

# Creating the learning organization

**An interview with Peter M. Senge author of *The Fifth Discipline: The Art & Practice of the Learning Organization*.**

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Many companies find learning difficult; and organizing to learn, more difficult still. But as Peter Senge notes in *The Fifth Discipline*, his provocative account of the key disciplines on which effective practice rests, "Learning disabilities are tragic in children, but they are fatal in organizations. Because of them, few corporations live even half as long as a person—most die before they reach the age of forty." This interview with Senge explores what "learning" really means in a corporate context and describes the tested approaches that managers can follow to build the necessary competence and orientation into their organizations. Shorter interviews—with Ray Stata, CEO of Analog Devices, and Craig Barrett, Executive Vice President of Intel—capture the first-hand experience of two top managers who have applied these learning disciplines in their own companies.

**McKinsey:** How do you define a learning organization?

**Senge:** First, you must realize that the very idea of a "learning organization" is a vision. Many years ago, Alan Kay led the research at Xerox PARC, which eventually led to the personal computer. All that Alan had at that time was a vision for what he called the "Dynabook"—an interactive computer that you could take around, like a book.

As far as realizing Alan's vision of a dynamic, interactive, fully portable technology, the research was a failure, even though it led to critical developments like the user interface that made the personal computer possible. But Alan always viewed his role in leading the team as providing a forcing mechanism for change. In this sense, his research was not a failure at all: it led to an extraordinarily creative outburst and the integration of different people's expertise. And that eventually spawned a totally new industry.

This is how visions work. They articulate a picture of what might be so compellingly that people begin to say, "This is really interesting. What will it take to make this real?" Who knows where the creative process will end up? It's like taking a path into the unknown. You cannot plan the path out in detail, but the more you get an idea of where you are headed, the more likely you are to make progress. This isn't pie-in-the-sky stuff. I believe nothing motivates change more powerfully than a clear vision. In essence, the vision of the "learning organization" is an organization that is continually expanding its capacity to create its future. This is the "Dynabook" driving our work.

**McKinsey:** How do you define learning?

**Senge:** Learning concerns the enhancement of the capacity to create. It starts with the principle we just discussed, although the vision doesn't need to be so grand. It must simply be something that people care about.

Real learning occurs when people are trying to do something that they want to do. Ask yourselves: Why do children learn to walk? Why do they learn to talk? Because they want to. They see an older brother walk across the room and they think, "Hey, this looks like a good deal." It is their intrinsic drive to create something new or do something that they have never done before that leads to learning. It is always related to doing something.

**McKinsey:** Is doing enough?

**Senge:** No. Real learning has two critical dimensions that are embedded in the phrase "expand the capacity to create." Just creating or doing is not enough. Say you strike it rich by winning the lottery. You bought the right card, which led to extraordinary results. But you have not expanded your capacity to win the lottery. You did not learn anything by the sheer action of buying the ticket.

**McKinsey:** How is learning different from knowledge?

**Senge:** It is not. My colleague Fred Kofman at MIT says that "learning is the enhancement of or increase in knowledge, and knowledge is the capacity for effective action in a domain, where effectiveness is assessed by a community of fellow practitioners." There has to be some assessment. Learning or knowledge is different from information. A fundamental misunderstanding that permeates Western society is that learning or knowledge does not need to be related to action. Colloquially, when we use the word "learn," we most often use it to mean "taking in information." We say, "I learned all about financial accounting for executives. I took the course yesterday."

In Japan, they say that you learn when you know it in your body—literally. There you do not say "I know it" because you heard it, but because you know it is in you. This is an important distinction. There isn't knowledge until it is in your body, not just in your head. You may not necessarily understand the principles of gyroscopic motion that make riding possible, but you know it within you when you know how to ride a bicycle.

Therefore, learning or knowledge has a cognitive or intellectual dimension and an action dimension, both of which are intricately intertwined and assessed relative to the needs for action. This view goes back to John Dewey, who said, "All learning is a continual process of discovering insights, inventing new possibilities for action, producing the actions, and observing the consequences leading to insights."

Note the similarity of this statement to the famous "Plan, Do, Check, and Act" cycle of quality management. The Japanese called it the "Deming cycle." Deming got it from W. A. Shewhart (the Bell Laboratories statistician, whose book, *Economic Control of Quality of Manufactured Products*, published in 1931, provided a scientific approach to quality), and Shewhart got it from John Dewey.

**McKinsey:** Why is it that the Japanese not only caught on to the "systemic" approach part of Deming's message, which includes "Plan, Do, Check, and Act," but also the focus on continual improvement of the organization as a whole?

**Senge:** Because they are acutely sensitive to interdependence: of actions, of relationships, and of almost anything. In the industrial age, they are the first country to rise to economic pre-eminence with no natural resources or even controlled access to natural resources. They have nothing, except that they understand interdependence. If you grew up on an island the size of California with 123 million inhabitants, you would also understand interdependence.

I once asked Deming why his message was so well received in Japan, and he said, "You have to realize that they had nothing." They had to rebuild their entire economy. Therefore they were open to new ideas. All that the Americans heard was statistical process control, and even there they said they could get experts to do it. But the Japanese heard the deeper message.

**McKinsey:** Which was?

**Senge:** Interdependence. Today we say that when we sneeze in the United States, Europe catches a cold, but the Japanese knew it long ago. We in the West simply have very little personal appreciation or cultural orientation for thinking about interdependence. We think about things. Look at Japanese art: to most of us in the West, it is a lot of empty space. But to them it is about relationships and a sense of proportions. This is systems thinking.

**McKinsey:** How explicit does systems thinking have to be in an organization for it to be an effective learning organization? Would you really prefer to see people talking to each other in so-called "interdependent feedback loops"?

**Senge:** Basically, yes. But recognize two traps: you could intellectualize about systems thinking but never develop the tools, such as feedback loops, to put the ideas into practice; or you could develop the tools and think the tools suffice.

Drawing a diagram of interdependencies in terms of feedback loops is not systems thinking. It is a diagram. But the diagram can help us get what we are really after: to be able to continually perceive our world and communicate about it in such a way that the interdependencies become apparent. This is a shift from looking at things to seeing interrelationships, a shift from seeing snapshot A and then snapshot B to seeing them both as well as the process connecting them.

**McKinsey:** Is systems thinking endemic among senior executives?

**Senge:** You occasionally come across people who say, "Look, if we did this, this, and this, then this, this, and this will happen." Or, they may say, "I really think this is a critical place for us to focus on or we risk losing market share." These people impress you because no one else thinks that. It is not immediately apparent from where they arrive at their conclusions. But they are thinking about the organization as a whole and are focusing on where they believe the leverage is.

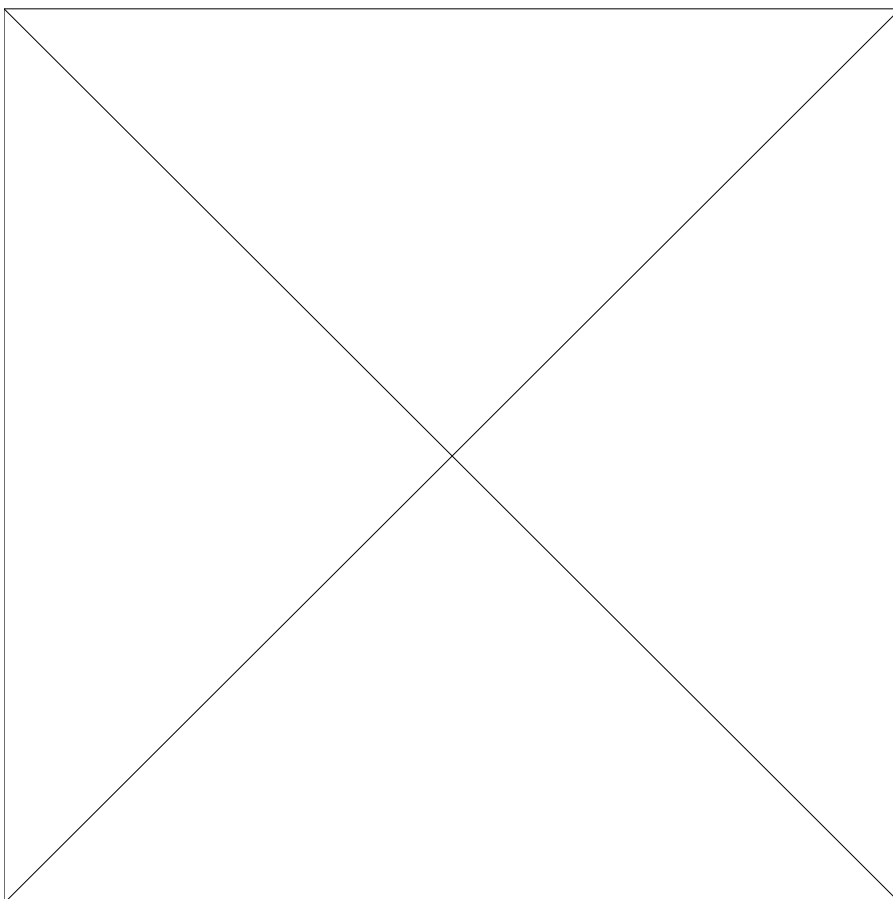
You will find that a disproportionate percentage of very successful CEOs are systems thinkers, not because they can draw causal diagrams—most have never drawn one—but because they have learned to develop a sense of the organization as a whole.

**McKinsey:** Systems thinking seems to suggest two paradoxical and yet complementary sets of skills at work: the ability to see the totality of the Gordian knot and the need to identify the right end to pull. Is this accurate?

**Senge:** Yes, I think it is. Frankly, I have been a little concerned about the phrase "systems thinking." What systems thinking is all about is the ability to see through the complexity to what is really essential. Wisdom may be a better term.

The problem with the phrase "systems thinking" is that it tends to connote fighting complexity with complexity. People seem to misinterpret it to say, "the world is becoming increasingly complicated, everything affects everything else, and therefore we have to draw these big complicated pictures." Unfortunately, they then get caught up in producing the world's most complicated diagrams that don't produce any penetrating insights into what is really going on.

"Systems analysts" had a field day with the US-USSR arms race for years, producing incredibly complex analyses of alternative scenarios, kill rates, and so on. But this contributed nothing to seeing the essential interdependencies: two countries each reacting to the other's perceived advantage in a way that increased the threat and produced still further reaction (*see Exhibit 1*).



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**McKinsey:** Does systems thinking have to start at the top of an organization or can it start from the bottom?

**Senge:** It is best when it does both. Learning is most rapid when a critical mass of senior executives challenge top-level strategic assumptions, while groups at local operating levels simultaneously challenge operational practices and processes. About seven years ago, we brought together a group of CEOs to explore how we could get our ideas about systems thinking out of the university and into practice. We met regularly and we had wonderful conversations about emerging management paradigms, the changing world of leadership, and the challenges and dilemmas faced by top management. These were, I think, very useful for the CEOs' individual learning. But I was dissatisfied by the extent to which the ideas penetrated their organizations.

Then, about four years ago, we decided to do something different. We took our ideas down to the operational level by developing a "learning laboratory" for claims management in a property and liability insurer. We wanted to address a critical set of operational issues to control runaway costs in claims handling. Most managers in the insurance industry will tell you, "It's not our fault that costs are rising." They blame it on the lawyers, a litigious society, or on an outdated tort liability system, all of which may account for the rise in costs in some way but not entirely.

Over a year, we developed a systemic theory which suggests that the problem is enmeshed in deep-rooted practices throughout the insurance industry, which have caused massive underinvestment in service capacity and led to erosion of quality standards. This in turn has led to higher total costs and increasing pressure for financial controls—very similar dynamics to those leading to the demise of many US manufacturing industries.

We tried the learning laboratory at Hanover Insurance. Its CEO, Bill O'Brien, had been involved with systems thinking for almost 10 years. In 1979, he brought in a retired philosophy professor from the University of New Hampshire to develop and teach a course entitled "Thinking about thinking." The course lasts five days and has now been attended by most of the 150 to 200 top managers at Hanover.

The course content had absolutely nothing to do with business. It was a tour of the history of Eastern and Western philosophy that helped participants appreciate systems thinking as an emergent synthesis of different currents of intellectual development. The course was very well received, but it did not really penetrate the operational side of the business. The managers would say, "This is great stuff. We are really into systems thinking out here. Wish I knew how to apply it."

And then it all came together in the claims processing laboratory, where all the claims managers, the local office managers, the regional managers, and the general managers—basically the entire decision-making infrastructure for claims processing—came together to examine the upstream and downstream effects (such as size of adjustment, time to adjust, customer satisfaction) of the decisions made in settling a claim. It all started to connect. They started saying, maybe it is our hiring, maybe the performance standards, maybe the way we organize the offices that is affecting our spiralling costs. They began to see the whole.

The claims management laboratory was what you call a "microworld" approach to problem solving applied to a specific functional arena. But when you take an entire organization and want it to see the whole in cross-functional terms, how do you create an equivalent microworld approach?

It is really not that much harder to develop an organization-wide, cross-functional microworld, as long as you do not try to model the entire system with all its complexities. That is a misnomer. You model a "problem."

Creating the microworld is like drawing a map. A map is not the territory.<sup>1</sup> You can never represent the world with all its infinite complexities on a map. Every map is an abstract of the territory, created for some purpose. But maps are always very simple.

**"Large organizations by and large are not designed to learn across functional lines. Functional hierarchies get in the way"**

The problem with the system dynamics profession for many years has been that its practitioners always want to go for the big cross-functional issues—to understand, say, how a set of policies in marketing and in capacity investment make great sense individually but interact to produce horrible cycles of boom and bust. Just think of the automotive or real estate markets. I can provide you with a laundry list of wonderful, multi-disciplinary models that have had no impact on the real world because their creators miss one key point: large organizations by and large are not designed to learn across functional lines. Functional hierarchies get in the way.

A second project in the insurance industry had to do with the insurance cycle, an intrinsically multifunctional phenomenon involving marketing and underwriting decisions like pricing, capacity, and underwriting standards. But the project did not have much impact. A potentially very useful model of the cycle was developed, which illuminated some important counter-cyclical strategies by which an individual firm could benefit. But the insurance cycle lasts something like 10 years. The long time horizon means right off the bat you have a problem. That period is longer than the decision-making time horizon of almost any manager, save maybe the CEO and, in most organizations, including the CEO.

The lesson here, I think, was that the modeling technology was getting ahead of our understanding of the learning process. Developing the systems model is not the only critical step. One needs also to design a learning process that will enable the key decision makers to benefit from the model's insights. And there must be motivation for that learning process. It is not very effective to force people to learn. The basic managerial task is fostering teams that have a genuine commitment to tackle difficult, long-term cross-functional problems, and to stay with those problems.

**McKinsey:** How does one encourage systems thinking at the lowest level of an organization?

**Senge:** You appeal to people's pure intuitive sense of causal relationships. At local levels people often have good insights about the causes underlying particular problems, especially

when those problems concern matters like service quality and customer loyalty, where they have ample first-hand experience.

**"For systems thinking to really become a part of the entire organization, a fundamental shift in organizational structure or design will be required"**

But when you look at it from their motivational standpoint, it gets murky. Unlike the CEO, who, at least in principle, has a deep motivation to understand the whole, the lower-level person is trapped in an organizational system where he is essentially trying to figure out how to keep out of trouble or how to get up the next step of the career ladder. But you have to have him involved. They are the ones who deal with the customers and really understand their problems as well as the firm's problems. But we do not tap them to do anything about these problems. For systems thinking to really become a part of the entire organization, a fundamental shift in organizational structure or design will be required.

**McKinsey:** What will this new organization look like?

**Senge:** In 1965, Jay Forrester, my mentor at MIT, wrote a paper called "The New Corporate Design,"<sup>2</sup> where he revealed how our corporations do not practice the beliefs that we espouse as fundamental to Western society: worth of the individual; power from the bottom up, not top down; local control; leaders elected by the people. Basic democratic ideals. Then he proposed an organization designed as a network of profit centers. He said there would be three forces that would bring this design to pass: the inevitable distribution of power and authority; computer technology, which would eliminate middle management (this was written in 1965) and the understanding of complex systems, which would make it possible to develop not just one great intuitive systems thinker at the top but many systems thinkers who would manage the enterprise.

Quite independently of Forrester's ideas, Russell Ackoff of Wharton came up with the same idea: break up your organization into a network of profit centers. Ackoff actually went further than Forrester in that he tried to implement it in several companies. What is really fascinating is that the two pre-eminent proponents of systems thinking in management of the last 30 years arrived at the same conclusion independently.

The network of profit centers isn't the same as decentralization. "Localization" is a better term: an organization made up of free-standing units that each have full profit-and-loss responsibilities and some synergy between them—synergy, not in the portfolio sense, but in the sense of shared learning and vision.

Hanover has localized regionally, with each region operating as a free-standing unit with its own internal board of directors. The people on the boards overlap, and this creates shared knowledge. Localization is different from a conglomerate of independent businesses within a holding company.

**McKinsey:** What is the role of these internal boards at Hanover?

**Senge:** To build knowledge by developing a design, creating the mechanisms, and providing the tools for shared learning. The internal boards at Hanover do not function as bosses. They serve as mentor and coach; they do not control the local leaders.

The concept of internal boards is still unfolding at Hanover and at other organizations experimenting with similar structures. There are several very basic problems that need to be addressed. First, there is the matter of the skills and capabilities of board members with respect to dealing with complex, highly conflictual issues. These include both conceptual and analytic skills and interpersonal skills, all of which are needed to confront difficult problems where important decisions need to be made, and yet where those decisions need to be understood and arrived at by groups of people.

If one or two board members simply mandate a decision as soon as a difficult issue arises, then the board concept is lost. But it is equally lost if they simply sit and watch local decision makers take actions which they feel are unwise. Confronting complex issues collaboratively in ways that foster inquiry rather than defensiveness requires sophisticated skills not possessed by many managers. These are precisely the types of skills and capabilities that the Japanese have been working to develop through their "seven new tools for management,"<sup>3</sup> the focus of the quality movement during the past 10 years.

Similarly, local leaders need to develop complementary skills, not only to interact effectively with the internal boards, but also to be more effective in fostering learning within their own organizations. There is also the problem of effective rotation of people among different boards, to allow them to build knowledge of particular business settings without becoming limited in their knowledge and perspective.

This internal board structure is promising, but I think it takes many years to implement effectively. There will be a never-ending battle to overcome the deeply-set instinct to make the decision for the local operating units, just as has always been done in traditional authoritarian organizations.

**McKinsey:** To introduce systems thinking to middle management, do we need to pitch it at a level of detail that is going to be almost individually meaningful to them, or can we somehow have a generic learning exercise?

**Senge:** I do not think anyone really knows the answer to that. Generic exercises such as the "beer game"<sup>4</sup> or the People Express Flight Simulator are very important for cultivating an appreciation for systems principles and helping people begin to see the common features underlying diverse settings. You want to create a "demand pull" system where people in the organization want to learn more. That is what anyone introducing significant change in an organization ought to do.

We are beginning to get a lot of data from efforts to introduce systems thinking in public schools. The kids love it. They are not being taught disconnected facts any more. They are given projects to work on (such as designing a national park that preserves the ecology, offers recreational opportunities, and is economically viable). They then have to gather the facts they



need in order to solve real problems. The nature of the problems is such that they have got to understand the larger systems at work.

**McKinsey:** Understanding the system is a kind of bedrock necessity. But it isn't sufficient. The process really starts to become powerful only when it begins to fundamentally extend human perception and intelligence. How does systems thinking extend perception?

**Senge:** Part of the problem with focusing too specifically on solving existing problems is that you can miss the possibility for rearticulating the entire situation. When we talk about enhancing perception, we are talking about "going upstream" in the conversation. Very often (and this problem tends to be especially chronic at middle management levels) people are working furiously to solve problems that really do not matter very much.

The leverage of systems thinking is to have a group or community arrive at a whole new articulation of the nature of the situation they face, which can lead to totally different "problems" to solve. For example, in the claims management situation we discussed earlier, the original problem to be solved was containing runaway litigation and settlement costs. One of the favored solutions was to hire more lawyers. Gradually, we began to re-perceive the problem as reversing a long-term trend of under- investment, demoralization of front-line service people, and declining customer loyalty. All of this eventually produces escalating costs and financial stress. So we now see the nature of the problem in a very different light.

**"In the creative orientation, the impetus for change comes from within us. In problem solving it comes from outside"**

This also suggests a bit of what I mean by "enhancing intelligence." I do not think problem-solving ability is a very rich definition of intelligence. Creating is different from problem solving. As my colleague Robert Fritz says, the impetus for change in the creative orientation comes from within us. In problem solving it comes from outside. My own view of intelligence leans more toward the capacity to articulate meaningful goals, which are in accordance with our core values and our highest aspirations, and to orient our efforts productively toward those goals.

**McKinsey:** Isn't systems thinking analogous to the advent of computers in our lives? It has made us talk differently, but hasn't yet fundamentally changed the way we think.

**Senge:** Years ago I was struck by something that Jay Forrester said. He had started off in computers and led the team that built the Whirlwind computer to coordinate the US air defense system. It was the first practical, general-purpose digital computer.

After helping build the Whirlwind, Jay left the field completely in 1955. At that time he said something very interesting: "This is a machine with a lot of possibilities, but it will be at least three generations before anyone starts using it for doing something really new. For at least the next three generations, people will use it to do something that they have always done, just faster. It will take at least that long before we start to use it to do something that we have never done before."

**"But I can imagine that 10 years from now, 50 percent of the time we spend in management meetings today will be spent in learning laboratories or microworlds"**

Do not get me wrong here. The computer will never replace the person. But it might fundamentally enhance or augment human perception and intelligence, especially as regards complex human systems. This is why I believe so strongly in the vision of the microworlds. Like Alan Kay's "Dynabook," it will probably be wrong in many ways. But I can imagine that 10 years from now, 50 percent of the time we spend in management meetings today will be spent in learning laboratories or microworlds.

Let's examine what we do in management meetings. We get eight or ten bright people trying to share information and knowledge, test their ideas, construct an integrated or synthesized view that is more insightful than any individual's view, and come up with practical implications that lead to improvements in policy and strategy. That is impossible to do with a group of people sitting around a table, even in an ideal world where a group is relatively free of "defensive routines" and internal politics. This is why the microworld idea is so important.

There is also the matter of generating public knowledge. Even when some deep sharing of understanding is achieved in a team, it occurs at the level of intuitive communication that the group can rarely replicate. This is similar to the brilliantly intuitive CEO whose greatest frustration in life is "Why cannot other people see what I see?" Because he or she cannot conceptualize the interrelationships that seem so clear intuitively, there is no reliable process whereby others can see what he or she sees. There is no public testing, and there is no public knowledge being produced.

**McKinsey:** How important is public knowledge in a corporate setting?

**Senge:** Thomas Jefferson really captured this very well when he said, "A democracy is only as strong as its public education." Which, of course, is one reason why we are in such trouble today in the United States. Despite the trappings of democracy, unless people have the wherewithal to understand the issues such as the causes of the budget and trade deficits that the community faces, they will always be easily manipulated.

In the corporate setting, we will need something analogous to continuously building public education about product development, quality management, and product lifecycles. Without this knowledge, people with power and authority cannot make wise decisions collaboratively. The best you'll ever get is wise decisions made by a person in power, which is why relying on a brilliantly intuitive "great leader" always leads to an authoritarian form of corporate governance. Therefore, microworlds are part of the ongoing evolution toward broader distribution of power and authority.

**McKinsey:** How is the kind of public knowledge you are describing different from organizational memory?

**Senge:** Building public knowledge in organizations is one aspect of organizational memory—probably the most neglected aspect. There are at least two fundamental dimensions of organizational memory: the conceptual and the enactive. The enactive memory is that which is

embedded in routines, policies and procedures, longstanding organizational structures, and, in general, "the way we do things around here." One might think of the entire phenomenon of organizational culture as a complex web of mechanisms that embody past learnings into constraints and guidelines for present actions. It is "enactive" because it directly shapes people's actions.

As long as this is the only form of memory that we have—and I believe that, by and large, this is the case—it will be very difficult to break free of the authoritarian style of management that constrains creativity and innovation. What is lost is the conceptual form of memory that captures the reasons why these procedures, structures, and policies made sense in the first place.

**"It is this continual process of building the knowledge base of an organization that will, I believe, eventually be seen as the central task of management in a learning organization"**

We need public knowledge to enhance our capability to continually reflect on the underlying reasoning, test its merits for the present situation, and evolve new and more appropriate understandings related to new ways of doing things. With a body of public knowledge, the lessons of the past become part of a "living library" that can be continually expanded, refined, and, if need be, thrown out altogether to fit a changing world. It is this continual process of building the knowledge base of an organization that will, I believe, eventually be seen as the central task of management in a learning organization.

**McKinsey:** How much does technology help in the development of the micro-worlds, especially as they relate to middle management, who face immense complexity in all aspects of their jobs, but who lack the motivation to get turned on?

**Senge:** If you take a group of managers above the age of say 30 or 35 and have them walk into a room with computers, the symbolic message you get from them will be totally inconsistent with what you are after: "We are going to model the world by number crunching and by using prediction and forecasting tools and spreadsheets." They do not approach the computer as a tool to help them understand their assumptions or to think through ways to develop a more internally consistent picture of their world, or as a collaborative learning tool.

This will probably change if computers are used sensibly in education. My son had a Macintosh when he was four, before he could read. His attitude toward the computer is different. He already views it as he views a pencil or paintbrush. He would have his easel right next to the computer, and he would play or draw on the computer and then go paint—sometimes the same thing. To him both are equally accessible media for creative expression and inspiration. But our 35-year-old middle manager isn't the same way.

**McKinsey:** How do you push middle managers toward systems thinking in a "learning laboratory"?

**Senge:** This is a crucial issue in designing an effective learning process. A typical introductory learning laboratory program lasts three days. We do not bring in computers on the first day because all we want the people to do at the end of this day is just talk to each other in a

different way. They start drawing some pictures or diagrams to represent problems. The specifics of the pictures are not important, but the underlying thoughts and medium of communication are.

Through the picture a marketing manager draws, he might suggest to his colleague: "You really do not understand my problem because you are there in manufacturing." But then we might ask him to clearly delineate the linkages between marketing and manufacturing. Then everyone begins to argue, "Well does the linkage go this way or that way?" Or they may say, "Yes, that is an important link, but we think the one here is more important." You now have them arguing objectively about this picture they are creating. Because it is a picture of how they see the system working, the conversation shifts from "I am right, you are wrong" to "How does this system really work?" This shift is critical.

The computer now becomes only a tool for improving our system representation. The picture is more important. It is also a record of their current thinking. They could come back to it three months later and say, "The marketing program really backfired. Maybe there is another linkage to which we did not pay attention." They are, over time, building a public representation of the thinking underlying their strategy.

**McKinsey:** Does the technology with which you draw these pictures make a difference?

**Senge:** Very little, if you are just starting off. You could use pencil and paper, flip charts, white boards, almost anything. The natural progression to the computer is very simple. Say you are working on the marketing example I described above. It is a simple drawing, with at the most five variables and two feedback loops. It is a system that they had been intuitively appreciating but never had a language for talking about. But when you begin to add a few more links to it, you end up with 15 variables and six feedback loops. And they look at it, and they say, "We are not sure if we could predict what the consequences are if we intervene here or there. How can we get a little help in thinking through how all these variables interact?"

Well this isn't a simple question any more. They have a real problem now because the human mind is not very good at deducing the consequences of anything with more than three or four variables. The computer can help. But you must be careful not to get the model too complicated too quickly. If you keep adding more variables, soon the human mind cannot understand the computer output either.

**McKinsey:** How do what you call "systems archetypes" or "generic structures" help?

**Senge:** By serving as building blocks. The systems archetypes are the simplest systemic structures that recur again and again. For example, the "limits to growth" archetype is useful for understanding what is happening whenever growth bumps against limits: organizations grow for a while and then stop growing; or products stop growing well before they've saturated their potential market; or individuals grow their personal potential and then plateau.

Like all systemic structures, archetypes of which we are unaware hold us as prisoners. We generally do not see these structures at play, but because they exist we feel compelled to act in a certain way. These structures are not anything like the reporting structure of an organization

or the logical structure of an argument. Rather, they are the key interrelationships that affect behavior over time in particular settings.

Once you recognize that a particular structure exists and manipulates how we think and behave, you realize, for example, that it isn't right to push growth after a certain point. What you need to do is to remove the factors that limit growth. That is the policy insight that comes from the "limits to growth" structure.

"Shifting the burden" is another archetype, which concerns what happens when we are unable or unwilling to focus on fundamental causes of problems and instead opt for "symptomatic fixes," an intervention that just makes the problem symptom go away for a while. Over time, the basic problem—be it falling market share or low morale or individual stress—just comes back, and you need more and more of the symptomatic fix.

These archetypes all differ in how they apply in different circumstances, but they give us a fundamental level for collectively describing the systems in which we operate. They represent the first rung on the ladder of systems thinking. They are deeply intuitive.

At the next rung on the ladder beyond the systems archetypes come the "generic management structures." These are more complicated as they get embodied in particular management settings. Take product development, for example. I think, at its most fundamental level, all product development is the same. How it is applied is different.

An ongoing task in our research concerns identifying the small number—maybe 20 or so—of generic structures that would apply to 80 percent of all management issues. The People Express Flight Simulator, which I mentioned earlier, was developed in 1984, when People Express was doing great. My MIT colleague John Sterman built a model of the airline's growth that showed that People Express would crash. He built the model using public information: articles and Harvard Business School cases. No matter which way he simulated the model, it was a surefire build-up and collapse system. This was two years before the real company crashed. Sterman based his model on the generic "market growth model" that Forrester had developed more than 25 years earlier to understand the failure of so many rapid-growth technology companies. True, he elaborated the generic model and changed the variables, but it was the same basic market growth model. This is a generic structure. Research over the past 10 years has identified similar generic structures underlying project management, service quality and service capacity, and product development and product release.

**McKinsey:** Is systems thinking critical to the survival of organizations?

**Senge:** Yes. And it always has been. It has always been the job of people at the top of an organization to "put the pieces together" and maintain a broad overview of what needs to be done to ensure the success of the enterprise as a whole.

What has changed is that this responsibility is now being spread more and more widely throughout our organizations. It is simply no longer possible to have "one great systems thinker" at the top—a single individual who figures things out and then devises the mechanisms and structures to translate his insights into organizational action. The days when

a Watson or Henry Ford or Alfred P. Sloan "fought for the organization" have long passed. The world is simply too complex to figure it all out from the top, and too rapidly changing to abide with the slow bureaucratic decision-making processes that come with top-down decision making in complex organizations. The breakdown of the authoritarian structure is universal, not only in business but in the world of public affairs as well, as can be seen only too well from the demise of the Eastern bloc governments.

The problem with moving from one or two systems thinkers at the top to an organization-wide capability for systems thinking is that what was previously intuitive must now become more conceptual and explicit. In the authoritarian organization, it was sufficient for one person to know what needs to be done and simply give orders. Making explicit the reasoning behind the orders was unimportant. In an organization of distributed decision making, where large numbers of people are making critical decisions and must develop synergy between those decisions, surfacing assumptions and the reasoning behind decisions becomes vital.

**McKinsey:** Where should a CEO start, Monday morning, to build a learning organization?

**Senge:** I believe these matters always start at home. What I mean by that is that all that we are talking about here will mean very little if it does not connect with the personal vision and core values of an individual. When all is said and done, this is just a lot of good ideas and new techniques until someone becomes truly committed. This, of course, goes right to the heart of leadership. Leaders "inspire" change. To "inspire" literally means to "breathe life into." This is where the CEO must start.

Having said that, it is also important to say that one person's commitment is never enough. It is only the first step. We have seen countless examples where bright, committed, sincere leaders fail to accomplish anything significant in producing fundamental change in their organizations. Therefore, the second step is to find your partners. This is often especially hard for many CEOs, who somehow feel that they must transform their organizations all by themselves.

We have come to the tentative conclusion that the fundamental building block for learning organizations is partnership—the relationships formed by small numbers of people who share commitment and responsibility toward building a new type of organization. Relationships are generative in a way that individual commitment is not. The partnership of a small number of people, who share a deep sense of responsibility, who continually challenge one another's thinking, who continually remain open to further elaboration of the vision, and who continually operate in a mode of genuine inquiry, challenging and pushing one another to deeper understanding, creates an incredibly powerful model for others to see what a learning organization is all about.

I also think people intent on building learning organizations need to be as objective as they can in assessing their own capabilities and identifying their own learning agendas. It is all too easy to look out into the organization and see what the organization needs but to miss the mote in our own eye. This is the role of the learning disciplines that I discuss in the book and that are a centerpiece of our work—approaches to developing the core competencies, if you will, of

individuals and teams in learning organizations. Pursuing these disciplines can be next to impossible on your own; partners are vital.

## **Organizational learning in practice**

Ray Stata, CEO of Analog Devices, Inc., talks to Ron Bohlin

**McKinsey:** How did Analog get interested in organizational learning?

**Stata:** Several years ago Peter Senge and Jay Forrester invited me to join the New Management Style Project at MIT. The challenge was to develop a new model for how successful companies will operate in the future. We had a hypothesis that systems thinking would be at the core of the model and that system dynamics would be an important tool to encourage systems thinking. To test our hypothesis, we explored a broad range of tools, methods, and concepts that are useful in creating a high-performance organization. Over time we came to believe that organizational learning was the concept that would distinguish successful companies in the future.

**McKinsey:** How practical are Senge's ideas in fostering organizational learning?

**Stata:** Peter's ideas, together with those of other great systems thinkers like Forrester and Russell Ackoff, are profoundly important in getting people to think about new ways of managing organizations. You have to start with new ideas and concepts before you can change people's actions and behavior. But even with the insight and inspiration that these ideas give, there's a very great challenge in figuring out how to operationalize them. System dynamics is one approach, but for many organizations this is like going to graduate school when you are still struggling with the basics that you should have learned in grade school.

**McKinsey:** What did you learn from applying system dynamics tools?

**Stata:** We learned that system dynamics was too advanced for our organization, so we backed off. We focused our energy on total quality management (TQM) as a better place to start. We think about TQM as another and a more basic approach to accelerating organizational learning and fostering systems thinking than system dynamics.

The themes of TQM—management by fact, management by process, focus on the vital few, systematic problem solving and continuous improvement, cross-functional management and commitment to shared learning—promote systems thinking and organizational learning. They prepare the groundwork for people to think more deeply about how feedback affects the dynamic performance of complex human systems. But certainly I have been significantly influenced by what Senge, Forrester, Ackoff, and others have said about the nature of human systems and how they operate or don't operate today and how they could operate in the future.

**McKinsey:** How useful or relevant were such tools as "microworlds" and "systems archetypes" to learning at Analog?

**Stata:** We are putting a lot of energy into understanding how to improve the processes by which new products are generated—from the idea stage, through product design and manufacturing and ultimate roll-out—with the goal of dramatically speeding time to market. This requires a redesign of processes and of the shared mental models of how these processes work.

To develop a comprehensive understanding, we need to introduce feedback and dynamic analysis into our new-product development models. In both the open-loop and the closed-loop models, we need an explicit representation of the system, agreement on how to measure performance and ways to continuously improve system performance. So I anticipate that someday TQM and system dynamics principles will merge into microworlds that accelerate our rate of learning.

These models and processes will not be static: they will continuously change as we redesign the processes to make them work better. Today we are still at a very primitive stage, but our organization is now committed to a systems approach in developing a shared mental model of how the new-product generation process works. The same approach is being taken to many other management processes around the company.

**McKinsey:** What are the impediments to "organizational learning"?

**Stata:** There are many impediments to organizational learning, but the most basic is communications. We need to understand the nature of communications and improve our communication skills. Although model building through system dynamics and process analysis enhances mutual understanding of complex systems, TQM tools help teams and groups achieve more precise communications. This is a great step forward.

Learning to work effectively in teams and groups, which is at the heart of organizational learning, is also shaped by our ability to communicate. Only in recent years have I begun to fully understand how profoundly the words which come out of my mouth and my pen affect organizational performance both for better and for worse.

When you think about it, the only thing a manager does that is visible to the organization is to listen and speak, and to draw and interpret symbols. There is a hidden dynamic in conversations because we can change each other by what we say and how we listen. We define issues and problems by what we say, but these issues and problems may not correspond to reality. So model building is one solution to this mess. A more profound understanding of linguistics is another.

**McKinsey:** What does the notion of "organizational learning" or "learning organizations" miss from a practical standpoint?

**Stata:** We are still learning how to translate the concepts into action plans—that is, how to operationalize the concepts. Talking about the concepts doesn't achieve anything. It's like the bicycle example that Peter mentions. You have to learn new skills by practising. Nor does it help to recount success stories if the infrastructure within companies and between companies by which these success stories can be shared is missing.



**McKinsey:** Does "systems thinking" lead to superior financial performance?

**Stata:** It is too early to say based on empirical evidence, since there are very few companies that are truly "systems thinkers." But if you accept that a commitment to TQM is a commitment to become a systems thinking company, which I do, then a recent study by the GAO<sup>5</sup> concluded: "Companies that adopted quality management practices experienced an overall improvement in corporate performance. In nearly all cases, companies that used total quality management practices achieved better employee relations, higher productivity, greater customer satisfaction, increased market share, and improved profitability."

One has to be careful about the conclusions you can draw from this report, but it would be difficult to conclude that TQM didn't help the companies studied in very important ways.

**McKinsey:** Is "systems thinking" critical for the survival of organizations?

**Stata:** I believe the only sustainable competitive advantage, particularly for knowledge-intensive companies, is the rate of organizational learning which is closely linked to systems thinking. The Japanese have proven the power of a new management paradigm, TQM, which, in my view, is fundamentally an approach to accelerate organizational learning. To be competitive in the future, you simply must have a very high performance organization, and the benchmark for high performance is increasing more rapidly now than ever before.

## **Organizational learning in practice**

Dr Craig Barrett, Executive Vice President of Intel Corporation, talks to T. Michael Nevens

**McKinsey:** How appealing are Senge's ideas about the learning organization?

**Barrett:** W. A. Shewhart, the Bell Laboratories statistician, came up with the "Plan, Do, Check, Act" (PDCA) cycle approach to quality management in the 1930s. In my mind, that is continuous learning, whether it be for the individual, the team, or the organization. Many of Senge's ideas about the "learning organization" seem to have their roots in the PDCA cycle. Essentially, he says: "Do not stop where you are today; do not be frozen by past prejudices, actions, or paradigms; look to the future for opportunities." This is a modernized version of Shewhart—perhaps more targeted at dealing with today's problems.

**McKinsey:** How do you foster "continuous learning" at Intel?

**Barrett:** We follow a fairly straightforward path by taking a Shewhart PDCA approach to planning. We do an annual long-range plan. Six months later we update it, just before we do our annual operating plan. As a precursor to both planning events, we carry out the rest of the Shewhart cycle. To check ourselves, we go out and seek benchmarks on performance indicators both within and outside our industry. We bring in industry experts to assess our performance, examine competitors, and develop a database of the most important performance indicators for our business.

This database is fed into our planning cycle to provide us with a measure of where we are and then to determine what the strategic vectors are for the future. These vectors help us develop our strategic objectives and we generate our operating plan off those strategic objectives. We act according to the objectives.

**McKinsey:** Is the planning cycle the main mechanism by which people in key positions learn about the environment?

**Barrett:** The planning cycle seeds changes in the organization. It's clearly not the cycle that helps us respond on issues from day to day, but it is through the cycle that we drive major reorganizations in the company. It is also the mechanism by which we identify major competitive threats and formulate our response, and by which we develop the vision or primary focus of the corporation in terms of the economic and business environment.

**McKinsey:** How much leeway do you have for corrections along the way?

**Barrett:** If your corporate strategic objectives change every six months, you are in deep trouble. We keep them relatively constant. We do leave room to modify them—mostly slightly, but sometimes dramatically—every six months. We have to, given the competitive nature of our industry. In the last several years, we have had very interesting switches in who we consider to be our major competitor: we had TI, then Motorola, then DEC, and today maybe it is the Reduced Instruction Set Computing (RISC), generically.

**McKinsey:** How do you get your entire organization focused on a common set of objectives?

**Barrett:** Our planning system starts with high-level strategic objectives at the corporate level and transitions through to laying out strategies, tactics, and projects at each business unit level. Also, each year we present our strategic objectives to every employee in the company through our quarterly business update meetings. Every month we have several of what we call strategic discussions, where people from various groups meet to discuss specific business unit or functional strategy changes. We also have discussions within each group fairly regularly, both to address strategic issues before the group and to course correct.

**McKinsey:** Senge talks about the importance of systems thinking. How much of your planning discussion fosters systems thinking?

**Barrett:** There is one question we always ask ourselves at these discussions when faced with a new idea or concept: How does it relate to the strategic objectives of the corporation? It may be interesting, it may provide a very exciting opportunity, but if it is a diversion from the strategic direction of the corporation, then why in the world should we pursue it? If it is worth pursuing, then that suggests that our strategic objectives are wrong. So we need to go re-evaluate them either to corral this opportunity into our objectives or to modify the objectives to fit the opportunity—but not without thinking through the relationships among all of them.

We also study the interrelationships between companies within the industry. For example, whenever we get into a discussion about entering the marketplace with a certain piece of equipment, we have to analyze not only how our components fit in, but also how well the rest

of the industry is doing. What happens if we don't enter? Will the competition move in? Will our customers do it by themselves? How do we grow our architectural market share if we do enter? All these questions need to be answered at the total systems level, where the industry is the system encompassing customers, competitors, and their ability to influence whatever is the outcome.

**McKinsey:** How would you contrast learning through planning and learning through your quality process?


**Barrett:** We neither present nor champion our quality effort under the banner of "This is Intel's total quality effort." Our quality effort is designed to bring in those tools, techniques, and concepts that are useful to the corporation to improve our processes, our customer service, and our performance against our set of values. These values are the driving bedrock of learning, not a total quality program or the planning processes. We also view them as tools and techniques that we have found useful in running the organization.

**McKinsey:** Among the core values that Intel holds, which are the most important for driving change, driving learning, and keeping thinking fresh?

**Barrett:** One of our values is risk taking, which is very appropriate in our industry, where new ideas, new concepts and technologies, together with the wherewithal to present views that are off the beaten path, determine success. Complementing risk taking is our value of results orientation, which harkens back to the pragmatic reality that the bottom line is important and that one shouldn't shy from focusing on it. These are probably the two that are most responsible for driving change and learning. Our other values include: disciplined behavior and interaction, customer orientation, continuous improvement, and making Intel a great place to work.

**McKinsey:** How do you develop a "shared vision" with this set of values?

**Barrett:** Let's take this two-by-three-foot, multicolored piece of paper on my wall. It lists our values, our corporate strategy, the things we are interested in, and our objectives for the year. Well, it doesn't sit just on my wall. Thousands of copies of this get sent to all levels of the corporation.

For 1992, we have five objectives. We recently clarified our values some more, but they are still the same six. We identified our key technological capabilities and made sure everyone understood them. That is how we develop a shared vision. 

#### **About the Authors**

**Peter Senge**, a leader in the Organizational Learning Center at MIT and founding partner of Innovation Associates in Framingham, Massachusetts, is author of *The Fifth Discipline: The Art & Practice of The Learning Organization* (Doubleday/ Currency, New York, 1990 and Century Business, London, 1992). He has also been involved in a major ongoing research program applying systems thinking to the major forces shaping economic change and national policy choices. **David Meen**, Director of McKinsey's EuroCenter in Brussels, works with organizations in the consumer goods and services, and transportation industries, where his focus over the past decade has been on major transformational change programs. **Mark Keough**, a Principal in the London office, works primarily with industrial companies on operational issues. He is also leading a McKinsey research effort on systems thinking. **Dr Craig Barrett** is Executive Vice President of Intel Corporation in Santa Clara, California. **Mike Nevens**, a Principal in McKinsey's San Jose office, works mainly with electronics companies around the world. Ron Bohlin is

Vice President—Corporate Marketing and Business Development at Analog Devices, Inc. Until recently he was a Principal in McKinsey's Boston office, where he worked primarily with companies in the electronics industry.

## Notes

<sup>1</sup>The term "microworld" (used synonymously by Senge with "learning laboratory") was coined by educator and computer scientist Seymour Papert, developer of "Logo," the pioneering computer learning system for young children. Papert's microworlds are designed microcosms of reality within which children learn through experimentation with computer-based transitional objects, such as the famous "Logo turtle." Children discover the principles of geometry by learning how to instruct the turtle to trace out squares, rectangles, triangles, and circles. See Seymour Papert, *Mindstorms: Children, Computers, and Powerful Ideas*, Basic Books, New York, 1980. (From *The Fifth Discipline*.)

<sup>2</sup>*Sloan Management Review*, Fall 1965.

<sup>3</sup>The seven tools are simple statistical techniques—Pareto charts, cause-and-effect diagrams, stratification, check sheets, histograms, scatter diagrams, and control charts—which are taught to factory workers (from David A. Garvin, *Managing Quality—The Strategic and Competitive Edge*, Free Press, New York, 1988, page 190).

<sup>4</sup>The "beer game" simulation, first developed in the 1960s at MIT's Sloan School of Management, is a laboratory replica for producing and distributing a single brand of beer. There are three main characters who play the game: a retailer, a wholesaler, and the marketing director of the brewery. The aim of the beer game is to reveal the consequences of decisions that players make in trying to maximize their profits. If players can play repeatedly and understand collaboratively how their decisions interact to affect a larger system that includes the brewery, the wholesaler, and the retailer, the beer game becomes a microworld or learning laboratory (see *The Fifth Discipline*, pp. 27–54).

<sup>5</sup>*Management Practices—US Companies Improve Performance Through Quality Efforts*, General Accounting Office, Washington, D.C., May 1991.