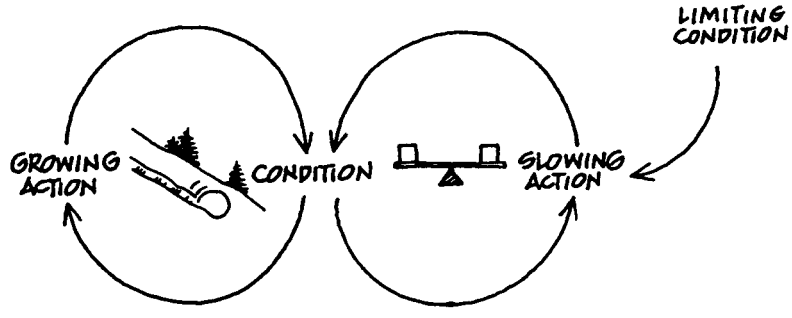
"The systems archetypes reveal an elegant simplicity underlying the complexity of management issues" (Senge, 1990, p. 94). They help to "recondition our perceptions, so as to be more able to *see* structures at play, and to see the leverage in those structures. Once a systems archetype is identified, it will always suggest areas of high- and low-leverage change" (p. 95).

Analyzing the data in terms of the system archetypes outlined by Senge (1990) may provide insight into where and how organizational managers have–or may be able to–facilitate organizational problem solving.

## Limits to Growth

In each case of limits to growth, there is a reinforcing (amplifying) process of growth or improvement that operates on its own for a period of time. Then it runs up against a balancing (or stabilizing) process, which operates to limit the growth. When that happens, the rate of improvement slows down, or even comes to a standstill. (Senge, 1990, p. 97)

**Structure:**




Management Principle: "Don't push growth, remove the factors limiting growth" (p. 95).

***Example #1.*** Pilot session participants found the problem solving tools to be helpful. However, the lack of data was a barrier to using them. The "growing action" (reinforcing process) in this case was/is use of the newly-learned problem solving tools. The "slowing action" (balancing process limiting growth) was/is the lack of data.

Recognizing the need for effective data management to facilitate problem solving on the new production lines, the organization: (1) Hired a statistician to support organization-wide data management; (2) Created a cross-functional team, led by the statistician, to develop processes for gathering production line data.

***Example #2.*** It may be that a lack of system-wide clarity as to organizational priorities limited the effectiveness of problem solving efforts within the company. A "growing action" (reinforcing process) may have been the application of newly-learned problem solving tools. A "slowing action" (balancing process limiting growth) may have been the lack of system-wide clarity as to organizational priorities.

At the end of the third quarter (approximately three months after the pilot session of the training), the strategic team created to improve the efficiency of the production lines took action to better focus problem solving efforts on the lines by: (1) Identifying

four problem areas critical to the success of the lines; (2) Creating cross-functional teams to address these problem areas.

***Example #3.*** Training session participants found that the problem solving tools worked very well when used with cross-functional teams (see Chapter IV). The "growing action" (reinforcing process) in this case was *team problem solving*. Using the tool in teams, according to session participants, increases motivation, improves communication, channels more "brain power" toward problem resolution, broadens the data base, and provides a disciplined, systematic approach to solving problems within the organization. The "slowing action" (balancing process limiting growth) related to demands on team members' time from their own individual responsibilities.

Because a significant amount of the training is devoted to class participants' "real" work problems, this training provides an opportunity to more closely link training with on-the-job performance–and results. Pilot session participants found team members' diverse educational backgrounds and experiences helpful when working through the "root cause" problem solving tool. Further, as session participants mentioned, the training provides "common ground"–a common way to approach problems. Since the specific methodology is new to the organization, the training also provides "a more level playing field"–no one on the team is "expert," all team members are learning to use the new tools together. As the company currently tackles production problems through the use of cross-functional teams, there may be an opportunity to improve organizational problem solving, and team functioning, by putting cross-functional teams–whose team members all have responsibility for addressing a particular problem–through the training together.

Example #4. As indicated by the post-training survey data and in follow-up interviews, managers attending the management session of the problem solving training felt the training was effective, and important. The "growing action" (reinforcing process) in this case was management attending the training (a member of senior management, and twelve members of his management team, took 2-1/2 days during an extremely hectic

time to attend the training themselves in order to better model and support use of the problem solving tools within the organization). The "slowing action" (balancing process limiting growth), according to a number of these managers, was pressure imposed toward meeting deadlines/targets (see previous discussion on Mental Models).

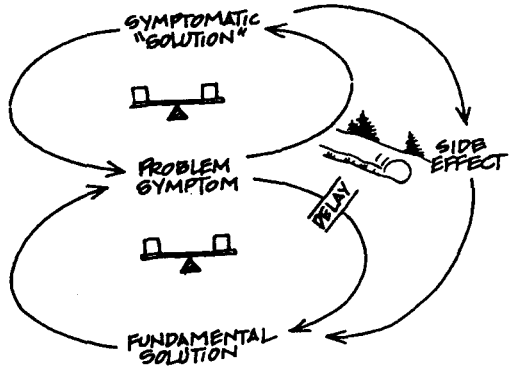
To improve problem solving on the production lines, it may be helpful to first examine the deadlines/targets. If the deadlines/targets are realistic, then the opportunity implied in this situation may center around building employees' confidence in their ability to meet them–the "right way" (using a systematic approach to identify and address root causes of production problems). If, however, the deadlines/targets are not realistic, and pressure is still being applied toward meeting them, perhaps one of the most effective ways to improve organizational problem solving is to set more realistic targets. This may not only help to reduce "shot gunning/fire fighting," but also improve morale.

## Shifting the Burden

Management Principle: Beware the symptomatic solution. Solutions that address only the symptoms of a problem, not fundamental causes, tend to have short-term benefits at best. In the long term, the problem resurfaces and there is increased pressure for symptomatic response. Meanwhile, the capability for fundamental solutions can atrophy. (Senge, 1990, p. 104)

Dealing effectively with shifting the burden structures requires a combination of strengthening the fundamental response and weakening the symptomatic response. The character of organizations is often revealed in their ability (or inability) to face shifting-the-burden structures. Strengthening fundamental responses requires a long-term orientation and a sense of shared vision. Without a vision of succeeding through new product innovation, pressures to divert investment into short-term problem-solving will be overwhelming. (pp. 110, 111).

**Structure:**

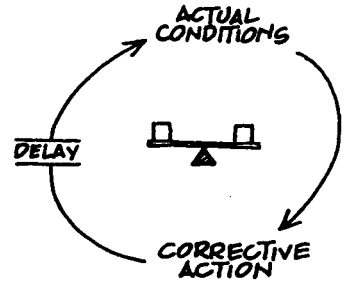


As explained in Chapter IV, a number of employees appear to believe that the organization too often relies on "fire fighting"/"shot gunning" ("quick fixes") rather than systematically identifying and addressing the "root causes" of production problems. "What make the shifting the burden structure insidious is the reinforcing cycle it fosters, increasing dependence on the symptomatic solution" (p. 109). To deal effectively with the structure, according to Senge, the organization must keep focused on the long-term, and build/maintain a sense of shared vision.

**Balancing Process with Delay**

Description: A person, a group, or an organization, acting toward a goal, adjusts their behavior in response to delayed feedback. If they are not conscious of the delay, they end up taking more corrective action than needed, or (sometimes) just giving up because they cannot see that any progress is being made.

**Structure:**




Management Principle: In a sluggish system, aggressiveness produces instability. Either be patient or make the system more responsive. (Senge, 1990, p. 382)

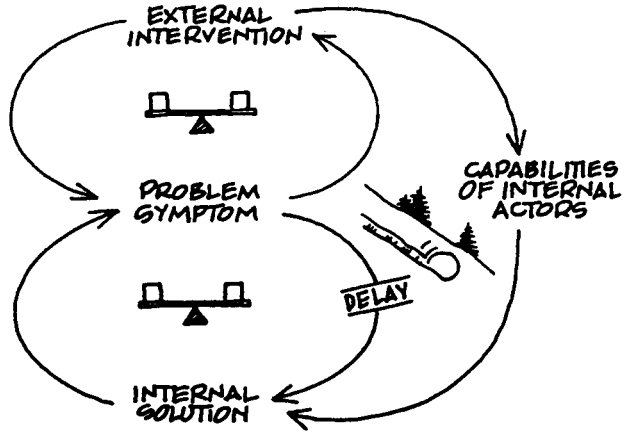
As explained in the shifting the burden example (above), some employees appear to believe that the organization too often relies on "fire fighting"/"shot gunning" rather than systematically identifying and addressing the "root causes" of production problems. Because of the highly interactive, complex nature of the production systems, aggressive actions taken to address problems ("fire fighting") may be detrimental to the integrity of those systems. To improve organizational capacity for problem solving, it may be important for managers to tenaciously apply analytical methods to production problems, standardize procedures/methods to improve the responsiveness of production systems,

and then exhibit/maintain patience as analytical methods/follow-up actions are implemented.

## Shifting the Burden to the Intervenor

One area where shifting the burden structures are so common and so pernicious that it warrants special notice is when outside "intervenors" try to help solve problems. The intervention attempts to ameliorate obvious problem symptoms, and does so so successfully that the people within the system never learn how to deal with the problems themselves.

**Structure:**




Management Principle: "Teach people to fish rather than giving them fish." Focus on enhancing the capabilities of the "host system" to solve its own problems. If outside help is needed, "helpers" should be strictly limited to a one-time intervention (and everyone knows this in advance) or be able to help people develop their own skills, resources, and infrastructure to be more capable in the future. (Senge, 1990, p. 382).

Like the shifting-the-burden structure, the shifting-the-burden-to-the-intervenor structure is composed of two balancing (stabilizing) processes. In this case, however, the top circle represents the external intervention. It may be able to "solve" the problem quickly, but neglects the need for the host system to develop problem-solving *and* problem-prevention capabilities. The bottom circle has a delay. It represents a more fundamental response to the problem, one whose effects take longer to become evident.

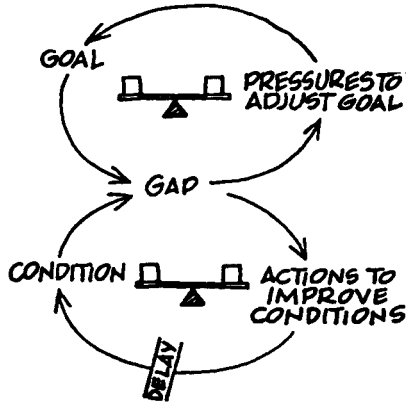
As explained in Chapter IV, some evidence indicating that this structure may be prevalent was uncovered in this investigation. The external intervenor in this case may be senior management. As Senge explains, it is important to "teach people to fish rather

than giving them fish" (p. 382). Senior management may be able to improve organizational capacity for problem solving by *supporting* rather directing problem solving activities.

## Eroding Goals

Description: A shifting the burden type of structure in which the short-term solution involves letting a long-term, fundamental goal decline.

**Structure:**



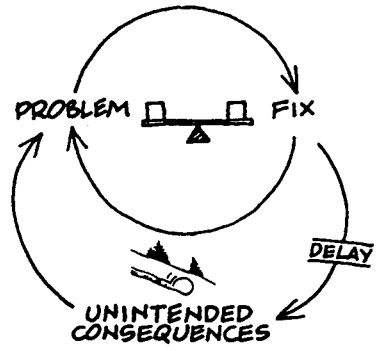

Management Principle: Hold the vision. (Senge, 1990, p. 383)

As explained in the Limits to Growth Example #4, it may be that unrealistic deadlines are sometimes causing the organization to "fire fight"/"shotgun" rather than systematically identifying and addressing production problems. If unrealistic deadlines are driving decision making in the organization, then standards could decline in efforts to meet deadlines. As Senge explains, the management principle in this case is to ***hold the vision.*** To facilitate problem solving, managers must ensure that they have realistically defined, and clearly communicated, what the organization is trying to accomplish–and what is important (e.g., changing quality standards to meet production targets could help to meet immediate deadlines, but have a negative impact on the company in the long term).

## Fixes that Fail

Description: A fix, effective in the short term, has unforeseen long-term consequences which may require even more use of the same fix. (Senge, 1990, p. 388).

**Structure:**




Management Principle: Maintain focus on the long term. Disregard the short-term "fix," if feasible, or use it only to "buy time" while working on a long-term remedy (p. 389).

As explained previously, a number of employees appear to believe that the organization too often relies on "fire fighting"/"shot gunning" rather than systematically identifying and addressing production problems. If this is so, it may be that actions taken to quickly "fix" production problems may have "unforeseen long-term consequences." Management may have an opportunity to improve organizational problem solving by helping to build/support a system-wide focus on the long-term.

## Organizational Learning

In this section, data collected in this investigation are discussed in terms of Senge's framework for a learning organization. The company's apparent strengths in terms of promoting organizational learning are discussed, as well as areas in which the company may have an opportunity to enhance organizational capacity for learning.

As explained previously, Senge (1993) contends there are three cornerstones of learning organizations: Aspiration, Conversation, and Conceptualization. To develop these cornerstones, organizations must focus on five inter-dependent disciplines: (1) Personal Mastery; (2) Building Shared Vision; (3) Mental Models; (4) Team Learning; and (5) Systems Thinking.

### Aspiration

To build this cornerstone, according to Senge, organizations must focus on two disciplines: Personal Mastery and Building Shared Vision.

#### Personal Mastery

Personal growth is a matter of choice. As Senge explains, "no one can be forced to develop his or her personal mastery" (p. 172). The way to promote personal mastery, according to Senge, is to provide an environment that supports personal growth. "The most positive actions that an organization can take to foster personal mastery involve working to develop all five learning disciplines in concert" (p. 173).

In efforts to improve organizational effectiveness, companies sometimes send employees to training without fully considering individuals' personal motivation levels, and other issues impacting employees' ability to learn and apply new skills (e.g., timing issues–their workload, personal issues, the specific relevance of the training content in terms of their current work responsibilities, the degree to which employees can/will be supported in applying the training content upon returning to the job, etc.). As explained in Chapter IV, 80% of the pilot session participants indicated they attended the training

because they were asked to attend. Perhaps one way the company may be able to foster personal mastery is to ensure that participation in training is *encouraged*, but not mandated. As Weisbord (1991) warns, mandated training does not help to build productive workplaces:

> We all need the best methods we can find for learning new skills. Unless our learning is self-motivated, we are unlikely to use it. Training needs to be voluntary, jointly entered into by people who work together, and safe in the sense that people will not be compromised by others' judgments of them. . . . Putting everybody through this or that experience satisfies certain needs. Building productive workplaces is not one of them. (Weisbord, 1991, p. 373)

## Building Shared Vision

As explained in Chapter II, the importance of creating and sustaining a vision in efforts to facilitate change has been discussed by both researchers and practitioners–in business and educational settings (e.g., Bennis & Nanus, 1985; Boyett & Conn, 1992; Clemmer, 1992; Fullan, 1991; Hammer & Champy, 1993; Kanter, 1989; Marsick & Watkins, 1993; Miles & Louis, 1990; Pine, Victor & Boynton, 1993; Senge, 1990; Smith & O'Day, 1991; Weisbord, 1991; et al.). Clemmer (1992) contends that all organizations have a vision; a challenge facing managers today is to help *shape* their organizational visions–to build shared visions that will unify and drive efforts toward accomplishing what their organizations want to create:

> Just as every individual has a vision of the future, every organization does as well. Your organization's vision is simply a collection of everyone's individual vision.
>
> Your organizational vision acts as a magnet. It attracts people, events, and circumstances to it. Another way of looking at visioning is as a self-fulfilling prophecy. What your people believe will happen, they will make happen, often unconsciously.
>
> So the big question becomes, what is your organizational vision? Is it what you and your management team want to have happen, or is it a collection of everyone's fears and paranoia? What the majority of people see, they will work to make reality. (p. 346)

According to Senge (1990), "shared vision is vital for the learning organization because it provides the focus and energy for learning" (p. 206). In interviews with pilot session participants, their direct managers, and management session participants in this

investigation, interviewees were asked to describe the company's vision (or "the picture of the future the organization was trying to create"). Their responses are summarized in Chapter IV (see Building Shared Vision, Table 5). As the data indicate, employees do not appear to share a common vision. Most employees described the vision in terms of the company's relative position in the marketplace. Some employees described the vision in terms of "being #1," although they were not in agreement as to what they company would "be #1" in. Similarly, some employees explained the vision in terms of being "world class"/"world leaders," although again employees differed in describing in what respect the company would be "world class"/"world leaders." Interestingly, when asked to describe the company's vision, one manager observed: "We aren't clear on this–that's part of the problem!"

Senge suggests that visions work best when they are intrinsic, not relative to others. Further, unlike general "purpose" statements, visions must be specific:

> Purpose is similar to a direction, a general heading. Vision is a specific destination, a picture of a desired future. Purpose is abstract. Vision is concrete. Purpose is "advancing man's capability to explore the heavens." Vision is "a man on the moon by the end of the 1960s." Purpose is "being the best I can be," "excellence." Vision is "breaking four minutes in the mile." (Senge, 1990, p. 149)

Senior management may have an opportunity to promote organizational learning by focusing on building a shared vision of the company's future. As Senge explains, shared visions establish overarching goals, provide a rudder to keep the learning on course when stresses develop, and foster risk taking, experimentation, and a commitment to the long term (pp. 207-210).

## Conversation

To build this cornerstone, according to Senge, organizations must focus on two disciplines: Mental Models and Team Learning.

### Mental Models

According to Senge, mental models are the assumptions, generalizations, pictures/images, or complex theories that influence how we understand the world and

how we take action. The discipline of mental models involves exposing our assumptions so that they can be examined and tested. And making a commitment to discovering the best "mental models" for a given situation. This means, Senge explains, that managers' ability to *influence* others (advocacy) must be balanced with their need to *learn from* others (inquiry). Further, "this requires an organizational 'commitment to the truth'" (Senge, 1990, p. 191).

A number of pilot session participants indicated that the problem solving training helped them to increase their focus on facts, to encourage them to examine their assumptions. The disciplined, structured approach that the problem solving tools provide appears to facilitate examination and refinement of individuals' mental models (particularly with the "root cause" worksheet, which helps to make individuals' thinking more "visible").

The company may have an opportunity to promote organizational learning by: (1) Making an organization-wide commitment to using a systematic approach to solving problems, and exposing assumptions so that they can be examined and tested; and (2) Making an organization-wide commitment to discovering the best "mental models" for a given situation (requiring *inquiry* and advocacy skills, and a "commitment to the truth"). Actually, it appears that the company is already on the path to developing this discipline. A desire to improve problem solving within the organization was evidenced by introduction of the training, and managers' attending it so that they could discern how to best support it. Further, data collected throughout this investigation–as well as the very fact that the organization asked for assistance in assessing the impact of the training (and that employees were so cooperative throughout this investigation)–indicates there appears to be a "commitment to the truth" within the organization.

## Team Learning

Over the last four years the company has regularly created cross-functional teams to identify and address problems within the organization (see Appendix A). Data

reported in Chapter IV from the cross-functional team survey indicate that these teams function fairly well. Items receiving the highest ratings related to how team members treat one another. As discussed previously, the item receiving the lowest rating related to inadequate attention to the long term in solving problems.

According to Senge (1990), teams are "the fundamental learning unit in modern organizations" (p. 10). It appears that the company in this investigation is already on the path to developing this discipline through its TQM program.

## Conceptualization

To build this cornerstone, according to Senge, organizations must focus on Systems Thinking. "Systems thinking is a discipline for seeing wholes. It is a framework for seeing interrelationships rather than things, for seeing patterns of change rather than static 'snapshots'" (Senge, 1990, p. 68). As Senge explains, systems thinking helps us to see how the underlying structures in situations often cause their problems:

> "When there are problems, or performance fails to live up to what is intended, it is easy to find someone or something to blame. *But more often than we realize, systems cause their own crises, not external forces or individuals' mistakes"* (p. 40)

According to Senge, "the bottom line of systems thinking is leverage–seeing where actions and changes in structures can lead to significant, enduring improvements" (p. 114):

> Our nonsystemic ways of thinking are so damaging specifically because they consistently lead us to focus on low-leverage changes: we focus on symptoms where the stress is greatest. We repair or ameliorate the symptoms. But such efforts only make matters better in the short run, at best, and worse in the long run. (ibid.)

Data collected throughout this investigation indicate that although the company does not currently advocate a systems perspective, it may have an opportunity to enhance organizational capacity for learning by doing so. As reported in the Mental Models section of Chapter IV (and discussed in an earlier section of this chapter), a mental model that surfaced throughout this investigation was the belief that the organization too often relied on "fire fighting/shot gunning" rather than a systematic approach to identifying and

addressing the "root causes" of problems. This mental model indicates there may be too much focus on events. And as Senge explains, "generative learning cannot be sustained in an organization where event thinking predominates" (p. 53).

Additional evidence indicating there may be an opportunity to enhance organizational capacity for learning by adopting a systems perspective came from the team survey. One-fourth of the team functioning survey respondents who answered the open-ended item: "My team would function more effectively if:" pointed to the need for their teams to take a more strategic focus. Further, analysis of the data collected throughout this investigation in terms of the systems archetypes (see Systems Thinking section of Chapter IV, and Part One of this chapter) indicate that there may be a number of opportunities to exercise leverage in efforts to improve problem solving within the organization.

According to Senge, "mastering the systems archetypes starts an organization on the path of putting the systems perspective into practice" (p. 95). As he explains:

> It is not enough to espouse systems thinking, to say, "We must look at the big picture and take the long-term view." It is not enough to appreciate basic systems principles. . . It is not even enough to see a particular structure underlying a particular problem (perhaps with the help of a consultant). *This can lead to solving a problem, but it will not change the thinking that produced the problem in the first place.* For learning organizations, only when managers start thinking in terms of the systems archetypes, does systems thinking become an active daily agent, continually revealing how we create our reality." (Senge, 1990, p. 95)

Senge argues that "it is vital that the five disciplines develop as an ensemble" (Senge, 1990, p. 12). Systems thinking is the fifth discipline because:

> It is the discipline that integrates the disciplines, fusing them into a coherent body of theory and practice. It keeps them from being separate gimmicks or the latest organization change fads. Without a systemic orientation, there is no motivation to look at how the disciplines interrelate. By enhancing each of the other disciplines, it continually reminds us that the whole can exceed the sum of its parts. (Senge, 1990, p. 12)

## Concluding Remarks

### Limitations of the Study

One limitation to this study was that the sample size was small, and there was some overlap in the groups participating in the study. For example, one pilot session participant was also another's direct manager; further, two direct managers had more than one employee in the training. As a result, the generalizability of data collected regarding the training's impact may be questionable.

Another limitation was that the researcher's initial lack of familiarity with the organization and training content may have inadvertently limited initial data acquisition. As the researcher was attempting to gain perspective, learn new terms/concepts, develop relationships, etc., useful information may have been overlooked in the initial phase of this investigation.

### Suggestions for Further Research

In the current climate, economic pressures and/or technological advances are driving major changes in most organizations. Since system-wide change is complex, and difficult to achieve, there is a need for greater understanding of how to facilitate it. Additional research in organizational learning and change could inform this processs.

Senge's framework proved to be useful and practical for analyzing organizational change. It focuses on critical factors affecting change. Further, the system archetypes outline by Senge provide structure for analysis of case-specific data, and include management principles for leveraging change.

### Summary

In this qualitative study, a theoretical construct was applied to the analysis of an organization's attempts to change. More specifically, the utility and practicality of Peter Senge's conceptual framework for a learning organization was tested as the researcher gathered and analyzed data relating to the impact of the company's attempts to learn and

apply new skills. The focus of this investigation was the company's effort to introduce, pilot, and support training designed to equip individuals with the information and skill practice needed to enable application of the program's systematic problem-solving tools. Use of these tools within the company, it was hoped, would lead to more rapid identification and resolution of problems, thereby improving organizational capacity for problem solving.

The researcher was asked to help the organization to assess the impact of the organization's pilot of the training. Over a six-month period, surveys and interviews were conducted to gather data relating to the impact of the training, and organizational efforts to support use of the problem solving tools. Data were collected to assess participants' and managers' perceptions as to behavioral changes and tangible results from the training. The data were then analyzed in terms of Senge's research-based model for organizational learning. Application of system archetypes outlined by Senge (1990) served as the basis for developing recommendations as to how the company might be able to improve organizational problem solving, as well as its capacity for organizational learning.

This investigation provided an opportunity to see the excitement, frustration, and complexity inherent in efforts to effect organizational change. The individuals participating in this study believed the change was important, and wanted to support it. But as data collected in this study indicated, change in complex settings is not easily accomplished.

Although research has demonstrated that change cannot be mandated or "controlled," orchestrating system-wide change is clearly more easily discussed than achieved. The study demonstrated that a systems perspective provides an effective vantage point for leading and leveraging actions in change efforts.

Time appeared to be one of the most significant barriers to change. Although research clearly warns us that change takes time, exhibiting patience throughout the

change process is difficult when individuals are under pressure for results. The importance of patience was affirmed in a recently released study:

> Despite suggestions from critics that its day has passed, "America's Total Quality Management movement is alive and well and will remain that way for the foreseeable future, says a new study released Wednesday by the Conference Board.
>
> There is, however, one caveat. Companies implementing TQM programs need at least 4 years to persuade their employees to buy into the philosophy and 8 to 10 years to fully establish TQM principles. And that kind of patience is not the norm in the boardrooms of corporate America, according to the study, which is based on more than five years of research on hundreds of U.S. companies.
>
> As a result, what many TQM critics see as a failure among U.S. companies to successfully implement quality principles is really a general failure on the part of corporate America to adjust to the kind of long-term culture change demanded by an all-encompassing management strategy such as TQM. (Yates, 1994, p. 3)

Becoming a learning organization requires major shifts in thinking. Ownership, responsibility, and commitment to supporting the processes that drive change must be system-wide:

> At the heart of a learning organization is a shift of mind–from seeing ourselves as separate from the world to connected to the world, from seeing problems as caused by someone or something "out there" to seeing how our own actions create the problems we experience. A learning organization is a place where people are continually discovering how they create their reality. And how they can change it. (Senge, 1990, pp. 12, 13).

# APPENDIX A

## TIMELINE OF ORGANIZATIONAL ACTIVITY RELATING TO THE TRAINING

# APPENDIX A

## TIMELINE OF ORGANIZATIONAL ACTIVITY RELATING TO THE TRAINING

The following is a timeline of organizational activity relating to the problem solving training. Some information in this timeline relates directly to the training, describing organizational efforts to introduce, support, or follow up on the training. Other information contained in this timeline is more "indirectly" related to the training. Nonetheless, it is of vital importance in understanding and interpreting data collected in the study, as it provides background information describing the "context" of this change study, and/or describes organizational efforts to address perceived "barriers" to implementation of the training.

1980s

In the mid-1980s, demand for the company's product line skyrockets as the company creates a new market segment. To address increased sales demands, the company invests heavily in technology in terms of a computer ordering system (in the latter part of the 1980s).

The computer ordering system does not function as intended, creating both internal and external problems for the company. Further, using technologically-advanced manufacturing processes, a competitor introduces a new product which is rapidly gaining market share.

By the end of the decade, the company faces unprecedented financial difficulties. For the first time in the company's forty-year history, a number of employees in the urban manufacturing facility are laid off.

The company's Research and Development group (R&D) works to develop a new product, and semi-automated process for mass production of the new product.

1990

A new president, brought in from the parent company, works to create a "customer-focused" organization. Senior management changes are made, including the naming of a director of TQM (reporting directly to the president of the company). The initial focus of TQM is on customer service.

R&D efforts relating to the new product line, and semi-automated process for mass production, continue. The company's international facility, located outside of the United States, grows to meet product demands created as a result of lay-offs in the urban facility (site of the company's conventional manufacturing operation, and headquarters).

1991

TQM program expands; the focus enlarges to include identifying and addressing needs relating to organizational structure and/or production capabilities. A statistical consultant works with the organization to support internally-focused TQM efforts.

Development of the semi-automated production line (Line 1) begins at a new facility in the second quarter of 1991. Although the company' has operated within the urban setting for approximately 40 years, the new site is located in a nearby suburb. More of the conventional manufacturing operation (from the urban facility) is moved to the international production facility.

By the end of 1991, customer surveys (conducted by outside consultants) show that the company's "customer" focus has begun to pay off. Development work for a new product, using a fully automated production line (Line 2) also begins at the end of 1991.

TQM efforts include: (1) Providing employees with service, quality and interpersonal skills training (in both urban and suburban facilities); (2) Creating cross-functional teams, with a short-term focus, to solve problems.

1992

Service, quality and interpersonal skills training (in both urban and suburban facilities) continue as part of TQM, as well as the use of cross-functional problem solving teams (at one point, as many as 12 teams are functioning simultaneously). Customer service representatives are empowered to address customer complaints. The second phase of TQM is also initiated: process improvement.

The company's first semi-automated production line (Line 1) begins operation in the second quarter of 1992. Development of the first fully automated production line (Line 2) continues throughout the year.

Because Line 1 fails to meet the efficiency targets predicted during development, R&D forms a cross-functional team forms to address production problems in the third quarter of 1992. The team consists primarily of R&D employees.

In the latter part of 1992, another major component of the TQM program is initiated. Its intent is to redesign production tasks and responsibilities to more accurately reflect the needs and opportunities created in more fully automated environments.

1st Qtr., 1993

Line 1 is still not meeting efficiency targets. A cross-functional team is formed by Operations management to address production problems. No members from the R&D team are initially included on this team, although after some discussion, one member from the original team is added to the new team.

The statistical consultant supporting TQM efforts works with the cross-functional team to develop a more "strategic" focus. Tactical spin-off teams are created, as needed, targeting specific problem areas (with strategic team members acting as team leaders).

2nd Qtr., 1993 Manufacturing employees begin working on a 12-hour work schedule (with a monthly schedule of 3 weeks with 3 days on, 4 days off; 1 week with 4 days on, 3 days off). This schedule enables production around the clock, 7 days a week. Management schedules, however, remain unchanged.

The statistical consultant supporting TQM efforts identifies problem solving as one of the organization's shortcomings (along with standardization of processes). Recommends problem solving training be provided (i.e., technically-oriented, not "generic"), as well as other specialized training (e.g., SPC).

In the latter part of the quarter, a training manager decides to pilot a problem-solving training product, to be delivered by an outside firm. She asks a Loyola University professor for support in assessing the impact of the training (this study begins).

Approximately two weeks before the training, a three-hour management overview of the training is provided by the consultant who will be delivering it. Operations and R&D managers are present for the session. One week before the training, the researcher conducts interviews with managers who will be sending employees from their areas to the training (see Appendix B, *Pre-Training Management Interviews*).

The pilot session of the problem-solving training course is conducted at the end of the second quarter for 11 company employees at the suburban facility. As early as possible on the first day of the training, pilot session participants are interviewed by this researcher and a fellow graduate student (see Appendix C, *Pilot Session Participant Interviews*). At the end of the training, pilot session participants are asked to respond to a post-training questionnaire (see Appendix D, *Pilot Session Post-Training Survey*).

By this time, all conventional manufacturing is performed outside of the U.S. Only the more technologically-advanced production lines are now operating in the area (in the suburban facility). More than half of the company employees are working at the suburban rather than urban facility.

3rd Qtr., 1993

The consultant who delivered the problem solving training returns in the first part of the quarter for a follow-up meeting with management. The intent of the session is to determine how organizational management can best support the training. Barriers to implementing the training that pilot session participants had identified during their training are discussed. The group decides to attend the training themselves.

The first fully automated production line (Line 2) begins operation. Another line (Line 3), identical to Line 2, is under construction.

Follow-up interviews are conducted with pilot session participants (see Appendix E, *Follow-up Interview #1 with Pilot Session Participants*), and their direct managers (see Appendix F, *Follow-up Interviews with Pilot Session Participants' Managers*).

A statistician is hired to address the organization's need for greater control/management of data. The strategic team identifies technical resource constrains that will limit production capacity. The search for technical staff to support the new lines begins.

In the middle of the third quarter, a management session of the problem-solving training is conducted for Operations managers, including the Vice President of Operations. These managers are provided with a written summary of feedback from the post-training survey and follow-up interviews. On the final day of their training, managers identify "Next Steps", including: (1) Training of remaining members of the Strategic Team; and (2) Identification, training of "problem-solving process" experts (the Vice President of Operations asks the newly-hired statistician to play a major role in this). At the end of their training, management session participants complete a post-training questionnaire (see Appendix G, *Management Session Post-Training Questionnaire*).

At the end of the quarter, follow-up interviews are conducted with management session participants (see Appendix H, *Follow-up Interviews with Management Session Participants*) and pilot session participants (see Appendix I, *Follow-up Interview #2 with Pilot Session Participants*). As a final source of data in the investigation, the researcher asks the training manager who had asked for help in assessing the impact of the training to watch for an opportunity to follow up with teams containing members who had attended the training.

The Operations manager responsible for Line 2 calls a meeting to discuss how the strategic team responsible for improving the efficiency of the production lines can better focus production problem solving efforts. The team identifies four areas critical to the success of the lines.

4th Qtr., 1993 Four tactical (spin-off) teams are formed (re-formed, in one case) to address each of the areas identified by the strategic team as critical to the success of the production lines. The training manager responsible for the problem solving training contacts the researcher to explain that each of these teams has at least one member who has attended the training.

The researcher contacts the spin-off team leaders, and interviews are conducted in the latter part of the quarter (see Appendix J, *Spin-off Team Functioning–Team Leader Interviews*). The team leaders are supportive of the study; some offer suggestions for additional items to include on the survey. After modifying the instrument to reflect their input, the researcher meets with the team leaders again to review the survey once more, and plan for its implementation (see Appendix K, *Spin-off Team Functioning Survey*). Within two weeks, the survey is completed by all four teams. Reports summarizing survey data from their own teams, as well as aggregate data for numeric ("rating") items from all four teams, are developed for the team leaders.

# APPENDIX B

# PRE-TRAINING MANAGEMENT INTERVIEWS

# APPENDIX B

## PRE-TRAINING MANAGEMENT INTERVIEWS

1. Specifically, why are you sending your employees to this training? What led you to the conclusion that this training is necessary? How did you decide who would attend?

2. What criteria will you use to determine whether or not you are satisfied with the results of the training?

3. What strategies or tools could be used to measure and evaluate results against the criteria you specified in Question #2?

# APPENDIX C

# PILOT SESSION PARTICIPANT INTERVIEWS

# APPENDIX C

## PILOT SESSION PARTICIPANT INTERVIEWS

1. What is your position in the organization?

   How does this contribute to [company's] success?

2. In order of importance, what are the top three priorities of your position?

3. On a scale of 1-4, how important is it for [company] to improve its problem solving ability?

| NOT IMPORTANT | | | VERY IMPORTANT |
|---|---|---|---|
| 1 | 2 | 3 | 4 |

4. Why are you attending this training?

5. On the average, approximately what percentage of the time do you spend solving problems on your job?

6. Will this training contribute to "bottom-line" results for [company]?

   (HOW?)

7. On a scale of 1-4, rate the organization's ability to problem solve:

| LOW | | | HIGH |
|---|---|---|---|
| 1 | 2 | 3 | 4 |

8. On a scale of 1-4, rate your problem-solving skills:

| LOW | | | HIGH |
|---|---|---|---|
| 1 | 2 | 3 | 4 |

# APPENDIX D

# PILOT SESSION PARTICIPANT POST-TRAINING SURVEY

# APPENDIX D

## PILOT SESSION POST-TRAINING SURVEY

1. Was the training effective? (Circle your answer)

| NOT EFFECTIVE | | | VERY EFFECTIVE |
|---|---|---|---|
| 1 | 2 | 3 | 4 |

Please explain _____

_____

_____

2. Is the training important? (Circle your answer)

| NOT IMPORTANT | | | VERY IMPORTANT |
|---|---|---|---|
| 1 | 2 | 3 | 4 |

Please explain _____

_____

_____

3. What, if anything, might prevent or inhibit implementation of the problem-solving approach presented in this training?

Can this/these be overcome? If so, HOW?

4. How will this training help you?

5. Rate your problem-solving skills:

Before the training

| LOW | | | HIGH |
|---|---|---|---|
| 1 | 2 | 3 | 4 |

After the training

| LOW | | | HIGH |
|---|---|---|---|
| 1 | 2 | 3 | 4 |

6. Should this training be offered to others? Is so, to whom? WHY?

# APPENDIX E

## FOLLOW-UP INTERVIEW #1 WITH PILOT SESSION PARTICIPANTS

# APPENDIX E

## FOLLOW-UP INTERVIEW #1 WITH PILOT SESSION PARTICIPANTS

1. What do you see as [company's] vision--what is the picture of the future or ultimate goal the organization is trying to create?

   How does your department fit into this picture?

   How does this training fit into the vision?

2. Are you approaching problem-solving differently as a result of the training? If "yes," specifically, how?

3. How has this training helped you on your job?

4. Approximately how many times in the past month have you used:

   ("Root cause" tool) _____ (Tool for preventing problems) _____

5. How has management supported your use of [tools]?

   What (else) could management do that would be helpful to you?

6. One of the steps in applying the ["root cause" tool] asks that you clearly identify your assumptions in problem-solving. Have you found this useful? Have you been able to apply this to other aspects of your job?

7. During the training the group identified potential barriers to using [tools] on the job. Do you remember the exercise in which each member of the group put three checks by the potential problems they felt were most likely to impact use of the training? I'd like to follow up on those. . . .

| | A Was this a problem? (If yes, see Columns B and C) | B How significant of a problem? (1=LOW, 4=HIGHLY) | C To what extent were you able to overcome it? (1=NOT ABLE, 4=ABLE) |
|---|---|---|---|
| a. Availability of proper data | YES NO | 1 2 3 4 | 1 2 3 4 |
| b. Getting support and help of other departments | YES NO | 1 2 3 4 | 1 2 3 4 |
| c. Shortage of time for proper analysis | YES NO | 1 2 3 4 | 1 2 3 4 |
| d. Lack of cross-functioning team representation | YES NO | 1 2 3 4 | 1 2 3 4 |
| e. Management making the skills a higher priority | YES NO | 1 2 3 4 | 1 2 3 4 |
| f. Lack of interest by others to implement follow-up actions. | YES NO | 1 2 3 4 | 1 2 3 4 |
| g. May impact production output | YES NO | 1 2 3 4 | 1 2 3 4 |
| h. Not properly following [tool] steps. | YES NO | 1 2 3 4 | 1 2 3 4 |

Interviewer Note: For any problems employees were unable to overcome (indicated by a "1" in Column C), probe for clarity as to what it will take to overcome this problem)

8. Has your use of [tools] contributed to bottom-line results for [company]? If not, do you think it will? How?

# APPENDIX F

# FOLLOW-UP INTERVIEWS WITH PILOT SESSION PARTICIPANTS' MANAGERS

# APPENDIX F

## FOLLOW-UP INTERVIEWS WITH PILOT SESSION PARTICIPANTS' MANAGERS

1. What do you see as [company's] vision--what is the picture of the future or ultimate goal the organization is trying to create?

   How does your department fit into this picture? What are your department's goals, priorities?

   How does this training fit into the vision?

2. Specifically, how is _____ approaching problem-solving differently as a result of the training?

3. How has this training helped her/him on the job?

   Can you give me some examples?

4. Is ____ using the tools appropriately?

5. Have you been able to support _____'s use of the (tools)? How?

6. What benefits have been realized as a result of ___ using the problem solving tools? For example, have you noticed a reduction in time spent solving problems, faster resolution to problems, more effective resolution to problems, permanent resolution to problems, improved communications, bottom-line results, or any other benefits?

# APPENDIX G

# MANAGEMENT SESSION PARTICIPANT POST-TRAINING SURVEY

# APPENDIX G

## MANAGEMENT SESSION POST-TRAINING SURVEY

1. How important is it for [company] to improve its problem-solving ability?

| NOT IMPORTANT | | | VERY IMPORTANT |
|---|---|---|---|
| 1 | 2 | 3 | 4 |

2. How relevant is use of the [tools] in terms of organizational goals and/or priorities?

| NOT RELEVANT | | | VERY RELEVANT |
|---|---|---|---|
| 1 | 2 | 3 | 4 |

Comments:

3. Was the training effective?

| NOT EFFECTIVE | | | VERY EFFECTIVE |
|---|---|---|---|
| 1 | 2 | 3 | 4 |

Comments:

4. Is the training important?

| NOT IMPORTANT | | | VERY IMPORTANT |
|---|---|---|---|
| 1 | 2 | 3 | 4 |

Comments:

5. What benefits do you see to [company's] applying [the tools]?

6. What strategic or organizational changes/actions (i.e., non-training) are needed to support use of these tools in the organization?

7. How do you view your role in implementing these tools in your organization?

Specifically, what actions will you take to support implementation of these tools?

# APPENDIX H

# FOLLOW-UP INTERVIEWS WITH MANAGEMENT SESSION PARTICIPANTS

# APPENDIX H

## FOLLOW-UP INTERVIEWS WITH MANAGEMENT SESSION PARTICIPANTS

1. What do you see as [company's] vision--what is the ultimate goal or picture of the future the organization is trying to create?

   How does your department fit into this picture?

   How does this training fit into the vision?

2. Have YOU been able to use any of [training] tools since you attended the training? Individually or with a team?

   What happened?

   Has your use of [training] tools contributed to bottom-line results on any of your projects (ultimately, leading to increased profitability for the company)?

   No tangible results: What benefits have you realized from use of the tools?
   OR Tangible results: What other benefits have you realized from use of the tools?

3. Have you been able to encourage or support others' use of the tools? HOW? WHO? WITH WHAT RESULTS?

4. Was the [training] effective? (Rate the training on a scale of 1-4)

   | NOT EFFECTIVE | | | VERY EFFECTIVE |
   |---|---|---|---|
   | 1 | 2 | 3 | 4 |

   WHY/WHY NOT?

5. Is the training important? (Rate the training on a scale of 1-4)

| NOT IMPORTANT | | | VERY IMPORTANT |
|---|---|---|---|
| 1 | 2 | 3 | 4 |

WHY/WHY NOT?

6. What factors might limit effective use of the [training] tools here at [company]?

Have YOU been able to address or prevent this/these?

What (else) could YOU do?

WHO else needs to do WHAT to address this/these?

7. Specifically, *what needs to happen* in order for the organization to improve its problem solving ability?

- How can YOU contribute to this effort?

# APPENDIX I

## FOLLOW-UP INTERVIEW #2 WITH PILOT SESSION PARTICIPANTS

# APPENDIX I

## FOLLOW-UP INTERVIEW #2 WITH PILOT SESSION PARTICIPANTS

1. On a scale of 1-4, rate your problem solving skills:

| LOW | | | HIGH |
|---|---|---|---|
| 1 | 2 | 3 | 4 |

2. On a scale of 1-4, how important is it for you to IMPROVE your ability to solve problems on the job:

| NOT IMPORTANT | | | VERY IMPORTANT |
|---|---|---|---|
| 1 | 2 | 3 | 4 |

Please explain:

3. Has the training changed the way you solve problems on the job? HOW?

Do you think the training will (continue to) impact the way you do your job? In what way/Why not?

Do you think the [training tools] are of more benefit individually or in team situations?

Have you used the tools with a team? What happened?

4. Has your use of [training] tools contributed to results or savings for [company], ultimately leading to increased profitability for the company?

5. What factors have most affected your ability to use the tools?

Have you been able to overcome or minimize [limiting factors'] effects? HOW?

6. How has management supported your use of the tools? Specifically, WHO has done WHAT?

   What else could "management" do to support the training? WHO could do WHAT?

7. Was the [training] effective? (Rate the training on a scale of 1-4)

   NOT EFFECTIVE 1 2 3 VERY EFFECTIVE 4

   WHY/WHY NOT?

8. Is the training important? (Rate the training on a scale of 1-4)

   NOT IMPORTANT 1 2 3 VERY IMPORTANT 4

   WHY/WHY NOT?

9. Specifically, *what needs to happen* in order for the organization to <u>improve its problem solving ability</u>?

   - What could "management" do? WHO could do WHAT?
   - What could YOU do?

# APPENDIX J

## SPIN-OFF TEAM FUNCTIONING–TEAM LEADER INTERVIEWS

# APPENDIX J

## SPIN-OFF TEAM FUNCTIONING–TEAM LEADER INTERVIEWS

As you know, I am helping [company] to look at the impact of the [problem solving training] on the organization. Intended outcomes of the training, as expressed by senior managers, included helping to develop a more standardized approach to problem solving, as well as a "common language" for problem solving.

I understand at least two members of your team have been through the problem solving training. [Pause for confirmation.] I'd like to administer a brief questionnaire at one of your team meetings (I also plan to work with the other spin-off teams created by the strategic production line improvement team). Please understand that the numerical data from all four teams will be aggregated. I will share team-specific information only with you (as I will with all four team leaders).

1. Why was this team formed--i.e., what is the team's purpose? Why is this important to the company?

2. How was it decided who would be included on the team? (Functions/individuals?)

3. What are the team's goals?

   How were the goals decided upon?

4. Is a team the best way to accomplish these goals? Why/Why not?

5. What training has the team had on group functioning/group processes?

   Is there a group facilitator? Who? Why/how decided upon?

6. As a team, are you using any of the (training problem-solving tools)?

   Do you plan to?

7. Here's a draft of the questions I plan to ask, although after these interviews with the team leaders I may need to alter it slightly. Is there anything you would like me to ask? What feedback do you think would help you most?

# APPENDIX K

# SPIN-OFF TEAM FUNCTIONING SURVEY

# APPENDIX K

## SPIN-OFF TEAM FUNCTIONING SURVEY

1. On a scale of 1-4, rate your team's ability to problem solve:

| LOW | | | HIGH |
|---|---|---|---|
| 1 | 2 | 3 | 4 |

2. Why was this team formed--i.e., what is the team's purpose? Why is this important to [company]?

3. What are the team's specific goals?

   How were the goals decided upon? Did you have input in developing them?

4. Is a team the best way to accomplish these goals? Why or Why not?

5. Are the functional areas needed to achieve the goals represented in the team?

   WHY or WHY NOT?

6. Do you think your team will successfully achieve these goals? WHY or WHY NOT?

7. Please circle your responses to the following statements (continued on the back):

   a. My team functions efficiently and effectively as a group.

| SELDOM | | | ALWAYS |
|---|---|---|---|
| 1 | 2 | 3 | 4 |

   b. Our team leader acts as a facilitator, as needed, to help us to maintain ownership of the process and outcomes in my team's meetings.

| SELDOM | | | ALWAYS |
|---|---|---|---|
| 1 | 2 | 3 | 4 |

   c. All team members are treated as colleagues on my team.

| SELDOM | | | ALWAYS |
|---|---|---|---|
| 1 | 2 | 3 | 4 |

d. When differences of opinion arise on my team, we objectively explore the "truth" in each other's views.

| SELDOM | | | ALWAYS |
|---|---|---|---|
| 1 | 2 | 3 | 4 |

e. Team members can drop their departmental perspectives and think from an organization-wide perspective.

| SELDOM | | | ALWAYS |
|---|---|---|---|
| 1 | 2 | 3 | 4 |

f. My team takes the time to fully explore complex issues before deciding what actions to take.

| SELDOM | | | ALWAYS |
|---|---|---|---|
| 1 | 2 | 3 | 4 |

g. Team members are willing to question their own assumptions and viewpoints.

| SELDOM | | | ALWAYS |
|---|---|---|---|
| 1 | 2 | 3 | 4 |

h. As a team, we spend adequate time developing long-term solutions to root causes of problems (not just "putting out fires").

| SELDOM | | | ALWAYS |
|---|---|---|---|
| 1 | 2 | 3 | 4 |

i. On my team, we hold ourselves responsible and accountable for the team's performance.

| SELDOM | | | ALWAYS |
|---|---|---|---|
| 1 | 2 | 3 | 4 |

j. We are committed to "exploring the truth" on my team–we rely on facts and analyze assumptions rather than defending opinions or jumping to conclusions.

| SELDOM | | | ALWAYS |
|---|---|---|---|
| 1 | 2 | 3 | 4 |

k. I feel I am respected and "listened to" by other members of my team.

| SELDOM | | | ALWAYS |
|---|---|---|---|
| 1 | 2 | 3 | 4 |

l. Team members value and actively seek diverse viewpoints.

| SELDOM | | | ALWAYS |
|---|---|---|---|
| 1 | 2 | 3 | 4 |

6. **My team would function more effectively if:**

# REFERENCES


Argyris, C. (1992). On Organizational Learning. Cambridge: MA. Blackwell Publishers.

Barton, S. (1994). Chaos, Self-Organization, and Psychology. American Psychologist. 49, 5-14.

Betts, F. (1993). Systems Thinking and the Integrated Curriculum. Curriculum Handbook. Alexandria, VA: Association for Supervision and Curriculum Development.

Bohm, D. (1980). Wholeness and the Implicate Order. New York: Routledge.

Boyett, J. & Conn, H. (1992). Workplace 2000. The Revolution Reshaping American Business. New York, NY: Penguin Books USA, Inc.

Byham, W.C. & Cox, J. (1988). Zapp! The Lightning of Empowerment. New York: Fawcett Columbine.

Carnevale, A. (1984). Jobs for the Nation: Challenge for a Society Based on Work, Alexandria, VA: American Society for Training and Development.

Clemmer, K. (1992). Firing On All Cyliners. The Service/Quality System for High-Powered Corporate Performance. Homewood, IL: Business One Irwin.

Davenport, T. (1993). Process Innovation. Reengineering Work through Information Technology. Boston, MA: Harvard Business School Press.

Fullan, M. (1991). The *New* Meaning of Educational Change. New York: Teachers College Press, Columbia University.

Fullan, M. & Miles, M. (1992). Getting Reform Right: What Works and What Doesn't. Phi Delta Kappan, 73,. 745-752.

Gardner, H. (1985). The Mind's New Science. New York: Basic Books.

Gleick, J. (1987). Chaos. Making a New Science. New York: Viking Penguin, Inc.

Hammer, M. & Champy, J. (1993). Reengineering the Corporation: A Manifesto for Business Revolution. New York: HarperCollins Publishers, Inc.

Hoyert, M. (1992). Order and Chaos in Fixed Interval Schedules of Reinforcement. Journal of the Experimental Analysis of Behavior, 57, 339-363.

Innovation Associates (1990). The Fifth Discipline: The Art and Practice of the Learning Organization, A Conversation with Peter Senge. Farmingham, MA: Innovation Associates.

Kanter, R.M. (1989). When Giants Learn to Dance. New York: Simon and Schuster.

Katzenbach, J.R. & Smith, D.K. (March-April, 1993). The Discipline of Teams. Harvard Business Review. 93207, 111-120.

Kirkpatrick, D. (1987). Evaluation. In R.L. Craig (Ed.) Training and development handbook, (3rd Ed.), pp. 310-317. New York: McGraw-Hill.

Krathwohl, D. (1993). Methods of Educational and Social Science Research. New York: Longman Publishing Group.

Laszlo, E. (1972). The Systems View of the World. New York: George Braziller.

Marshall, R. & Tucker, M. (1992). Thinking for a Living: Education and the Wealth of Nations. New York: BasicBooks.

Marsick, V. & Watkins, K. (1993). Sculpting the Learning Organization. Lessons in the Art and Science of Systemic Change. San Francisco: Jossey-Bass, Inc.

Marsick, V. & Watkins, K. (1990). Informal and Incidental Learning in the Workplace. New York: Routledge, Chapman and Hall, Inc.

McGregor, D. (1960). The Human Side of Enterprise. New York: McGraw-Hill.

McLaughlin, M. (1990). The Rand Change Agent Study Revisitied: Macro Perspectives and Micro Realities. Educational Researcher, 19, 11-16.

Miles, M. & Louis, K. (1990). Mustering the Will and Skill for Change. Educational Leadership, 47, 57-61.

O'Neil, J. (May, 1990). On Systemic Reform: A Conversation with Marshall Smith. Educational Leadership, 51, 12, 13.

Peters, T. (1989). Thriving on Chaos. Handbook for a Management Revolution. New York: Alfred A. Knopf, Inc.

Pine II, J., Victor, B., & Boynton, A. (September-October, 1993). Making Mass Customization Work. Harvard Business Review. 108-119.

Prigogine, I. & Stengers, I. (1983). Order Out of Chaos. New York: Bantam Books.

Senge, P. (1993). Cornerstones of the Learning Organization. A Videoconference. Alexandria, VA: PBS, ALSS/The Business Channel.

Senge, P. (1990). The Fifth Discipline: The Art & Practice of the Learning Organization. New York: Doubleday/Currency.

Smith, M. & O'Day, J. (1991). Systemic School Reform. In The Politics of Curriculum and Testing. S. Fuhrman & B. Malen (eds). Bristol, U.K.: Falmer.

Steen, L. (1990). On the Shoulders of Giants: New Approaches to Numeracy. Washington, D.C.: National Academy Press.

Steffy, B. (1993). Top-Down—Bottom-Up: Systemic Change in Kentucky. Educational Leadership, 51, 42-44.

Sungaila, H. (1990). The New Science of Chaos: Making a New Science of Leadership?. Journal of Educational Administration, 23, 4-23.

Weinberg, M. (1975). An Introduction to General Systems Thinking. New York: John Wiley & Sons, Inc.

Weisbord, M.R. (1991). Productive Workplaces. Organizing and Managing for Dignity, Meaning, and Community. San Francisco: Jossey-Bass.

Wheatley, M. (1992). Leadership and the New Science. San Francisco, CA: Berrett-Koehler Publishers.

Yates, R. (1994, February 9). TQM is alive and well–and not just a fad, study finds. Chicago Tribune, 3, 1.

# VITA

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