Transforming the Practice of Management

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Traditional resource-based organizations are giving way to knowledge-based organizations, a fundamental change that requires a transformation of the practice of management. Knowledge-creating companies will require distributed leadership built on a four-level foundation of philosophy, attitudes and beliefs, skills and capabilities, and tools (artifacts).

We are in the midst of a worldwide, fundamental shift in management philosophy and practice. The traditional resource-based organization of the past is rapidly giving way to the emerging knowledge-based organization. The questions we face as managers revolve around the major dimensions of this transition as it unfolds in different parts of the business community. More important, individual companies face important choices: Will they lead or follow in creating the changes that lie ahead?

The rise of Japan as a preeminent industrial power illustrates some of the basic aspects of this shift. Japan's success in the past twenty or thirty years is unique in the history of the industrial era, because Japan is the first country with no natural resources—or no controlled access to resources—that has risen to preeminence. The British empire, for example, had controlled access to natural resources; America's rise to preeminence was fueled by an extraordinary endowment of natural resources. But the Japanese have neither. What they do have are two key characteristics of the emerging organization: an intense appreciation of interrelationships and extraordinary capacities to manage knowledge.

A New Management Paradigm

In "The Coming of the New Organization," Peter Drucker (1988) observes: "There have been two major evolutions in the concept and structure of organizations. The first took place in the ten years between 1895 and 1905. It distinguished management from ownership and established management

as work and task in its own right. The second evolutionary change, which marked the development of the modern corporation, began twenty years later with Pierre S. du Pont's restructuring of his family company and continued with Alfred P. Sloan's redesign of General Motors a few years later. This introduced the command and control organization of today" (p. 53). Drucker goes on to assert that we are entering a "third period of change. The shift from the command-and-control organization, the organization of departments and divisions, to the information-based organization, the organization of knowledge specialists" (p. 53).

Dr. Edwards Deming articulates what is at the heart of this shift in another way: "Our prevailing system of management has destroyed our people. People are born with intrinsic motivation, self-esteem, curiosity to learn, joy in learning. The destruction starts with toddlers, a prize for the best Halloween costume, gold stars, grades in school, and on up through the University. On the job, people, teams, divisions are ranked, reward for the one at the top, punishment for the one at the bottom. Management by objectives, incentive pays, bonus plans, put together separately cause further loss unknown and unknowable" (cited in Senge, 1990c, p. 7). In a forthcoming book Deming argues that the "profound knowledge" needed to transform management has four cornerstones: understanding of a system, theory of variation, theory of knowledge, and psychology.

Deming is deeply frustrated with the inability of American management to grasp the deeper messages of the worldwide quality movement. Despite serious efforts in many companies in the past decade, by and large we are back where the Japanese were in the 1950s and 1960s, focusing on using statistical process improvement to understand, measure, and improve physical processes. But we are missing the deeper levels of total quality management, what quality pioneer Ishikawa once called "the thought revolution in management."

Standard applications of statistics, according to Deming, are "2 percent of the work." The deeper transformation starts with distinguishing intrinsic from extrinsic motivation and developing an organization where everyone, from top to bottom, is a learner. Speaking on a visit to England several years ago, Konosuke Matsushita (cited in Galgano, 1989) commented, "For you, the essence of management lies in extracting ideas from the minds of executives and putting them into the hands of the workers. For us, the essence of management lies precisely in the art of mobilizing the intellectual resources of everyone working for the company. We know that the intelligence of a group of executives, impressive as this might be, is no longer enough to guarantee success."

While American companies have been playing catch-up, total quality management in Japan has evolved dramatically over the past fifteen years. What started with statistical process control and continuous improvement of physical processes has moved toward recasting the work of management. As the Japanese understand, the work of management is the work of ideas.

The "seven new tools for management" (Mizuno, 1988), the focus in Japan through the 1980s, represent a second wave in the methodology of quality management, distinct from the seven traditional tools for quality.[1] The foundation for these tools lies in linguistics and anthropology. The focus of these tools is on how to help managers have more rigorous and productive conversations about complex issues.

Today, a new overarching vision seems to be emerging in Japan. It centers around the "knowledge-creating company," an organization whose ability to continually improve its processes and systems comes from continually enhancing its underlying knowledge base. "In an economy where the only certainty is uncertainty," writes Hitotsubashi University Professor Ikujiro Nonaka (1991), "the one sure source of lasting competitive advantage is knowledge."

Nonaka's words echo a view that I first heard many years ago from former Shell planning chief Arie deGeus: In today's business world, "the root source of all competitive advantage is a company's relative ability to learn" (see deGeus, 1988). As a guiding member for many years of our research program at the Massachusetts Institute of Technology, deGeus had a pivotal effect on our efforts toward organizational learning. In the past few years, we have focused on understanding the basic characteristics and capabilities of "the learning organization" (for example, see Stata, 1989; Senge, 1990b). The picture that has emerged corresponds closely to Nonaka's description of the "knowledge-creating company."

The Knowledge-Creating Company

"Despite all the talk about 'brain power' and 'intellectual capital'," writes Nonaka (1991), "few managers grasp the true nature of the knowledge-creating company—let alone know how to manage it. The reason: they misunderstand what knowledge is, and what companies must do to exploit it" (p. 312).

As Nonaka suggests, understanding the knowledge-creating company starts with rethinking the meaning of knowledge and learning. For most people, learning means taking in information. We may say, "I learned all about accounting yesterday; I took that seminar." But what do we mean? That we took in certain information and can now play it back with some accuracy? But no one learns how to ride a bike that way, or how to walk or talk. We learn by experimenting. Real learning is about enhancing our capacity, being able to do something we were not able to do before. It is inseparable from action. Similarly, knowledge is the "capacity for effective action." In this sense, knowledge is never merely an intellectual construct. It is more know-how than "know-that." We know how to ride a bicycle, how to walk, how to communicate in a different way than we know a set of facts that we read in a book.

This view of learning and knowledge as inseparable from action is rooted

in philosophical pragmatism, as is much of Japanese management philosophy. This view is evident in the famous plan-do-check-act cycle in quality management, which the Japanese originally called "the Deming cycle." Deming learned it from his mentor at Bell Labs, Walter Shewhart, who in turn derived it from the ideas of the famous American educator and pragmatist John Dewey. Dewey believed that all learning is a continual process of discovering new insights about the world, inventing possibilities for action, producing those actions, and then reflecting on the outcomes in order to develop new discoveries.

Nonaka goes on to argue that most of an organization's knowledge is tacit, carried in the heads of its members. "The centerpiece of the Japanese approach is the recognition that creating new knowledge is not simply a matter of 'processing' objective information," according to Nonaka. "Rather it depends on tapping the tacit, and often highly subjective insights, intuitions and hunches, of individual employees. And making those insights available for testing and use by the company as a whole" (p. 313).

Nonaka observes that building on the tacit knowledge base is a radical notion in the West, because of our predominant mental model of organizations. "Deeply ingrained in the traditions of Western management, from Frederick Taylor to Herbert Simon, is a view of the organization as a machine for 'information processing,' " says Nonaka. "According to this view, the only useful knowledge is formal and systematic—hard data, codified procedures, universal principles" (p. 96). To begin to understand the knowledge-creating company, we must consider an alternative view of the nature of the organization. "The more holistic approach to knowledge at many Japanese companies," Nonaka claims, "is founded on [a] fundamental insight. A company is not a machine but a living organism. Much like an individual, it can have a collective sense of identity and fundamental purpose. This is the organizational equivalent of self knowledge—a shared understanding of what the company stands for, where it's going, what kind of world it wants to live in, and, most importantly, how it intends to make that world a reality" (p. 97).

Table 1 illustrates the basic characteristics of the knowledge-creating, or learning, organization by contrasting five basic tasks common to all organizations: direction setting, thinking and acting, the nature of thinking, conflict resolution, and the role of leadership. In making this contrast, I have labeled the traditional organizational model, from which we are evolving, the *resource-based organization*. This term is borrowed from Drucker, who sees the traditional organization as defined by its ability to command, process, and ultimately "add value" to resources. It is a resource-processing machine, which takes in resources from its environment (raw material resources, financial resources, productive capital resources, human resources) and uses them to produce a new resource, a "product/service" that it puts back into its environment.

The knowledge-creating company also uses resources, but its defining characteristic is the knowledge it creates. The knowledge-creating process is fundamental to the company's relationship with all its stakeholders. It is embodied in the products and services provided to customers. It drives the continual reduction in material resources used and harmful by-products created, which are of primary concern for the communities in which the company operates. And it links the company's fortunes intrinsically to the imagination, commitment, and efforts of all its members; rather than being mere "human resources," they are the source and carriers of the company's knowledge.

Direction Setting. According to Nonaka (1991), the key to continually bringing tacit knowledge to the surface and testing it "is personal commitment, the employee's sense of identity with the enterprise and with its mission" (p. 97). Building this personal commitment starts with direction setting.

The crucial distinction between traditional and knowledge-creating organizations in this regard is the number of people at different levels who participate in direction setting. In the traditional organization, direction is

Table 1. The Shift Toward the "Knowledge-Based" Organization

Task	Resource-Based Organization	Knowledge-Based Organization
Direction setting	Vision from top	Shared vision can emerge from many places; top responsible for existence of vision
Thinking and acting	Top thinks; local acts	Thinking and acting integrated at *all* levels
Nature of thinking	Atomistic thinking	Systemic thinking
Conflict resolution	Political mediation of conflict	Dialogue and integration of diverse views (building shared mental models)
Role of leadership	Set vision	Build shared vision
	Motivate people toward attainment of vision through rewards and recognition ("carrots" and "sticks")	Empower people and inspire commitment
	Make key decisions and create structures to control local actions	Enable good decisions to be made throughout organization through design of learning

set at the top. Whether it be called "strategic objectives" or vision, it is the central task of top management. Moreover, top management is widely expected to set objectives that are clear and measurable, so performance against those objectives can be assessed.

By contrast, in the knowledge-creating organization new business visions can emerge from all levels of the organization. The responsibility of top management is to manage the process of molding emerging visions into shared visions, which involves communication, assessment, and an ongoing process of building on the ideas of one another.

Canon, for example, decided to enter the photocopier industry because of the initiative of its overseas sales subsidiary. When Canon was still in photography only, salespeople began reporting back to headquarters about possible strategic advantages over industry giant Xerox. They felt Canon was better able to standardize production and to produce reliable, easy-to-service products. They argued that Canon had technical know-how, particularly at the lower price levels, that Xerox could not duplicate. Canon's successful penetration of the copier market, especially in minicopiers, not only revolutionized the business but eventually shook Xerox from its lethargy and stimulated companywide commitment to revitalization and quality management (Hamel and Prahalad, 1989).

When new visions do emerge at the top, they must not be too rigidly or precisely spelled out, lest the extent to which others in the organization must participate in fleshing them out becomes limited. In 1987, Honda's top management—in stark contrast to the classic "management objective from on high"—initiated a new-concept car with the slogan "Let's gamble." According to Nonaka (1991), "the phrase expressed senior management's conviction that Honda's Civic and Accord models were becoming too familiar" (p. 100). Nonaka emphasizes the important role of symbols and metaphors, "figurative language," in the visions communicated by top management. They provide a sense of direction but require explication in order to be translated into operational plans and decisions.

Overall, official messages from senior management need the right balance of excitement and ambiguity: "It is important to emphasize that a company's vision needs also to be open-ended, susceptible to a variety of different and even conflicting interpretations. At first glance this may seem contradictory. After all, shouldn't a company's vision be unambiguous, coherent and clear? If a vision is too unambiguous, it becomes more akin to an order or instruction. And orders do not foster high degrees of personal commitment. . . . A more equivocal vision gives employees in work groups the freedom and autonomy to set their own goals" (Nonaka, 1991, p. 104).

None of this implies a lesser role for senior management in direction setting. If anything, the skills and insight needed to manage the organizationwide "visioning" process are more demanding than those needed simply to issue "official visions" from the top. There is still plenty of room for creative input and energy from the top. But senior managers must be able

to listen and interrelate ideas from elsewhere and to manage the process of resolving conflicting and contradictory ideas. Ultimately, senior management is responsible for making sure that shared visions exist. For without the commitment and excitement generated by genuine vision, little significant learning will occur.

Thinking and Acting. The key to success in the traditional resource-based organization is to have a few great thinkers at the top and to design effective control systems to translate management insights and directives into coordinated organizational actions. The top thinks, and the local acts.

But authoritarian systems of management and governance are breaking down today in the face of increasing interdependence and accelerating change. It is simply no longer possible to figure it all out from the top. Rigidly centralized control systems, whether in corporations or governments, are giving way to broader distribution of power and authority.

I have borrowed the phrase "integrates thinking and acting at all levels" from Professor Shoji Shiba of Tsukuba University, architect of the Center for Quality Management, a pioneering Japanese-style learning collaborative among a group of high-tech companies in New England. Professor Shiba sees the increasing integration of thinking and acting as a constant theme over the forty-year evolution of quality management.

Quality management became an organizational revolution when statistical process control and related tools were put in the hands of production workers and quality inspectors were fired. Deming's famous phrase (1982), "Put everybody in the company to work to accomplish the transformation," captured the spirit of treating all organizational members as partners in understanding and improving how the organization works. It started the move toward integration of thinking and doing.

Subsequent developments in total quality management (TQM) have carried the idea further. In the first wave of the quality revolution in the 1950s and 1960s, the focus was on solving well-defined problems. "[TQM] started from the defects of the production line," says Shiba. "The defects were known a priori and there was a standard against which they could be measured. The disparity from the standard was the problem" (Senge, 1989). Even in this first phase, there was "weaving back and forth between the level of thought and experience." Quantitative data (experience) was needed for diagnosis of the problem at hand, which led to determining a solution (thought), implementation and measurement (experience), and evaluation and standardization (thought). This first phase involved the traditional "seven quality tools" based on statistics. The focus was on problem solving in tangible physical processes, like assembly and material procurement.

"Quality management has evolved beyond problem solving to embrace the subtler tasks of defining problems and satisfying 'latent requirements' of the customer," Shiba says (Senge, 1989). This required newer methodologies to cover the tasks whereby groups move from a broad exploration to eventually select a theme for improvement. "To understand something, we

need logic," says Shiba. "But before that logic, there is intuition. Intuition gives the human being a feel for something about the problem." Intuitive exploration (thought) leads to collection of qualitative data like anecdotes, observations, and judgments (experience), which leads to formulation of hypotheses about the nature of the situation (thought). Tools like the KJ method, based on the work of anthropologist Jiro Kawakita, are used for clarifying and formulating unstructured problems (Mizuno, 1988). This method (also known as the affinity diagram) is often taught as the first of the "seven management tools" for TQM. Assessment of alternative hypotheses (thought) eventually leads to selection of a theme for analysis, quantitative data gathering, and improvement—the problem-solving process described above. The circle from exploration to standardization and back keeps the organization in a constant state of renewal through integrating thought and action.

Nature of Thinking. The newer TQM tools illustrate the emergence of more rigorous approaches to helping groups in organizations think together more productively. But the changes required in the knowledge-creating company go further—to the very nature of our predominant patterns of thinking.

In the resource-based organization, people throughout the organization have to understand their job and what is expected of them. How their job interrelates with others is not their concern. Implicit in the command and control hierarchy is the notion that someone "up there" figures out how all the pieces fit together.

· What is changing today is the scope of systems thinking skills required. As power and authority are distributed more widely, it becomes increasingly important that people throughout the organization be able to understand how their actions influence others. To do so, local actors need better information systems so they can stay aware of systemwide conditions. They also need new learning tools and processes to improve mental models and develop systems thinking skills. Otherwise, the distribution of power and authority will lead to chaos rather than commitment and creativity.

For example, Hanover Insurance, a midsize property and liability insurer, steadily increased local control of its regional operations throughout the 1980s. This development increased commitment and involvement and created a much greater sense of ownership throughout the company. But it has also increased the risk of fragmented and counterproductive local decisions. Recognizing this, senior management in the claims organization spent a year in 1987 developing a claims management learning laboratory to help local managers better understand how individual decisions interact.

The learning laboratory combined conceptualization, experimentation, and reflection, using the tools for systems thinking developed at the Massachusetts Institute of Technology (MIT).

Using the "management flight simulator" developed from the model, managers discovered how well-accepted practices throughout the industry might be contributing to some of the industry's most pressing problems (runaway costs and escalating premiums). These problems stem from managing what is easily measured—such as numbers of customers served and expenses—and neglecting the more subtle interactions among quality, turnover, the number of experienced adjusters, and overpayment on claims. When managers using the simulator followed practices that were common throughout the industry, they generated escalating settlement costs and declining overall profitability. Interestingly, the simulator did not include the legal system and the external pressures on litigation, which many in the industry blame for cost and profit problems. (For more on the claims management learning laboratory, see Senge and Sterman, 1992.) Today, similar learning laboratories are being developed and implemented in many firms through the MIT Center for Organizational Learning (see below).

Conflict Resolution. In the traditional management system, disputes among differing views are mediated politically. Typically, the "biggest stick" wins. In the corporation of the future, the emphasis must be on integrating diverse views and building shared mental models.

Nonaka (1991) explains: "People don't just passively receive new knowledge, they actively interpret it and fit it to their own situation and perspective" (p. 103). The result is a great range of differing perspectives and mental models. The "confusion created by the inevitable discrepancies in meaning . . . might seem like a problem," says Nonaka. "In fact, it can be a rich source of new knowledge—if a company knows how to manage it" (p. 103). Indeed, the process of tapping the tacit knowledge that people carry in their heads is intrinsically chaotic. "The main job of managers in the knowledge-creating company is to orient this chaos toward purposeful knowledge creation" (p. 103).

The skills Nonaka is describing are embedded in what we have come to call the disciplines of working with mental models and team learning. Nonaka advocates that managers "continuously [challenge] employees to reexamine what they take for granted." But challenging people's thinking can provoke defensiveness. The ability to challenge one another in a way that does not provoke defensiveness depends on behaviors in which few managers are highly skillful.

Most managers in Western corporations have received a lifetime of training in being forceful, articulate advocates. They are highly skilled at presenting and justifying their views. They are problem solvers. But what happens when they are confronted by increasingly complex issues where no one individual knows the answer, where the only option is for groups of informed and committed individuals to work together to arrive at new insights and courses of action? They usually fall prey to what Harvard's Chris Argyris calls "defensive routines," accepted organizational patterns for avoiding the risk and potential embarrassment of exposing one's own and others' ignorance.

"The common assumption is that getting people to learn is largely a matter of motivation," says Argyris (1991). But learning about complex and conflictual issues is more often blocked by deep patterns of "defensive reasoning [that] can block learning even when the individual commitment to it is high, just as a computer program with hidden bugs can produce results exactly the opposite of what its designers had planned." Ironically, Argyris argues, the problems are more acute in highly successful professionals who have rarely experienced failure, who often have the greatest stake in not failing, and who "have never learned how to learn from failure" (p. 104).

Although much lip service is paid to collaborative learning and integrating diverse viewpoints in contemporary decision making, there has been little real progress away from the traditional political mediation of conflict. We may hear one another out (often, even this does not happen), and then the person with the political power usually decides.

Significant progress requires developing individual and collective abilities to balance inquiry and advocacy in confronting complex issues. In our research, we have tape-recorded three-hour management meetings in which not one question is asked. Obviously there is a lot of advocacy and not much inquiry going on. This pattern will not change until managers develop greater skills for reflecting on their thinking, collectively inquiring into the nature of the problems, and balancing "dialogue" and "discussion" (see "Skills and Capabilities" section later in this article). These skills start with learning how to reflect on one's own mental models and reasoning processes. "What it takes," says Argyris, "is to make the ways managers and employees reason about their behaviors a focus of organizational learning. Teaching people how to reason about their behavior in new and more effective ways breaks down the defenses that block learning" (1991, p. 100). The goal must be to build better shared mental models, rather than simply battling to see whose mental model triumphs (see Senge, 1990b, chap. 10).

Building shared mental models is clearly the intention in the companies Nonaka describes, although the processes of getting there may be very different in a Western versus an Eastern culture. For example, "Canon organizes product development teams according to 'the principle of internal competition.' A team is divided into competing groups that develop different approaches to the same project, then argue over the advantages and disadvantages of the proposals. This encourages the team to look at the project from a variety of perspectives." Although Nonaka describes this process as "competition," the outcome is not win-lose: "Under the guidance of a team leader, the team eventually develops a common understanding of the best approach" (1991, p. 102).

Role of Leadership. If this new type of organization is going to occur, our thinking about leadership will have to change profoundly. In the traditional, resource-based organization, leadership and top management are synonymous. In the knowledge-creating company, leadership is a distributed phenomenon. The organization is full of leaders operating at different levels and around different issues. Leadership is defined by the spirit you bring to your work, the quality of your thinking, your ability to influence and be influenced by others, and your capacity for continual learning. Although it is crucial that senior management provide leadership, it is equally important that people throughout the organization also provide leadership appropriate to their organizational setting and work tasks.

An equally profound shift in the roles and tasks of leadership is necessary. In the resource-based organization, leaders set the direction, motivate the troops, and make the key decisions. In the knowledge-creating organization, leaders throughout the organization are stewards, teachers, and designers. They are concerned with building shared vision, inspiring commitment, and accelerating learning (see Senge, 1990c).

In the resource-based organization, leaders set direction. In the knowledge-creating organization, leaders are responsible for the processes of building shared vision. Whether leadership in direction setting is coming from the top or from local leaders, the core responsibility is to participate in ongoing "visioning" and in the continual translation of emerging visions into workable goals and strategies.

Leaders in traditional organizations worry about few issues more than how to motivate people. Leaders attempt to motivate workers through motivational speeches and other shows of charisma and enthusiasm. Motivation is also supposed to be engendered through rewards and recognition, another focus of inordinate managerial time and energy in the West. Yet this entire set of concerns may miss the most important source of real motivation: the motivation that comes from within. Deming asserts that "people are born with intrinsic motivation." This distinction between extrinsic and intrinsic motivation is largely lost in Western management.

For example, continuous improvement is seen in Western corporations as primarily a problem of how to motivate people by setting higher and higher goals. As one factory worker recently said, "It's like, all my career there's been one treadmill—except now, with continuous improvement, each day the treadmill moves a little faster." By contrast, in a management system based more on intrinsic motivation, the issue is not how to motivate people toward improvement, because it is assumed that people are already motivated to improve. It is assumed that people are intrinsically curious and naturally look for ways to do things more effectively. The issue is how to help them, how to empower their efforts to improve through both increased authority and more effective tools, methods, and ways of sharing insights.

In part, our misplaced efforts to motivate people stem from a failure to recognize the difference between motivating and inspiring. The great teacher kindles students' inner motivation by her own passionate commitment to learning. The word *inspire* means "to breathe life into." Leaders inspire commitment by being committed, by breathing their own life into what they care about. It is impossible to get another person to commit to something.

On the other hand, when you are around people who are committed, your own commitment naturally tends to emerge.

Lastly, leadership has to do with design. It includes the work of continually designing better organizational structures, but it goes further to include designing the learning processes whereby people at all levels become better able to make good decisions. Hanover Insurance's claims management learning laboratory is a good example of how senior management can undertake this new leadership work. The design team was led by the vice president of the claims organization and two direct reports. To develop the underlying dynamic models that were eventually used in the laboratory, they met on average once every two weeks for a year and a half. They were assisted by two systems modeling experts. In this work, the team was engaging in significant organizational research: They were developing and testing a theory of the systemic interactions underlying the claims-settling operation. By eventually sharing that theory widely and inviting managers to interact with it and improve it, they contributed to an ongoing knowledge-building process. This knowledge-building process occurred through the learning laboratory itself, which the senior team designed and facilitated. The modeling experts who helped initially (including me) never attended the learning laboratory. It was the managers' work entirely.[2]

Building a Foundation for the New Organization

There are no simple formulas for building organizations that are knowledge-generating. As we are coming to understand, building a foundation for the new organization requires at least four levels of attention: philosophy, attitudes and beliefs, skills and capabilities, and tools and artifacts. Each of these levels reaches beyond the impact of one or two leaders.

Philosophy
    Vision
    Values
    Purpose
    Sense of place
Attitudes and beliefs
    "Don't know": willingness to experiment
    Genuine caring
    Commonality of purpose
    Power of systemic structure (beyond blame)
    Commitment to the truth
    "We can create our future"
Skills and capabilities
    Personal vision
      Building shared commitment

    Surfacing assumptions
    Balancing inquiry and advocacy
    Dialogue
Tools (artifacts)
    System archetypes
    Generic structures
    Management flight simulators
    Action inquiry maps

Philosophy. "Good ideas drive out bad ideas," says recently retired Hanover Insurance CEO William O'Brien. "The problem with most companies is that they have no good ideas. Like a bad ecology, bad ideas like 'the name of the game is climbing the corporate ladder' and 'do whatever it takes to win (personally)' pollute the organizational climate and become self-reinforcing."

Developing a philosophy involves articulating the guiding ideas that undergird the organization. It is the vision, the values, the sense of purpose that we articulate. It is what Nonaka refers to as "fundamental purpose"— what the company stands for and where it is going. It also includes a sense of place. Why is this articulation of vision, values, and purpose appropriate at this time? What is really needed? What is the nature of the world? What is the nature of the market? Where is the fit, the fundamental fit, between our vision and sense of mission and the world within which the company operates?

O'Brien says, "Our traditional organizations are designed to provide for the first three levels of Maslow's hierarchy of human needs—food, shelter, belonging. Since these are now widely available to members of industrial society, our organizations do not provide anything particularly unique to command the loyalty and commitment of the people. The ferment in management will continue until organizations begin to address the higher order needs, self-respect and self-actualization." In this statement, O'Brien places his personal vision in a context of social and personal development going on in the world. The world has changed. The basic needs are met. We now need organizations that start to address higher-order needs.

By philosophy, I mean what the company stands for at an espoused level. The problem with espoused philosophy is that it does not by itself describe how the company actually operates, how people act, and the deeper attitudes and beliefs they hold. What matters is the philosophy that is lived, not the philosophy that is preached. If a company's philosophy is not lived, philosophy statements, no matter how sincere, will ultimately foster cynicism rather than change. Therefore, guiding ideas must eventually be matched by new attitudes and capabilities consistent with the philosophy.

Attitudes and Beliefs. Edgar Schein (1987) suggests that organizational culture is best understood from three distinct perspectives. The most obvious aspects of culture are the most tangible: how people dress, how they talk, what is appropriate and inappropriate behavior, how work spaces are

arranged. A second aspect concerns the stated values and espoused philosophy of an organization. Leaders and organizational change consultants often focus on this level of culture. But there are often enormous gaps between espoused values and the way people really think and act. The deeper aspects of culture, Schein suggests, concern the basic assumptions, beliefs, and attitudes that people in an organization are largely unaware of. In this sense, culture often rests on the assumptions we do not see. Implicit beliefs directed toward senior management—such as "They'll never let us do it" or "Don't get caught doing something different that doesn't work" or "What really matters around here are costs"—never appear on the official corporate "value statement," but they may dictate people's behavior much more than espoused values.

What, then, would be some of the deep beliefs and taken-for-granted assumptions of a truly learning-oriented culture? One would be the basic attitude of the learner, which starts with the willingness to not know and includes the willingness to experiment, to continually test ideas and perceptions. In most Western corporations, not knowing is threatening. What it means to be a manager is to be in control and to know what needs to be done. This attitude is laced throughout our primary institutions, from the family to school and work. The hierarchical nature of these institutions is rooted in the perception of the child that "mommy and daddy know," in the student that "the teacher knows," in the worker that "the boss knows." As we get older, we develop skepticism toward our all-knowing hierarchical leaders, but we still feel trapped in a set of social expectations that prohibit confronting those in control; in turn, those expectations prohibit leaders from acknowledging their own doubts and confusions.

Another basic attitude of a learning organization is genuine caring. The president of a large consumer goods company observed several years ago at the conclusion of a leadership workshop that, to people in an organization, vision and purpose really mean the opportunity to "genuinely care about what they're doing, and about each other." When you come to work to do what you care about, work is more than just "work."

Commonality of purpose is another important attitude. People feel that they are part of something larger than themselves. They feel an allegiance, as Nonaka suggests, to what the organization stands for. Moreover, they feel that they are part of a community of commitment, that others with whom they work share basic values and a commonality of vision: "We are doing something important, something that matters to us and to the world."

Compassion is another key element—not compassion in the purely emotional sense, but a deeper understanding of the power of the systemic structures within which people work and live. Such compassion is a cornerstone of deep assimilation of a systems perspective. By contrast, in most organizations there is the attitude that "if something went wrong, somebody screwed up." This attitude is rooted in a deeply held perception that reality is a series of unrelated events and disconnected actions. The first

breakthrough for managers is the understanding that, more often than not, different people placed in the same systemic structures produce qualitatively similar results. Real compassion is an appreciation of the structures that people are trapped in, an understanding that they are not trying to make things bad, they are simply stuck.

To see continually the underlying structures within which people are stuck, we must be committed to the "truth." We must have a willingness to inquire continually. We must be continually willing to ask difficult questions that do not have obvious answers. These may be questions that threaten us or others, but they are vital to deeper understanding of difficult issues. Such commitment to the truth can never flourish so long as there are counterbeliefs, like "The boss has his mind made up—don't challenge him if you know what's good for you" or "You can't ask those kinds of questions in official meetings."

Ultimately, in a learning-oriented culture there is the belief that we can create our future, that we can shape our destiny. This is the underlying confidence that a few rare teams and organizations develop. It infuses their learning with a unique energy. As a Japanese manager once commented about perceptions of time, "This is really the fundamental distinction—for the westerner time is the enemy, for us it is the ally."

Although such attitudes and beliefs are obviously critical in shaping a learning organization, counterproductive beliefs cannot usually be changed by direct frontal assault. Basic assumptions about people, the world, and our organization are not like light switches that can be turned from one setting to another. They develop over many years, through countless personal experiences. While a conscious guiding philosophy can create an environment conducive to developing new attitudes and beliefs, people's experiences are also shaped by their skills and capabilities. If people are unskilled in seeing the systemic structures that dictate each individual's actions, they will inevitably blame each other when mistakes are made. If they are unable to reflect on their own assumptions without becoming anxious, they will not develop a commitment to continual inquiry. Thus the process of building learning organizations must also focus on developing the necessary individual and collective skills and capabilities.

Skills and Capabilities. What, then, are the basic skills and capabilities that distinguish the new organization, the core competencies of a learning organization?

At the top of any list of basic capabilities should be the capacity to reflect on and articulate personal vision. Shared visions do not come from committees. They come from people clarifying what they care about deeply, considering opportunities, and fusing these two into new possibilities. Most adults have lost their ability to envision what matters to them, a tragic byproduct of growing up, of spending more and more time solving problems that do not matter, of fitting in and conforming to others' expectations. Learning organizations need to create a climate where people start asking

basic questions anew—questions like "What does matter to me?" or "What would I really be excited about working to create?"

Equally important are people's perceptions of reality. The visioning process will break down if people perceive themselves to be in a world of capricious forces outside their control. What good is it to have a vision I want to create if I believe my current reality was created by somebody else? The natural complement to vision is therefore systems thinking, which involves seeing the interrelationships and processes of change and understanding the forces that shape change and one's own part in those forces. Without this ability, people see themselves as victims of forces outside their control and do not see how their own actions contribute to their problems. For example, the insurance managers saw their problem of rising costs as externally generated until they developed a more systemic understanding of how their own practices also contributed. Similar examples abound, in such diverse issues as the arms race, product development, and the collapse of once successful companies. Like the auto executives who blame their problems on unfair foreign competition, on cheap foreign labor, or unmotivated U.S. labor, our propensity to see our problems as caused by forces outside our control is immense, until we begin to understand the systemic causes of those problems (Senge, 1990b).

But systems thinking is not simply a matter of figuring out the systems "out there." It represents a profound reshaping of the world "in here," a restructuring of our mental models. The power of systems thinking thus becomes operative only when coupled with skills in surfacing assumptions and in balancing inquiry and advocacy. The models that ultimately matter are not the computer models or the conceptual models developed as part of a systems-thinking learning process. They are the models we carry in our heads that determine what we actually perceive and how we make decisions.

The basic problem is that most managers in Western corporations are systematically trained to be forceful advocates. They do not have well-developed skills for reflecting on their views, for exposing the reasoning behind those views, and for encouraging others to inquire into that reasoning. As Argyris (1991) says, it is not just a matter of motivation. Developing useful skills in balancing inquiry and advocacy starts with becoming more aware of the assumptions we make and distinguishing our assumptions from the direct experience or data on which those assumptions are based.

Developing such skills requires a lifelong commitment, and those seeking to progress benefit enormously from being part of a community of learners who support and teach one another. Although capabilities for articulating visions, thinking systemically, and balancing inquiry and advocacy may start at a personal level, they become most meaningful when they are practiced collectively. The visions that matter in an organization are those that become widely shared. The systemic understandings that can lead to significant change in organizational structures and policies are those that

As our work progresses, a cornerstone for developing the collective capability for learning is emerging from a very old concept: dialogue.[3] The word dialogue comes from the Greek dialogos. Logos means "meaning" or "word," dia means "through." The original meaning of the word dialogos is "when a group of people talk with one another such that the meaning moves through." By contrast, the word discussion comes from the same root as percussion and concussion. It literally means to heave one's views at the other, in a sort of winner-take-all battle. Competition is inherently built into discussion. Dialogue is something very different. It is about searching for a deeper meaning. The physicist Werner Heisenberg (1972), for example, begins his autobiography with the statement, "Science is rooted in conversation." His entire autobiography is simply a retelling of his conversations with Schrödinger, Pauli, Bohr, and other leading figures of twentieth-century physics. Again and again he shows how his and others' thinking changed profoundly as these conversations unfolded. That is dialogos.

A contemporary theory of dialogos is being articulated by one of the world's leading quantum physicists, David Bohm. Bohm has been working for the last ten years on understanding the nature of thought. As he explains it, "Thought creates the world and then says I didn't do it." Bohm's investigation has led him to revive some very, very old ideas about dialogos. In fact, it appears that the capability for dialogos was firmly grounded in many so-called primitive cultures, such as Native American cultures (Bohm and Edwards, 1991). His research recalls an observation by another theoretical physicist, Albert Einstein: "The world we have created is a product of our ways of thinking. It cannot be changed until we change those patterns of thinking."

Much remains to be done before we completely understand the skills and capabilities of learning organizations. But one thing seems clear: Developing new organizational skills and capabilities may well be the highest-leverage area for creating lasting change. Surely, this is a level of development that has staying power beyond changes in organizational structure and business conditions.

It may also be the most systematically neglected part of American management. Dan Kim, a colleague at Massachusetts Institute of Technology, draws an interesting downward-sloping curve. On the vertical axis is the time spent in learning-related activities—developing and applying new learning skills. On the horizontal axis is level in the management hierarchy. He then asks, "Which end of the horizontal axis is top management versus local management?" Most American audiences respond that, obviously, top management is at the right end of the scale. When new educational programs are introduced in American organizations, workers and supervisors get the full five-day version, middle managers get the two-day version, and top managers get the three-hour "executive summary." Kim argues that "in Japan it is just the opposite. Managers are each expected to spend more time than their subordinates on learning and improvement-related activities

otherwise those activities will have no real credibility in the organization."
It seems that most American managers regard learning as something for somebody else. They did their learning in school; now is the time to perform.

Clearly, a new connection must be forged between continual personal learning and the work of management. One way this can happen is to connect the work of management to the continual development and application of new learning tools—methods that can help in dealing with important practical managerial issues *and* will also lead to the skills and capabilities needed to confront new and different issues in the future.

Tools (Artifacts). Buckminster Fuller used to say that if you want to teach people a new way of thinking, do not bother trying to teach them. Give them a tool, the use of which will lead to that new way of thinking. Such tools he called "artifacts." Fuller's precept can be seen in the profound influence of the first tools on early humans. They significantly altered the human relationship with the environment in ways that are still unfolding. The environment became something we could influence rather than simply accept. Beliefs like "Nature is a resource for humans to use" have their origins in those first tools.

The important tools for the new organization are those that not only help us deal with practical and important issues but also help develop the skills and capabilities of learning organizations. Developing such tools has been and will continue to be a critical focus of research.

Many of the critical tools will involve conceptualizing and understanding the complex, systemic nature of most important contemporary management issues. What organizations most need to learn about today is often the interrelatedness of what might have previously been seen as separate problems. Marketing's difficulties may have more to do with the interactions of marketing promotions with manufacturing capacity than with the marketing promotions themselves. A pricing policy might make a lot of sense unless we consider the longer-term effects on customer expectations and the types of people that are attracted and retained by the organization. Our organizations are in critical need of tools that can help people understand such interactions and forge systemically sound strategies and policies.

One basic tool that is proving helpful is system archetypes, basic patterns of interrelationships that recur in all natural systems. For example, all processes that exhibit growth and stagnation or decline can be understood in terms of the "limits of growth" archetype. These processes include population growth, market growth of a new product, and overall growth of a firm, of employee morale, or of team spirit. Similarly, the "shifting the burden" archetype helps us understand situations where it is all too easy to mask the symptoms of underlying problems and not get at deeper causes. "Escalation" situations are the vicious spirals where any party's actions to improve its situation only increase the threat to other parties and worsen the very conditions it was trying to improve. Examples abound, from arms races to price

A next step in complexity, beyond the basic system archetypes, involves generic management structures. These are also recurring patterns, but they are more specific to particular managerial situations, and they are more complex. A good deal of our ongoing research is focused on these structures. For example, all processes of product development have common underlying features and interdependencies: tasks to be completed, engineers to be hired (or brought into the process), time to be allocated, and coordination to be achieved between developing the product and developing the means to produce the product. Similarly, once a product is released, all product life cycles have similar underlying features. Both of these generic structures have been the subject of research for the past several years, and now prototype generic "management flight simulators" are being tested within companies that are part of the new Center for Organizational Learning (see below). To date, about six to eight generic structures have been developed and tested. We believe that fifteen to twenty of these prototypes may encompass 50 to 75 percent of the basic settings within which all policy and strategy issues develop. Obviously, if this belief is sound, such generic theories would provide a powerful integrating force for management education and practice.

There are similar tools for developing the other basic skills and competencies of learning organizations; some, such as the KJ method (see Argyris, 1985; Argyris, 1990; Senge, 1990b), are helpful in developing basic skills for surfacing assumptions and fostering inquiry into those assumptions. The KJ method, or affinity diagram, is one of the seven new management tools of total quality. Action-inquiry maps are also very helpful for conceptualizing overall learning patterns and patterns of defensiveness organizationwide.

Getting Started. The first implication of thinking about the process of building learning organizations as a multilevel task is that it will require great effort. There is no simple formula, no five-day seminar on becoming a learning organization. No simple slogan or management mission statement will do. Concern is not enough, no matter how genuine. It will take continual effort. The task is intrinsically open-ended. There is no "there"—no magic end state of being a learning organization. The journey, as they say, is the reward.

Second, although all four levels of attention are important, the wisest strategy is probably a top-down and bottom-up strategy. You cannot change attitudes outright. They change gradually as people come to new understandings and new awarenesses. Skills and capabilities, likewise, develop over time. The initial focus therefore should be both philosophy and tools. In these two areas an impact can be made and momentum developed. It is from those two opposite ends that eventually the change processes can encompass new skills and capabilities as well as new basic attitudes and beliefs.

Just such a top-down and bottom-up strategy characterizes most profound and lasting organizational change processes. Consider the total qual-

movement. Clearly, it encompasses a significant set of core philosophic precepts: commitment to the customer, belief in the intrinsic motivation of human beings to continual learning, and belief in learning as a process that occurs over time through continual experimentation and reflection. But where would the movement have gotten without the practical tools of statistical quality control, process charting, and more recently the new management tools? What has driven the development of quality management is the co-evolution of tools and philosophy. Likewise, it is probably the neglect of philosophical precepts that has most hindered Western companies that are eager to use quality tools to fix problems, without taking to heart the deeper philosophical messages.

Third, there is a difference between innovating and copying. The four levels of effort outlined above provide a framework for thinking and shaping a strategy appropriate for each individual company. But clearly there is no simple set of steps to follow. There are principles to understand, tools to use, skills and attitudes to develop. As Kim says, "If you were going to build a foundation for a new home, you wouldn't borrow your neighbor's foundation. You'd have to build your own."

This brings us to the bottom line. Building such a foundation can only start when there is genuine commitment. It requires real leadership. As O'Brien of Hanover Insurance once commented, "I talk with people all over the country about learning organizations, and the response is always positive. If this type of organization is so widely preferred, why don't people create such organizations? I think the answer is leadership. People have no real comprehension of the type of commitment it requires to build such an organization. To change a corporate culture, leaders must be willing to change themselves."

Who will make this commitment? The people who truly care. When all is said and done, the hard work, the struggle, and the uncertainty will only be undertaken by people who truly care about making this new type of organization a reality. A consultant at Hewlett-Packard recently told me she once asked co-founder David Packard about his theory of leadership. After a long pause, he said, "Well, I really don't think I have a theory of leadership. Bill [Hewlett] and I were just always doing what we loved, and we're just so glad that people wanted to join us."

That is the theory of leadership that will be required. Building learning organizations will be either a labor of love or nothing at all.

Collaborating in Advancing the State of the Art

"Among engineers and scientists there is a consensus that collaborative university-industry research promotes innovation and competitiveness," says Analog Devices CEO Ray Stata. "If we broaden the concepts of innovation and technology to embrace management," he adds, "then the need for collaborative research in management is no less than it is in engineering.

Stata outlines six dimensions of the type of industry-university collaborative he envisions:

Focus on critical management problems, as identified by industrialists and academics working together

Develop and disseminate new learning tools and methods

Test tools and methods in practice

Provide cross-organizational learning through the opportunity to share experiences and to work together in developing concepts into tested innovations

Use a cross-disciplinary approach to get at the intrinsically complex, ill-defined problems that thwart learning in contemporary management

Provide cooperative education opportunities for students.

Over the past year, a new Center for Organizational Learning has been developing at the Massachusetts Institute of Technology. Not surprisingly, Stata's ideas have had a significant impact on the goals and design of the center, since he is a founding member of a CEO leadership project that we began eight years ago. The center probably will continue in a start-up mode for the next two to three years, as a group of companies and researchers learn how to be true partners in advancing knowledge and methods to deepen organizational learning.[1] But a rough outline of the format and purpose of the endeavor is emerging.

Purpose and Underlying Disciplines. The purpose of the center is to advance the state of the art in building learning organizations. The center's specific goals are

To develop and test new tools and methods for accelerating and deepening organizational learning

To build new knowledge of the individual and collective skills and capabilities required in learning organizations and of how those capabilities might be better developed

To advance theoretical understanding of the nature of organizational learning and the individual, group, and institutional barriers to learning.

One cornerstone of the center's work is helping organizations learn about complex, dynamic issues. It builds on thirty-five years of working to develop managerial tools and methods for understanding complex human systems. The system dynamics approach, first developed by Jay Forrester, represents a potential breakthrough for both management education and practice. It offers general tools for conceptualizing and analyzing complex policy and strategy issues, for developing general theory, and for illuminating the counterproductiveness of many management policies and practices. The method has been applied successfully to a wide range of corporate, economic, environmental, and biological systems. Moreover, software and

hardware developments in recent years have made system dynamics computer-modeling tools useful for managers and educators who are not versed in computer simulation.

But systems thinking is only one of the disciplinary cornerstones for the center's work. Equally important are the disciplines of working with mental models, fostering dialogue and collaborative inquiry, and managing organizational change.

The center will be a place to explore and develop additional disciplines relevant to deepening and accelerating organizational learning. These include new developments in total quality management and the design of performance measures and management information systems that are conducive to learning. The latter work is taking shape in potentially ground-breaking work by Fred Kofman. "Our present accounting systems," he says, "are like coaching a team by looking at the points on the scoreboard rather than the action on the field" (1992, p. 1). Kofman's new vision, double-loop accounting, embeds the process of measuring performance and responding to performance shortfalls within the larger process of reflecting on present mental models, developing more systemic understandings, and designing performance measures and information systems that focus managerial attention where it can have the greatest leverage.

New Research Paradigm. Bringing these multiple disciplines to bear on significant organizational issues will require a new synthesis of research paradigms. Management research in the West has come under increasing fire from the business community for its impracticality and distance from the pressing needs for organizational change and industrial revitalization. But researchers are also concerned about staying true to their core mission of advancing knowledge about universal management issues and making that knowledge publicly available, through both publications and the educational process. They fear that if academic research becomes involved in solving only particular business problems, insights will be relevant only to those particular settings and will not contribute to general knowledge.

Edgar Schein, who is chairman of the board of governors of the Center for Organizational Learning, has suggested that research must be organized around three previously disparate and even competing research paradigms:

Normal science (developing and testing models of generic organizational processes and decision making). One goal of the research is to continually expand the "library" of generic systemic structures and to make these theories more widely available. The library presently includes generic models of product development, product life cycles, service quality management, balance of market growth and capacity investment, and cycle time in complex supply chains. Better theories of these generic processes would accelerate the development of useful learning tools for specific organizational settings. They would also enrich management education by giving students a foundation for understanding diverse policy and strategy issues.

A second, related goal is to better understand the recurring difficulties of human decision makers in managing complex organizational systems and processes. Individually, we have limited cognitive information-processing capabilities. As a result, we often focus arbitrarily on a few salient variables and ignore other more important interdependencies. Collectively, we often make matters worse by becoming locked in a defense of our individual views rather than building from individual views to more comprehensive shared mental models. The methods used here involve experimental analysis of individual and group decision making (Sterman, 1989).

Clinical, or action, research (developing and studying the effectiveness of particular learning processes). This research will involve working with organizational teams to develop and implement learning processes that address particular organizational issues. The goals will be to help managers develop practical tools tested in realistic organizational settings and to generate deeper insights into the dilemmas and possibilities for organizational learning by trying to help produce improved learning.

Ethnographic and participant observer research (studies of the nature of learning, within groups and larger organizations). What is really going on when organizations learn? When management teams achieve breakthrough insights, do new insights lead to new policies and behaviors? Why or why not? Can interveners involved in helping management teams become co-opted into their own defensive, antilearning patterns? Do learnings achieved in one setting spread to other parts of the organization? Why or why not?

These are just a few of the background questions that a serious study of organizational learning must encompass. By having researchers who observe but do not participate extensively in designing and carrying out organizational interventions, we hope to shed light on such universal issues.

Each of the above approaches has its own history and proponents. Each has distinctive strengths and weaknesses.

Normal science research is by far the most common in today's business and management schools. It usually involves collecting large bodies of data to test theories. Sometimes it involves conducting laboratory-type experiments. It does not involve intervention in actual organizations.

Critics of normal science argue that the types of data one gets from a distance can be biased in subtle ways that scientists do not appreciate. People in an organization have little incentive to let the normal scientists know what is really going on. Aggregate data collected from a distance rarely reveal the inner conflicts and pressures that shape real decisions.

In response, advocates of clinical, or action, research believe that people in an organization will be willing to describe what is really going on if they can thereby help researchers solve important problems. This working from the inside out gives the clinical researcher an opportunity not only to gather more valid data but also to test new tools and methods for helping people

confront real issues.

Critics of clinical, or action, research question its objectivity and generalizability. Action researchers can become so closely aligned with their organizational compatriots that they become immersed in the insiders' views and lose their ability to critique and contrast those views with others. Moreover, what is learned becomes so unique to a particular organizational setting that it does not lead to insights that can be transferred to other settings.

In response, ethnographers and participant observers attempt to work from the inside but escape the biases of aligning so closely with organization members that they lose their objectivity. Unfortunately, as the clinical researchers point out, if they are not offering help, ethnographers may suffer the same plight as the normal scientists—not learning what is really going on within the organization because the organization's members have no incentive to help them.

The center's tripartite research strategy is analogous to the engineering concept of triangulation: By looking at something from multiple points of view, we might gain a richer and ultimately more useful way of understanding. It is our hope that by combining all three research paradigms, we will be able to advance general knowledge and practical tools beyond what would be possible by following only one research paradigm.

Putting the Approach into Practice: Defining Initial Pilot Projects. In 1992 we launched the first pilot projects. They concentrate on three broad areas where there are important general management issues and the opportunity to have an impact on meaningful problems within member companies. In each of these areas there has been past research into underlying generic structures upon which current work can build:

Product development: improving cost, quality, and timeliness of new-product development efforts

Services management: improving quality, customer loyalty, and employee morale, and reducing total costs in service operations, and developing a service orientation within both traditional manufacturing and traditional service companies

Cycle time in complex supply chains: understanding and reducing total cycle time, from customer orders and materials procurement to delivery and payment.

In confronting these issues, the first step has been to develop a process for defining projects. Our goal is to have projects that can both realize important managerial goals and achieve important research objectives. The idea is easy to espouse, but bringing it to fruition is no mean feat. We spent the better part of six months developing and testing a project-definition process with our first pilot projects. The primary architects of the process

have been Chris Argyris and William Isaacs. After two cycles, it seems to be having a significant impact on the clarity of project goals and plans and the commitment of both researchers and practitioners.

The following example may help illustrate how this approach operates: The alpha team is a new-product development team from XYZ manufacturing. They have responsibility for a new generation of one of the company's core product lines, which faces significant domestic and international competition. They are under considerable pressure to shorten their development time, lower costs, and improve quality. They are willing to work collaboratively with other product development teams from other companies at the center. They hope their efforts will have benefits for other product development groups at XYZ, but they will be judged by their own success with the new product.

The alpha team started defining its project by forming a project team made up of the program manager for alpha, the head of product development for alpha, several other members of the alpha team, and several internal XYZ consultants, whose main job would be to help transfer what the alpha team learns to other groups at XYZ. An initial round of interviews elicited basic issues in product development, as perceived by alpha team members. Open-ended questions were asked, like "What do you think is needed to improve product development at XYZ?" and "What is the evidence that leads you to say this? What has been done in the past to improve product development? What has worked? What hasn't? And what is your evidence for these views?" All interviews were tape-recorded. The responses were transcribed, summarized, and circulated to the entire project team.

Then came the critical step, the project definition clinic. This was a day-long meeting involving the project team and the researchers. We reflected together on the interviews and began to explore our own perceptions and objectives in entering into the project. After a few hours, deep issues began to surface that had only been hinted at in the interviews. Harold, the program manager, began to talk about his frustrations with the traditional accounting metrics and with top management's intervention in major projects he had directed in the past. "What's really tough," he said, "is when you get calls at night with 'helpful suggestions' about what the product must do to compete. When you are two and a half years into a major four-year development effort, this is really a problem."

What surfaced was a fundamental bind for program managers at XYZ. In major projects, they are accountable to the COO and the CEO. But they also felt that following all the "helpful advice" they get from the top would be disruptive to their teams and potentially cause worse problems. Their cultural norms make it difficult to challenge such advice. When they do, top managers do not seem to understand their concerns and seem to suspect they are simply unwilling to make an extra effort. It is easy to talk about empowering the program manager, but deeply entrenched management

practices at XYZ often conflict with this simplistic goal.

After another hour or so of conversation, we all agreed that when such an event occurred in the alpha project, the CEO or COO would become part of the team. We would have to get everyone together, examine the intentions and possible consequences of such an intervention together, and, if appropriate, test the suggested changes with our product development flight simulator. Harold agreed to talk with both the COO and CEO about our project and to alert them that we might be seeking their participation down the road.

As this conversation unfolded, we could sense that everyone's commitment was rising. Harold and his team realized that we would be using our project as a window on deeper patterns of counterproductive reasoning and interacting in XYZ. The researchers on the team realized a bit of the depth and complexity of the issues we would be facing.

When the session ended, Harold and the team asked, "How much of our time will this require?" We then developed a work plan, which will likely run for two to three years. It was based on seeing the project as a central element of management's responsibilities and time commitments. We agreed on the project's overall objectives: to improve cost, quality, and timeliness of the alpha team's product; to develop transferable tools and processes for similar improvement in other product development efforts at XYZ and other companies; and to enrich learning capabilities at XYZ.

Building Partnerships. "No significant management innovation could ever be achieved by one company working in isolation," says Tsukuba University's Professor Shiba. "The complexity of the issues is vast. The range of experiments you need to run is tremendous. The discipline required to run those experiments and study them rigorously is much beyond even the largest corporation." Despite the compelling logic of this statement, in the United States we still operate by the dictum "Every man, woman, and corporation for themselves" in trying to develop and implement new management practice.

The partnerships we seek to foster will take several years to develop. As they develop, we believe the Center for Organizational Learning can become a model for collaboration in accelerating management innovation.

True partnership can develop only as managers within the companies participate in projects and assess their usefulness. Likewise, we need to understand the organizations and the business issues with which they are dealing. Eventually we will move beyond pilot projects, and the companies will develop internal capabilities to undertake a variety of projects. As this occurs, the breadth and depth of research opportunities will be enlarged significantly.

systematic diagram, the matrix diagram, matrix data analysis, the process decision program chart (PDPC), and the arrow diagram. The KJ method, for example, deals with nonnumerical or verbal data. It attempts to tap into the right-brain, intuitive abilities in order to crystallize a theme from an unformulated problem area (see Mizuno, 1988).

2. The process of developing the learning laboratory is described in Senge (1990a). The learning laboratory design is described in Kim (1989).

3. This capability is the focus of a major ongoing research project at the Massachusetts Institute of Technology, directed by William Isaacs.

4. These are but a few of the system archetypes. Others include "eroding goals," "tragedy of the commons," and "success to the successful" (Senge, 1990b, app. A).

5. Companies involved in the Center for Organizational Learning at present include Armco Steel, Digital, Du Pont, Federal Express, Ford, General Reinsurance, Harley Davidson, Hanover Insurance, Herman Miller, Intel, J. P. Morgan, Pacific Bell, Phillips U.S., and Polaroid.

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