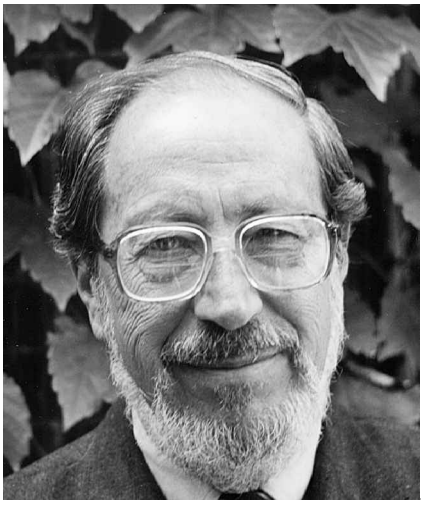
From the Founding Editor

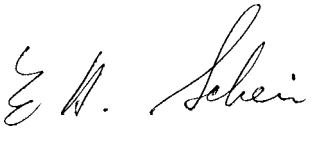
EDITORIAL



Last December, the field of organization development and learning lost one of its founders and great leaders with the death of Richard Beckhard at age 81. Dick was one of my mentors and a close colleague throughout my career. He served on the board of the original MIT Organizational Learning Center, was closely allied to Innovation Associates, and was always a steady influence on many of us who today are trying to evolve the concepts and methods of organizational learning. The ability to design human processes that would make a difference is crucial to learning and change, yet is sadly lacking in some of the most talented change agents operating today. Dick was a master of designing events that produced the kinds of connections needed to make things happen.

Why have we chosen "Connections" as a theme for this issue of *Reflections?* J.-M. Guehenno states it best in *The End of the Nation-State* when he notes that "power no longer consists in knowledge, but in functioning as a link between bodies of knowledge." I want to remind our readers that part of the mission of *Reflections* is to connect academics/researchers, consultants, and practitioner/managers with each other. Contrary to some theories, I do not view knowledge as emanating from the researcher and trickling down through the consultant to the practitioner, though it often appears that way. Each of these constituencies has a body of knowledge and know-how that tends to get entrapped in its own occupational sub-culture. And the difficulty of communicating across these subcultures is enormous because the members of each group "know" they have the truth because it works for them in their environment. Yet it is worth recounting Doug McGregor's answer when he was asked by a manager how he had ever come up with this esoteric Theory X and Theory Y stuff. His answer was that he had observed effective and ineffective managers in the field and noticed that they managed differently. He then described these differences and put a label on them, but the know-how was in the managers, not in the researcher.

To return for a moment to Dick Beckhard and the role of design; he was a genius at knowing whom to bring into a room together and creating a conversation that allowed the participants to connect with each other. One of my not-so-hidden agendas for *Reflections* is to try to do a bit of this in the impersonal publications format. By juxtaposing articles from the different constituencies whenever we can and by stimulating commentary from the different groups, I hope we can let readers discover that members of the other groups have important things to say and contribute. The articles themselves point out how connections were crucial in making some of the changes happen that are described, so I hope that readers will be convinced after reading and browsing that Guehenno is correct in noting that power in the future will lie in connecting.



Ed Schein

EDITORIAL

In This Issue

Edgar H. Schein and Karen Ayas

It is with great pleasure that we start this issue of *Reflections* with one of Dick Beckhard's most important and seminal articles, "The Confrontation Meeting." This 1967 article showed, well before its time, the importance of connecting all the parts of an organization if significant change was to be accomplished. We should all examine this classic closely for both its theoretical insight and its practical applicability. Marvin Weisbord, one of Dick's colleagues, offers comments and practical wisdom as a current leader in the field of "large systems change."

Features

We continue with an original paper by Robert Bauer and Noam Cook showing the social infrastructures that emerge and evolve within work practice. Through what the authors call a "coherence agent," small groups with different areas of expertise succeed in connecting, and they link and leverage their local knowledge to produce significant innovation at a global level. This valuable case shows the details of how complex the process of connecting can be, as our commentator Stephen Buckley points out.

Otto Scharmer's 1996 interview of Ikujiro Nonaka gives us some historical perspective and a more conceptual overview of what the connections process would have to be for knowledge creation and diffusion on an organizational level. This interview is followed by a report of a different kind of connections enterprise, the 1999 SoL Research Greenhouse. Natalia Levina provides an excellent account of this gathering through a lens of knowledge sharing across boundaries. Bringing together a wide range of researchers, consultants, and practitioners around a common theme is a crucial method of generating and disseminating knowledge, as documented by comments from John Carroll and Karen Ayas.

Barbara Lawton next provides us with a first-hand account of an organizational learning project. She shares her experience as a change agent, reflecting on both her failures and successes. Her account illuminates the dynamics of learning and change but also, as commentator Nancy Dixon indicates, raises questions about the level of detailed knowledge that is needed before one can fully understand such a change process and learn lessons that might be applicable to other situations.

Peter David Stroh picks up a theme from a previous issue in documenting how systems thinking helped an organization solve some current problems. But, in that process, he also shows how it was the connections that different parts of the organization made with each other in the process of doing their systems analyses that produced some of the dramatic results. Nelson Repenning and Linda Booth Sweeney analyze this paper thoroughly from both academic and practitioner points of view. Stroh responds to both comments.

David Coghlan's analysis of how interventions at different levels in an organization can and must be used if total organizational change is to be achieved highlights an important point that is often forgotten in our models. Each system is nested in a larger system, and to make real changes requires us to understand not only what is appropriate at the individual, group, intergroup, and organizational levels, but, even more importantly, how crucial are the interventions that connect the levels to each other. Sherry Immediato relates this work to other theoretical contributions that have been valuable to her as a consultant, and Coghlan replies.

Next is an account from Judy Rodgers of a dialogue at the Brahma Kumaris World Spiritual University. This remarkable organization connects people from all over the globe and from all walks of life to reflect on and explore the state of the world. Peter Senge, a participant in the dialogue, comments.

We close the issue with Peter Senge's reflections on knowledge, knowledge management, and connections.

Contributors

Karen Ayas is associate editor, *Reflections*.

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Richard Beckhard was a private consultant and Adjunct Professor of Management at MIT and Columbia University.

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Natalia Levina is a doctoral candidate in the information technologies group at the MIT Sloan School of Management.

Ikujiro Nonaka is a professor at Hitotsubashi University, Tokyo, and Xerox Distinguished Professor of Knowledge, University of California, Berkeley.

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Judy Rodgers is a communication and media strategist who has specialized in translating the work of organizational theorists and business authors for a wider audience.

C. Otto Scharmer is a visiting lecturer at the MIT Sloan School of Management and University of Innsbruck, Austria, and a research partner at Generon Consulting.

Peter M. Senge is a senior lecturer at MIT and chairperson of the Council of Trustees of the Society for Organizational Learning.

Emily Sper is the founder of Sperphoto, an Internet-based graphic arts and design company.

Peter David Stroh was a founding partner of Innovation Associates with Peter Senge, Charlie Kiefer, and Robert Fritz, and most recently was a principal with its parent company, Arthur D. Little.

Linda Booth Sweeney is a doctoral candidate at the Harvard Graduate School of Education and coauthor of the *Systems Thinking Playbook,* volumes 1–3.

Marvin Weisbord is codirector of Future Search Network, an international nonprofit organization based on public service, colleagueship, and learning.

The Confrontation Meeting

CLASSIC

Richard Beckhard

One of the continuing problems facing the top management team of any organization in times of stress or major change is how to assess accurately the state of the organization's health. How are people reacting to the change? How committed are subordinate managers to the new conditions? Where are the most pressing organization problems?

In the period following a major change—such as that brought about by a change in leadership or organization structure, a merger, or the introduction of a new technology—there tends to be much confusion and an expenditure of dysfunctional energy that negatively affects both productivity and morale.

At such times, the top management group usually spends many hours together working on the business problems and finding ways of coping with the new conditions. Frequently, the process of working together under this pressure also has the effect of making the top team more cohesive.

Concurrently, these same managers tend to spend less and less time with their subordinates and with the rest of the organization. Communications decrease between the top and middle levels of management. People at the lower levels often complain that they are less in touch with what is going on than they were before the change. They feel left out. They report having less influence than before, being more unsure of their own decision-making authority, and feeling less sense of ownership in the organization. As a result of this, they tend to make fewer decisions, take fewer risks, and wait until the "smoke clears."

When this unrest comes to the attention of top management, the response is usually to take some action such as—

. . . having each member of the top team hold team meetings with his subordinates to communicate the state of affairs, and following this procedure down through the organization;
. . . holding some general communication improvement meetings;
. . . conducting an attitude survey to determine priority problems.

Any of these actions will probably be helpful, but each requires a considerable investment of time which is competitive with the time needed to work on the change problem itself.

Action Plans

Recently I have experimented with an activity that allows a total management group, drawn from all levels of the organization, to take a quick reading on its own health, and—*within a matter of hours*—to set action plans for improving it. I call this a "confrontation meeting."

The activity is based on my previous experience with an action-oriented method of planned change in which information on problems and attitudes is collected and fed back to those who produced it, and steps are taken to start action plans for improvement of the condition.

Sometimes, following situations of organizational stress, the elapsed time in moving from identification of the problem to collaborative action planning must be extremely brief. The confrontation meeting can be carried out in 4½ to 5 hours' working time, and it is designed to include the entire management of a large system in a joint action-planning program.

I have found this approach to be particularly practical in organization situations where there are large numbers in the management group and/or where it is difficult to take the entire group off the job for any length of time. The activity has been conducted several times with a one evening and one morning session—taking only 2½ hours out of a regular working day.

The confrontation meeting discussed in this article has been used in a number of different organization situations. Experience shows that it is appropriate where:

- There is a need for the total management group to examine its own workings.
- Very limited time is available for the activity.
- Top management wishes to improve the conditions quickly.
- There is enough cohesion in the top team to ensure follow-up.
- There is real commitment to resolving the issues on the part of top management.
- The organization is experiencing, or has recently experienced, some major change.

In order to show how this technique can speed the process of getting the information and acting on it, let us first look at three actual company situations where this approach has been successfully applied. Then we will examine both the positive results and the possible problems that could occur through the use and misuse of this technique. Finally, after a brief summary, there are appendixes for the reader interested in a more elaborate description of the phasing and scheduling of such a meeting.

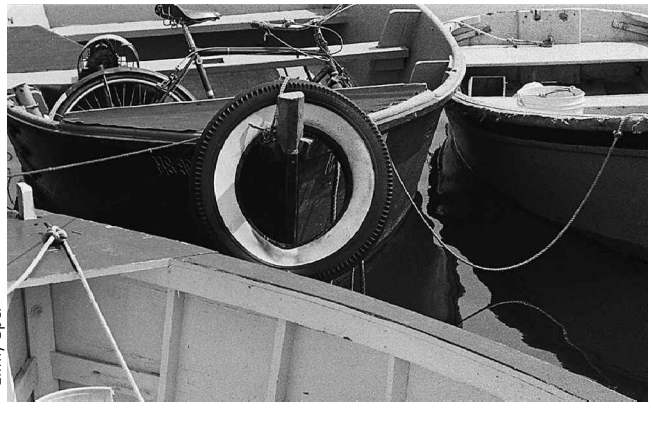
Case Example A

The initial application of the confrontation meeting technique occurred in 1965 in a large food products company. Into this long-time family-owned and closely controlled company, there was introduced for the first time a non-family professional general manager. He had been promoted from the ranks of the group that had previously reported to the family-member general manager.

This change in the "management culture," which had been carefully and thoroughly prepared by the family executives, was carried out with a minimum number of problems. The new general manager and his operating heads spent many hours together and developed a quite open problem-solving climate and an effective, cohesive team. Day-to-day operations were left pretty much in the hands of their immediate subordinates, while the top group focused on planning.

A few months after the change, however, the general manager began getting some information that indicated all was not well further down in the organization. On investigation, he discovered that many middle-level managers were feeling isolated from what was going on. Many were unclear about the authority and functions of the "management committee" (his top team); some were finding it very difficult to see and consult with their bosses (his operating heads); others were not being informed of decisions made at his management committee meetings; still others were apprehensive that a new power elite was developing which in many ways was much worse than the former family managers.

In discussing this feedback information with his operating heads, the general manager found one or two who felt these issues required immediate management committee attention. But most of the members of the top team tended to minimize the information as "the usual griping," or "people needing too many decisions made for them," or "everybody always wanting to be in on everything."



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The general manager then began searching for some way to—

. . . bring the whole matter into the open;
. . . determine the magnitude and potency of the total problem;
. . . give his management committee and himself a true picture of the state of the organization's attitudes and concerns;
. . . collect information on employee needs, problems, and

frustrations in some organized way so that corrective actions could be taken in priority order;

. . . get his management committee members in better tune with their subordinates' feelings and attitudes, and put some pressure on the team members for continued two-way communication within their own special areas;

. . . make clear to the total organization that he—the top manager—was personally concerned;

. . . set up mechanisms by which all members of the total management group could feel that their individual needs were noticed;

. . . provide additional mechanisms for supervisors to influence the whole organization.

The confrontation meeting was created to satisfy these objectives and to minimize the time in which a large number of people would have to be away from the job.

Some 70 managers, representing the total management group, were brought together for a confrontation meeting starting at 9:00 in the morning and ending at 4:30 in the afternoon. The specific "design" for the day, which is broken down into a more detailed description in Appendix A, had the following components:

The confrontation meeting was created . . . to minimize the time in which a large number of people would have to be away from the job.

1. Climate setting—establishing willingness to participate.
2. Information collecting—getting the attitudes and feelings out in the open.
3. Information sharing—making total information available to all.
4. Priority setting and group action planning—holding work-unit sessions to set priority actions and to make timetable commitments.
5. Organization action planning—getting commitment by top management to the working of these priorities.
6. Immediate follow-up by the top management committee—planning first actions and commitments.

During the day-long affair, the group identified some 80 problems that were of concern to people throughout the organization; they selected priorities from among them; they began working on these priority issues in functional work units, and each unit produced action recommendations with timetables and targets; and they got a commitment from top management of actions on priorities that would be attended to. The top management team met immediately after the confrontation meeting to pin down the action steps and commitments.

(In subsequent applications of this confrontation meeting approach, a seventh component—a progress review—has been added, since experience has shown that it is important to reconvene the total group four to six weeks later for a progress review both from the functional units and from the top management team.)

Case Example B

A small company which makes products for the military had been operating at a stable sales volume of $3 million to $4 million. The invention of a new process and the advent of the war in Vietnam suddenly produced an explosion of business. Volume rose to the level of $5 million within six months and promised to redouble within another year.

Top management was desperately trying to (a) keep raw materials flowing through the line, (b) get material processed, (c) find people to hire, (d) discover quicker ways of job training, and (e) maintain quality under the enormously increased pressure.

There was constant interaction among the five members of the top management team. They were aware of the tension and fatigue that existed on the production line, but they were only vaguely aware of the unrest, fatigue, concern, and loneliness of the middle manager and foreman groups. However, enough signals *had* filtered up to the top team to cause concern and a decision that something needed to be done right away. But, because of the pressures of work, finding the time to tackle the problems was as difficult as the issues themselves.

The entire management group agreed to give up one night and one morning; the confrontation meeting was conducted according to the six component phases described

earlier, with Phases 1, 2, and 3 being held in the evening and Phases 4, 5, and 6 taking place the following morning.

Case Example C

A management organization took over the operation of a hotel which was in a sorry state of affairs. Under previous absentee ownership, the property had been allowed to run down; individual departments were independent empires; many people in management positions were nonprofessional hotel people (i.e., friends of the owners); and there was very low competence in the top management team.

The general manager saw as his priority missions the need to:

- Stop the downhill trend.
- Overcome a poor public image.
- Clean up the property.
- Weed out the low-potential (old friends) management.
- Bring in professional managers in key spots.
- Build a management team.
- Build effective operating teams, with the members of the top management team as links.

He followed his plan with considerable success. In a period of one year, he had significantly cleaned up the property, improved the service, built a new dining room, produced an enviable food quality, and begun to build confidence in key buyers, such as convention managers. He had acquired and developed a very fine, professional, young management team that was both competent and highly motivated. This group had been working as a cohesive team on all the hotel's improvement goals; differences between them and their areas seemed to have been largely worked through.

At the level below the top group, the department and section heads, many of whom were also new, had been working under tremendous pressure for over a year to bring about improvements in the property and in the hotel's services. They felt very unappreciated by the top managers, who were described as "always being in meetings and unavailable," or "never rewarding us for good work," or "requiring approval on all decisions but we can't get to see them," or "developing a fine top management club but keeping the pressure on us and we're doing the work."

The problem finally was brought to the attention of the top managers by some of the department heads. Immediate action was indicated, and a confrontation meeting was decided on. It took place in two periods, an afternoon and the following morning. There was an immediate follow-up by the top management team in which many of the issues between departments and functions were identified as stemming back to the modus operandi of the top team. These issues were openly discussed and were worked through. Also in this application, a follow-up report and review session was scheduled for five weeks after the confrontation meeting.

Positive Results

The experience of the foregoing case examples, as well as that of other organizations in which the confrontation meeting technique has been applied, demonstrates that positive results—particularly, improved operational procedures and improved organization health—frequently occur.

Operational Advantages

One of the outstanding plus factors is that procedures which have been confused are clarified. In addition, practices which have been nonexistent are initiated. Typical of these kinds of operational improvement, for example, are the reporting of financial information to operating units,

the handling of the reservation system at a hotel, and the inspection procedures and responsibilities in a changing manufacturing process.

Another advantage is that task forces, and/or temporary systems, are set up as needed. These may be in the form of special teams to study the overlap in responsibilities between two departments and to write new statements and descriptions, or to work out a new system for handling order processing from sales to production planning, or to examine the kinds of information that should flow regularly from the management committee to middle management.

Still another improvement is in providing guidance to top management as to specific areas needing priority attention. For example, "the overtime policy set under other conditions is really impeding the achievement of organization requirements," or "the food in the employee's cafeteria is really creating morale problems," or "the lack of understanding of where the organization is going and what top management's goals are is producing apathy," or "what goes on in top management meetings does not get communicated to the middle managers."

Organization Health

In reviewing the experiences of companies where the confrontation meeting approach has been instituted, I have perceived a number of positive results in the area of organization health:

- A high degree of open communication between various departments and organization levels is achieved very quickly. Because people are assigned to functional units and produce data together, it is possible to express the real feeling of one level or group toward another, particularly if the middle echelon believes the top wants to hear it.
- The information collected is current, correct, and "checkable."
- A real dialogue can exist between the top management team and the rest of the management organization, which personalizes the top manager to the total group.
- Larger numbers of people get "ownership" of the problem, since everyone has some influence through his unit's guidance to the top management team; thus people feel they have made a real contribution. Even more, the requirement that each functional unit take personal responsibility for resolving some of the issues broadens the base of ownership.
- Collaborative goal setting at several levels is demonstrated and practiced. The mechanism provides requirements for joint goal setting within each functional unit and between top and middle managers. People report that this helps them to understand "management by objectives" more clearly than before.
- The top team can take corrective actions based on valid information. By making real commitments and establishing check or review points, there is a quick building of trust in management's intentions on the part of lower level managers.
- There tends to be an increase in trust and confidence both toward the top management team and toward colleagues. A frequently appearing agenda item is the "need for better understanding of the job problems of other departments," and the output of these meetings is often the commitment to some "mechanism for systematic inter-departmental communication." People also report a change in their stereotypes of people in other areas.
- This activity tends to be a "success experience" and thus increases total morale. The process itself, which requires interaction, contribution, and joint work on the problems and which rewards constructive criticism, tends to produce a high degree of enthusiasm and commitment. Because of this, the follow-up activities are crucial in ensuring continuation of this enthusiasm.

A real dialogue can exist between the top management team and the rest of the management organization. . . .

Potential Problems

The confrontation meeting technique produces, in a very short time, a great deal of commitment and desire for results on the part of a lot of people. Feelings tend to be

more intense than in some other settings because of the concentration of time and manpower. As a result, problems can develop through misuse of the techniques.

If the top management team does not really use the information from its subordinates, or if there are great promises and little follow-up action, more harm can be caused to the organization's health than if the event were never held.

If the confrontation meeting is used as a manipulative device to give people the "feeling of participation," the act can boomerang. They will soon figure out management's intentions, and the reaction can be severe.

Another possible difficulty is that the functional units, full of enthusiasm at the meeting, set unrealistic or impractical goals and commitments. The behavior of the key man in each unit—usually a department manager or division head—is crucial in keeping suggestions in balance.

One more possible problem may appear when the functional units select a few priority issues to report out. While these issues may be the most *urgent*, they are not necessarily the most *important*. Mechanisms for working *all* of the information need to be developed within each functional unit. In one of the case examples cited earlier, the groups worked the few problems they identified very thoroughly and never touched the others. This necessitated a "replay" six months later.

In Summary

In periods of stress following major organization changes, there tends to be much confusion and energy expended that negatively affects productivity and organization health.

The top management team needs quick, efficient ways of sensing the state of the organization's attitudes and feelings in order to plan appropriate actions and to devote its energy to the most important problems.

The usual methods of attitude surveys, extended staff meetings, and so forth demand extensive time and require a delay between getting the information and acting on it.

A short micromechanism called a confrontation meeting can provide the total management group with:

- An accurate reading on the organization's health.
- The opportunity for work units to set priorities for improvement.
- The opportunity for top management to make appropriate action decisions based on appropriate information from the organization.
- An increased involvement in the organization's goals.
- A real commitment to action on the part of subgroups.
- A basis for determining other mechanisms for communication between levels and groups, appropriate location of decisions, problem solving within subunits, as well as the machinery for upward influence.

APPENDIX A
CONFRONTATION MEETING

Here is a detailed description of the seven components which make up the specific "design" for the day-long confrontation meeting.

Phase 1. Climate Setting (Forty-five minutes to one hour)

At the outset, the top manager needs to communicate to the total management group his goals for the meeting, and his concern for and interest in free discussion and issue facing. He also has to assure his people that there is no punishment for open confrontation.

It is also helpful to have some form of information session or lecture by the top manager or a consultant. Appropriate subjects might deal with the problems of communication, the need for understanding, the assumptions and the goals of the total organization, the concept of shared responsibility for the future of the organization, and the opportunity for and responsibility of influencing the organization.

Phase 2. Information Collecting (One hour)

The total group is divided into small heterogeneous units of seven or eight people. If there is a top management team that has been holding sessions regularly, it meets as a separate unit. The rest of the participants are assigned to units with a "diagonal slice" of the organization used as a basis for composition—that is, no boss and subordinate are together, and each unit contains members from every functional area.

The assignment given to each of these units is along these lines:

> "Think of yourself as an individual with needs and goals. Also think as a person concerned about the total organization. What are the obstacles, 'demotivators,' poor procedures or policies, unclear goals, or poor attitudes that exist today? What different conditions, if any, would make the organization more effective and make life in the organization better?"

Each unit is instructed to select a reporter to present its results at a general information-collecting session to be held one hour later.

Phase 3. Information Sharing (One hour)

Each reporter writes his unit's complete findings on newsprint, which is tacked up around the room.

The meeting leader suggests some categories under which all the data from all the sheets can be located. In other words, if there are 75 items, the likelihood is that these can be grouped into 6 or 7 major categories—say, by type of problem, such as "communications difficulties"; or by type of relationship, such as "problems with top management"; or by type of area involved, such as "problems in the mechanical department."

Then the meeting breaks, either for lunch or, if it happens to be an evening session, until the next morning.

During the break all the data sheets are duplicated for general distribution.

Phase 4. Priority Setting and Group Action Planning (One hour and fifteen minutes)

The total group reconvenes for a 15-minute general session. With the meeting leader, they go through the raw data on the duplicated sheets and put category numbers by each piece of data.

People are now assigned to their functional, natural work units for a one-hour session. Manufacturing people at all levels go to one unit, everybody in sales to another, and so forth. These units are headed by a department manager or division head of that function. This means that some units may have as few as 3 people and some as many as 25. Each unit is charged to perform three specific tasks:

1. Discuss the problems and issues which affect its area. Decide on the priorities and early actions to which the group is prepared to commit itself. (They should be prepared to share this commitment with their colleagues at the general session.)
2. Identify the issues and/or problems to which the top management team should give its priority attention.
3. Decide how to communicate the results of the session to their subordinates.

Phase 5. Organization Action Planning (One to two hours)

The total management group reconvenes in a general session, where:

1. Each functional unit reports its commitment and plans to the total group.
2. Each unit reports and lists the items that its members believe the management team should deal with first.
3. The top manager reacts to this list and makes commitments (through setting targets or assigning task forces or timetables, and so on) for action where required.
4. Each unit shares briefly its plans for communicating the results of the confrontation meeting to all subordinates.

Phase 6. Immediate Follow-up by Top Team (One to three hours)

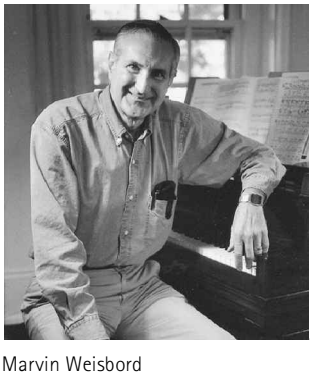
The top management team meets immediately after the confrontation meeting ends to plan first follow-up actions, which should then be reported back to the total management group within a few days.

Phase 7. Progress Review (Two hours)

Follow-up with total management group four to six weeks later.

APPENDIX B
SAMPLE SCHEDULE

9:00 a.m.	Opening Remarks, by general manager
	Background, goals, outcomes
	Norms of openness and "leveling"
	Personal commitment to follow-up
9:10	General Session
	Communications Problems in Organizations, by general manager (or consultant)
	The communications process
	Communications breakdowns in organizations and individuals
	Dilemmas to be resolved
	Conditions for more openness
10:00	Coffee
10:15	Data Production Unit Session
	Sharing feelings and attitudes
	Identifying problems and concerns
	Collecting data
11:15	General Session
	Sharing findings from each unit (on newsprint)
	Developing categories on problem issues
12:15 p.m.	Lunch
2:00	General Session
	Reviewing list of items in categories
	Instructing functional units
2:15	Functional Unit Session
	Listing priority actions to be taken
	Preparing recommendations for top team
	Planning for presentation of results at general meeting
3:15	General Session
	Sharing recommendations of functional units
	Listing priorities for top team action
	Planning for communicating results of meeting to others
4:15	Closing Remarks, by general manager
4:30	Adjournment



Marvin Weisbord
Codirector
Future Search Network

Commentary

by Marvin Weisbord

When I started consulting in 1969, I read every item I could find on organizational development (OD) practice. Nearly all the pioneers were academics, including Douglas McGregor, whose *The Human Side of Enterprise* had inspired me to experiment with self-managing teams in the 1960s. It was Dick Beckhard, the front-line practitioner, though, who showed me simple ways to bring McGregor's Theory Y assumptions alive in the workplace. I had just left a family business that had been a sort of 10-year learning lab with no processing. I had learned a great deal about managing. I was hungry for advice on how to consult and soon came upon Beckhard's little volume on *Organizational Development* in the Addison-Wesley OD series. I was struck by his practicality, his use of language that a manager could understand, and his specific action procedures, all backed by real cases.

Among my first clients was a consumer products firm. The perpetual tension among R&D, engineering, and manufacturing had escalated. People had gone from guerrilla skirmishes to the verge of open warfare. I ping-ponged among the combatants, something like a State Department emissary jetting around the Middle East, "collecting data," with an eye to bringing the parties face-to-face. But how to do it? There were so many levels and functions involved. And then a friend steered me to Dick Beckhard's article, "The Confrontation Meeting." I got the three relevant managers together and ran down Beckhard's list of benefits. They quickly agreed that the situation was worth a half-day of everyone's time. We booked a conference room in the factory basement. I went home, studied Dick's meeting design, and proceeded to run it just as it appears here in Appendix A.

For me, this was a magical experience. People fixed many problems at the same time. Rather than personal confrontation, they confronted shared dilemmas. There was tension aplenty. Still, their focus on mutual goals and joint responsibility, as Beckhard wisely knew, kept the proceedings civil. The principles embedded in this meeting soon informed my consulting practice. To wit—

1. Get all the relevant parties to sit down together.
2. Focus on shared goals.
3. Enroll top management first.
4. Work with clients expressing their own experience (rather than the consultants' experience of the clients' experience).
5. Make "open systems thinking" experiential rather than conceptual.
6. Encourage each person to be responsible for themselves and the whole.
7. Make public commitments for action.

The only aspect of Beckhard's design that I would change today is to reverse the figure/ground relationship between task and processes. Where he asked people to talk about processes—obstacles, demotivators, attitudes, and so on—I would focus the conversation on describing what happens now and what people's preferred system would look like, putting major systems, projects, or programs front and center. In short, I would seek to have people think "future potential" rather than "problem list," against a clear-eyed statement about the way things are. This is a subtle shift from the original, and one with remarkable effects on people's motivation to act.

That quibble aside, I believe Beckhard's work is implicit in most "large group interventions" that came into fashion in the late 1990s. He knew early on that we improve large systems only in relation to the larger systems of which they are a part. To make rapid progress in an organization, we can do no better than expand the boundaries of the system beyond natural work teams and individual functions. By bringing into the dialogue people from all levels and departments with a stake in the outcome, we can make many constructive changes at once. That was not as obvious in 1967 as it is now. Dick Beckhard, with the precision demonstrated by his article, pioneered the translation of systems theory into practical action. A great many practitioners, myself included, have been in his debt ever since.

FEATURE

Local Knowledge—Global Innovation: Leveraging Distributed Expertise

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Achieving innovation in organizations remains a daunting challenge because of the potential mismatch between the local nature of work and expertise, on the one hand, and the global nature of business objectives, on the other, particularly in dealing with knowledge as an organizational resource. Insights from recent research in work on knowledge management (Leonard-Barton, 1995), core competence (Prahalad and Hamel, 1990), knowledge creation (Nonaka and Takeuchi, 1995), and intellectual capital (Stewart, 1997) often underscore the importance of understanding and managing this local and global interdependency. A top-down approach that imposes standardized corporatewide technologies and processes can leave untapped valuable capabilities and pockets of knowledge that rest with individuals and small groups. Conversely, efforts to scale up such local resources can reach a seemingly natural social limit of approximately 100 people (if not far fewer)—as reflected in the literature on communities of practice (Lave and Wenger, 1991) and in much of managerial experience (Brown and Grey, 1995). There is a clear need, then, for concepts, practices, and technologies that help leverage local knowledge in ways that generate global innovation.

We report here on efforts to develop such concepts, practices, and technologies that were initiated at Xerox throughout the 1990s. We focus on two cases in which cross-organizational communities were established with the aim of producing global innovations by supporting and leveraging local knowledge. In particular, these communities have been developing software for a range of products. Such software contributes to the greater interoperability of products and/or product components, thus contributing, at the global level, to greater enterprise coherence. In neither case have global standards or technologies been imposed on local settings, nor have there been efforts to achieve scale simply by replicating or transferring local accomplishments to multiple or vastly expanded settings. Rather, in both cases, innovation on a global scale has been achieved through the establishment of ad hoc cross-organizational communities in which very specific technical work has pursued two aims: (1) to produce software that meets the functional requirements of individual products, and (2) to produce software that is sufficiently generic to be applied to development efforts across a range of products.

In assessing these cases and their successes, we discuss their organizational, social, and technological infrastructures; the role that coherence agents play in catalyzing work within them; and how these communities have leveraged local knowledge by constituting themselves as knowledge ecologies. We define these terms below.

By *organizational infrastructure,* we mean the formal and informal structures established in these communities to make possible both their internal operation and their interface with the broader corporation. *Social infrastructure* consists of the roles, relationships, and social forms in the communities that have grown from and sustain the details and character of their specific work. (Our use of this term has been influenced by Stucky's concept of "social ecology" [Stucky, 1998] and by Cook and Yanow [1993].) The organizational infrastructure, as we see it, is authorized, while the social infrastructure

is essentially emergent (Stucky, unpublished). By *authorized,* we mean both that elements of the organizational infrastructure tend to be authored (someone explicitly creates them) and that they have some official standing. In contrast, by referring to the social infrastructure as *emergent,* we mean that it is constantly emerging and evolving in the course of a community's work practice. The *technological infrastructure* consists of the tools (physical spaces, hardware, intranet archives, and so on) that each community uses, which reflect the specific character of its work. For the two communities in the cases we present, a large measure of their success rests on the appropriate fit between their work and the nature of their organizational, social, and technological infrastructures.

In various ways, *coherence agents* have facilitated the work of these two communities. As the term suggests, coherence agents have helped the communities make greater contributions to *enterprise coherence,* that is, to greater interoperability of products or product components. Although the work of all the members of these communities was dedicated to this aim, coherence agents have certain characteristics that are particularly valuable in achieving successful innovation. Specifically, the work of a coherence agent is distinct from his or her own work (for example, product-specific work) and catalyzes the work of others by engaging in the actual development work of the community.

By *knowledge ecology,* we mean a community in which different bits of knowledge are systematically and productively linked and leveraged. Making various kinds of information (raw data, informal records, sophisticated graphics, navigable intranets, and so on) generally available within an organization is clearly valuable. (Website document archives in both the cases we present are an example of this increasingly common practice.) At the same time, there are forms of knowledge (expertise, know-how, creative forms of working together, and so on) at the level of individuals and small groups (Cook and Brown, 1999) that can be valuable resources, if they can be found and leveraged. A community establishes itself as a knowledge ecology when it links these resources together (by way of appropriate infrastructures).

Two Cases

Next we describe two cases of global innovation (in the form of increased enterprise coherence) in which local knowledge was leveraged through the development of communities whose locally appropriate organizational, social, and technological infrastructures enabled them to function as knowledge ecologies. After we present the cases, we assess them, focusing on: (1) similarities and differences in their organizational, social, and technological infrastructures, (2) the role of coherence agents, and (3) their nature as knowledge ecologies.

Xerox Common Management Interface

The Xerox Common Management Interface (XCMI) community was initiated to develop greater networking capability among Xerox products. The goal was a range of products that could all be easily managed (that is, installed, configured, monitored, and operated) through a single computer network. For products to operate in this way requires that each machine present a software interface to the network that is compatible with that of other machines on the network; that is, they need a common management interface. However, since each product was developed by a unique product development team, the software interface for each product tended to be unique. The lack of a standing mechanism by which the software written by different product development teams could be coordinated gave rise to the XCMI community.

Two Xerox software developers, Gary Padlisky and Paul Gloger, began, on their own initiative, to address this challenge. Ultimately, their solution was simple, but it proved to be highly productive. First, they struck on the idea of establishing software interface standards that could apply across a range of machines. In practice, this meant getting each team of software developers for a range of products to agree to write their machine's code so that, when finished, the interfaces for all the machines would be compatible. However, different machines have different software requirements: the software for operating a fax machine, for example, can be substantially different from that for

operating a photocopier. What the respective programmers need to know, meanwhile, can be similarly disparate: different software developers have different areas of expertise. That is, no one software developer's knowledge covers all the various machines that might be networked. So the problem was double-barreled. It meant generating common standards for machines with different software requirements and doing so by drawing on the specialized knowledge of different software developers, who were themselves scattered among largely unconnected product teams.

What began as an ad hoc, exploratory conference call became an established occasion for a loosely associated group of developers from various product teams to work productively.

Paul and Gary recognized that they needed to find programmers who were working on products that could ultimately have a common interface, and that they would have to find a way for those programmers to work together. They did two things. Through informal channels, they began to spread the word about the common interface idea, and they set up a weekly conference call open to all software developers who wanted to chat about generating interface standards. Week by week, different developers joined the conversation, raising questions from the perspective of the products they were working on and bringing their own specialized knowledge. Some software developers became fairly regular participants; others came and went. In general, the number of participants grew, and the conversations became increasingly productive.

The conference calls began to produce a growing set of standards applicable across a range of products. As the standards were either established or augmented, they were archived in an XCMI website within the Xerox intranet where interested developers could refer to them and comment on them. This work, meanwhile, began to contribute to the development of a common interface and, in doing so, to enterprise coherence.

What began as an ad hoc, exploratory conference call became an established occasion for a loosely associated group of developers from various product teams to work productively. Many participants never met face to face, but they came to know one another and often chatted about nonwork matters as the "meetings" were getting started. XCMI began to feel and function like a community of software developers with common interests who were engaged in productive, innovative work. Although Paul and Gary continued to set up the calls and maintain the document archive on the XCMI website, they did not see themselves as "owners" of XCMI. Instead, they made a point of acting only as "conveners and facilitators for the community." When they made a business card for the XCMI web address and conference call phone number, no person was listed on the card, only XCMI.

The Toolkit Working Group

The Toolkit Working Group (TWG) is an ad hoc community within Xerox concerned with product development, research, and advanced technology focusing on machine control software. The internal operations of modern copiers, scanners, fax machines, and so on require increasingly extensive, sophisticated, and reliable software. Some products call for hundreds of thousands of lines of software code that can take months to produce, test, and implement. The purpose of the TWG has been to establish and contribute to an intranet archive (the "Toolkit") of machine-control software that can be a resource for developing software across a range of new products. The idea is to reduce the need to write each new product's software from scratch by using chunks of function-specific software from the Toolkit.

There is a clear advantage in being able to streamline product development by reusing blocks of software that have already been written and tested in the development of other products. The TWG community's objective, therefore, has been to maximize the amount of control software for a given product that can be taken from the Toolkit, thus minimizing the portion that is custom, non-reusable code. This allows Xerox to develop products more rapidly, more reliably, and more cost-effectively. Furthermore, using the Toolkit helps standardize software functionality and interfaces across products, which contributes to greater enterprise coherence.

The TWG began in 1991 when a single Xerox software developer, Marc Webster, began looking for ways to reuse software code. It was clear that, for chunks of code to be reusable, they had to be sensitive to the parallel software needs of different products. So, Marc figured, the best thing to do was to get software developers from different teams together to produce a single chunk of code that could work in more than one machine. Then, when such chunks were put into the Toolkit, their more generic flavor might also make them attractive to future product development efforts.

As this process began, it was quickly learned that the demands of writing software as a joint effort typically required the developers to be in the same location. Being able to point to a line of code on a workstation and discuss it in real time is essential to the efficiency of this work. A major feature of work in the TWG, therefore, became the co-location of key participants. In some instances, TWG members have relocated for days or weeks to work on joint development projects.

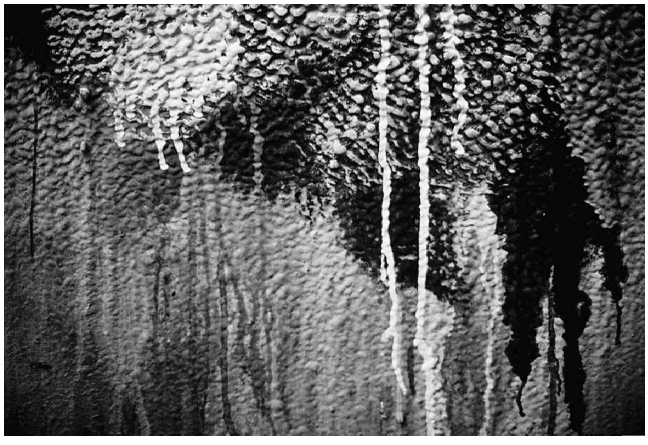
As such projects were completed, their software packages were put into a document archive on the TWG website, which programmers could access on the Xerox intranet. Over time, the number of items in the Toolkit grew. New product development teams then began to draw items from the Toolkit to reuse in their own software development. Eventually, more and more of Marc's own work shifted to bringing the Toolkit to the attention of software developers who might work jointly. Over time, the TWG took on a life of its own as more developers learned about it and even began to initiate joint work. After its first few years, Marc occasionally learned of TWG-related projects and contributions to the Toolkit only after they have been completed.

Since 1993, the TWG has included participants from several product development teams, both large and small, as well as participants from Xerox R&D organizations. Different groups and individuals have participated for different reasons. Some product development teams have been able to codevelop with other teams, thus increasing each team's productivity. Other product teams have simply picked up existing Toolkit software from the TWG document archive, which has allowed them to focus more of their development resources on product-specific areas. In addition, R&D units, such as the Palo Alto Research Center (PARC), have worked with the TWG to do research on product development practices. This, in turn, has enabled innovations to flow more quickly from basic research into new products, while also bringing product challenges and problems directly to the attention of R&D.

One of R&D's contributions to the TWG came through a group called Control Software Platforms (CSP) with which Marc had been involved. The CSP group had worked with two different product development teams helping to define particular aspects of their software architecture and interface. Their progress was captured in TWG documents. The joint work began to phase out as the deadlines for the two products approached. CSP then learned that a third product development team needed to produce similar interface software. Although the existing software was very close to what the third team needed, a significant gap in the software architecture would have to be closed. No one from the other two product teams, however, had time to work with the third team. So a member of the CSP team went to the third team's site and spent several weeks working with the programmers on the development of the product's system architecture. He drew on the architecture that CSP and the other two product teams had already defined and posted in the Toolkit archive. He then translated the terminology and design rationale of the software from the Toolkit into terms that addressed the third product team's design specifications. Together, they built a refined architecture that supported the goals of all three new products. Ultimately, CSP's involvement with the three product teams helped advance innovation that contributed to coherence across multiple product families.

Since inception, the TWG has had two core values: co-ownership and an equal voice in decision making.

Since inception, the TWG has had two core values: co-ownership and an equal voice in decision making. The Toolkit is not owned by anyone. Marc is its initiator and an expert on its function, but not its owner. All the participating individuals and groups co-own the Toolkit and the TWG's work. Any individual or group with an appropriate need to draw on or contribute to the Toolkit is free to do so. Each group involved in the TWG's



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work has an equal voice in decisions taken concerning the TWG and the Toolkit. All concerned individuals and groups make joint decisions on additions or modifications to the Toolkit or on collaborative TWG work. In this way, the Toolkit has grown, and TWG has sustained an increasing level of cross-organizational work and has made significant contributions to software reuse and greater coherence across product lines.

Leverage the Local; Generate the Global

Next we sketch some key factors contributing to XCMI's and TWG's success in achieving global innovations by leveraging local knowledge. In both cases, members learned from each other and by making use of materials posted to their respective document archives. However, in each case, important bits of local knowledge were leveraged without all community members necessarily learning or knowing them. In this respect, a good measure of XCMI's and TWG's success rested on their roles as communities that functioned as knowledge ecologies. That is, they linked physically and organizationally distributed groups and individuals in ways that enabled them to draw on their different areas of expertise, and through ways of working together to generate new knowledge and new capabilities. This interaction was greatly facilitated by the appropriate fit between the infrastructures they developed and the specific character of their work. Also, in each case, coherence agents played an important catalytic role in advancing global aims by leveraging local knowledge.

Infrastructure

Organizational Infrastructure

TWG and XCMI have two significant features in common. First, people who were interested in improving the quality and efficiency of their work started the projects; they were not mandated. Second, both groups functioned across traditional organizational lines: by definition, the work of each project needed to move among product development teams that traditionally did not have formal organizational connections. Eventually, both projects also became authorized (in both senses of the term). Managers gave them some measure of official recognition; for example, they began to support and track their progress and identify potential new members. And they were authorized as key members who defined the projects' missions and developed membership identity (for example, the TWG logo was broadly recognized, and XCMI built an identity by circulating its generic business card).

The cross-organizational character of both projects was necessary for both the work at the local level and the global aims they were serving. Each chunk of the TWG's software needed to be generic enough to be reusable. Likewise, every interface XCMI produced had to meet its common standards. At the same time, each software developer working toward these global aims was also responsible for ensuring that the software in question functioned properly in his or her product. Thus, each software developer's specific work was both global and local in focus—what we call its *glocal* character. Further, in designing such software, the developers needed to draw on the expertise of other developers across traditional organizational lines. Finally, to be successful, such cross-organizational work needed appropriate managerial support. (Learning to recognize and address this need is an important, emerging challenge for managers.)

Social Infrastructure

The nature of social infrastructure—the emergent social roles, relations, and groupings through which work is done—is constantly emerging from and evolving within work practice itself.

In both XCMI and TWG, the people who initiated the projects (Paul and Gary in XCMI, and Marc in TWG) took on the role of convener or expert. But that role is played down, and any sense of ownership is rejected. Any relevant members of each project,

not a key "authority," make key decisions about membership, the actual work, and postings to website archives, for example. The co-ownership of the group, of its way of working, and of its products has been, in our view, vitally important to each project's success. In particular, it has made involvement in each group attractive to potential participants by characterizing its work and products as growing from each participant's needs rather than being imposed by some general scheme.

A striking difference between the TWG and the XCMI communities lies in their social infrastructures. The TWG is largely a loose-knit network of co-located, ad hoc teams. The XCMI community, in contrast, is a conversation-based work group of physically dispersed members. We believe that each form of social infrastructure grew from each group's needs and is appropriate to the particular details and character of its work. XCMI's work on network interface standards calls for discussing the functions of various machines at a general level, which has been easily and successfully done through conference calls. No aspect of the work requires co-location. In fact, when Paul and Gary were asked if they would like to bring the participants together, they said it would be great to meet them but it was "completely unjustifiable," given XCMI's kind of work. By contrast, the TWG ad hoc teams' software development work calls for them to look at, point to, and manipulate software code together in real time. Thus, the co-location that is a signature of the TWG's social infrastructure grows from the specific needs of its work.

Technological Infrastructure

The technological infrastructure of each community has also grown from and dovetailed with the details of its specific work. The XCMI community's conversation-based practice is easily supported by conference-call facilities, including a phone number for the weekly conference calls and the XCMI business card. The conference calls have been closely linked to the community's use of its website document archive. Commonly, the results of conversations have been written up and posted to the website so members of the community can comment on them between weekly sessions. This individual work, meanwhile, feeds into the next conference-call session. Likewise, interface standards are documented and posted in the XCMI document archive.

The TWG community also depends on its intranet website. The Toolkit exists on TWG's website as a document archive. Referring to the archive, drawing from it, and making additions and amendments to it are common practices within the TWG. The TWG's technological infrastructure differs most strongly from that of XCMI in its support of co-location. Working jointly on software code gave rise to a need for physical workspaces that facilitate verbal and visual communications, such as shared or adjacent

Table 1 The infrastructures of the two communities are compared in the context of their respective work and enterprise aims.

	The Work	*Organizational Infrastructure*	*Social Infrastructure*	*Technological Infrastructure*	*Enterprise Aims*
XCMI	Develop standard for software interfaces	Support for conveners Enable cross-product, cross-division collaboration	Network of distributed ad-hoc teams	Conference calls Website Document archive	Maximized networkability Greater coherence across products Reduced customization costs & time
TWG	Build reusable software	Support for conveners Enable cross-platform cross-division collaboration	Network of co-located development working group	Travel Co-located work stations Website Document archive	More re-usable code Greater coherence across products Reduced development costs Accelerated time-to-market

workspaces and computer workstations on a local network. In such contexts, developers can look at, point to, and manipulate chunks of code displayed on a single workstation or written on a whiteboard and print out, discuss, and mark draft documents (table 1).

Coherence Agents

A coherence agent does work that is distinct from his or her own product-specific work, which catalyzes the work of others through active and productive engagement in the development work of a given community. Coherence agents have at various times facilitated the XCMI and TWG communities' productivity, both locally and globally. (Their roles are akin to those of organizational translators and knowledge brokers [Brown and Duguid, 1999].) In each case, coherence agents' work was different, but the general nature of the role was the same.

In the case of XCMI, Paul and Gary have been coherence agents. Their participation in the community does not stem from any product development teams they happen to be on, but rather from the need to loop new members into conversations or to move developing interface standards toward completion. They act as catalysts that make the community's conversation-based practice possible and productive. They establish and maintain the conference calls and the website document archive. However, their role is not simply to set the table and then sit back while others work. Nor is it only a traditional staff role of passing information between different practice areas. As coherence agents, they are catalysts in the community's conceptual work. They engage in the substantive details of conference calls and help distill the results into forms that are posted on the website. In doing so, they use their own technical expertise to keep the concerns and expertise of other members in parallel so that no product team's needs are left behind or ignored in the development of common standards. This work meets all the criteria for coherence agents and has helped contribute to global innovation.

The role of the CSP group in the TWG case also fits these criteria. The CSP's initial engagement with the TWG was prompted by an interest in moving new software developments quickly into product streams. Later, when the group recognized the possibility of bringing the third group into line with the first two, the connection took on a new dimension. In this shift of involvement with the TWG, the CSP began to function as a coherence agent. The CSP member who co-located with the third team shifted his focus from his original work to engagement with the specific software work of the three product teams. His involvement proved essential in making the software of the three teams compatible, thus adding to the reusability of the Toolkit.

In both cases, the coherence agents' involvement in the work of the communities proved valuable for leveraging local knowledge in ways that have contributed to global innovations.

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Knowledge Ecologies

A community with common interests but different areas of expertise whose members are able to work together productively by drawing on what each member knows is a knowledge ecology. We see projects like the TWG and XCMI communities as knowledge ecologies. Both are examples of how various pockets of local knowledge distributed around the corporation are linked to enable creative, productive work. This knowledge (expertise, skills, creative ways of working together, and so on) is part of Xerox's intellectual capital. However, without ways to link such local knowledge, much of this corporate resource can go untapped.

In each community, the ability to share or transfer certain information is important, as their web-based document archives attest. But there are other ways that members have drawn on each other's expert knowledge without sharing or transferring it. In the XCMI community, for example, expert knowledge of scanner software is essential for designing a common interface. But not everyone discussing that particular interface needs to become an expert in scanner software. Only one scanner expert is needed. The same is true of the other machines involved in the common interface. This specialized knowledge that is distributed

throughout the community is not shared. However, through the community's conversations, the knowledge becomes "sharable." In developing software standards, members of the XCMI community can draw on each other's knowledge without acquiring it. In this way, the XCMI and TWG communities, as knowledge ecologies, can leverage local knowledge from various parts of the corporation in ways that contribute to global innovation.

Summary

In the two cases we've presented, significant innovation at a global level has been achieved by making productive use of local knowledge. Both cases are examples of how knowledge that is distributed about the corporation has been identified, linked, and leveraged to productive ends. This has been accomplished through the establishment of ad hoc cross-organizational communities of individuals and small groups who have diverse bits of knowledge yet share common interests. The work of these communities has been made possible by the existence of organizational, social, and technological infrastructures whose forms have grown out of, fit, and support the particular details and character of the work each community does. In each community, the results of the work have been functionally applicable to individual products yet generic enough to contribute to development efforts across a range of products. At key times, coherence agents have helped generate and maintain this dual character. Further, in some instances, information essential to the success of these communities is "shared" through such mechanisms as document archives. In others, knowledge that has been equally essential has been made use of not by its being "shared" (that is, "transferred" or "duplicated") but by making it "sharable." That is, knowledge possessed by individuals or small groups has been used by other members of these communities without it being learned by them. In this sense, the community itself has learned to make creative use of knowledge variously distributed among its members. Finally, the ability of these communities to leverage knowledge in this way has led us to see them as knowledge ecologies. These knowledge ecologies, using organizational, social, and technological infrastructures in which information can be shared and knowledge can be made sharable, have made it possible to leverage local knowledge in ways that generate global innovation.

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ways of working with teams and across formal organizational boundaries for enterprisewide results. Their collaboration in reflecting on their efforts and sharing the extensive documentation of their projects has been tremendously valuable.

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Commentary

by Stephen C. Buckley

Stephen C. Buckley
Entrepreneur, writer, and consultant

Bauer and Cook present a case for investing modestly in "coherence agents" in order to create cross-organizational "knowledge ecologies," which can link local expertise and garner productive returns at the firm level. In both the supporting examples, groups of software developers located in different departments of Xerox worked together and succeeded in creating something of value to the organization. While the framework of "coherence agents" and "knowledge ecologies" helps us conceptualize the activities of the programmers, there are some fairly fundamental prerequisites for their successes that the authors leave almost unexplored.

The most important observation I can make about these two groups is that they were both founded by, and composed of, software engineers. However, not only were they software engineers, they were also highly specialized types of software engineers. Each was involved in very specific technical work. As a result, the contention that the groups were working cross-organizationally becomes somewhat blurred. While these programmers were certainly in different departments, I propose they had far more in common with each other than with the other members of their own "local" departments, such as marketing or accounting. Computer languages are called languages because they are just that. They enable those conversant in them to build and communicate highly complex and very specific ideas through time and space for the benefit of others. There can be little doubt that these programmers enjoyed a productive relationship with each other at least in part because it was built on the common language and culture of the hacker.

The authors do concede to this, albeit briefly, stating "a large measure of their success rests, we conclude, on the appropriate fit between the specific character of their work and the nature of their organizational, social, and technological infrastructures." Had these groups been cross-disciplinary as well as cross-organizational, I suggest that the results probably would have been very different. Therefore, to attribute their success predominantly to the role of the coherence agent, without taking into account the makeup of the participants, paints an incomplete picture.

Seen from this perspective, the concept of what constitutes "local" versus "global" spatially also becomes blurred. What is local and what is global? The programmers who were part of the XCMI group stated it would "be great to meet" some of the participants but it would be "completely unjustifiable." This suggests that locality is of no relevance whatsoever because had these individuals been either sitting next to each other in the same department or distributed around the world, the results would have been the same.

There are many other interesting points in these two cases that deserve mentioning. Perhaps most notable is that the two groups—without any authorization or support to speak of—conceptualized, designed, prototyped, manufactured, and delivered two successful products. Nobody told them to do it, yet they did it. Someone generated an idea that was simple and compelling, others coalesced around it, a team formed, individuals assumed various roles, and the products were built. Cool.

These cases are very similar in nature to the development of the Linux computer operating system in the mid-1990s. Linux, a competitor to the Microsoft Windows platform, was the brainchild of a 22-year-old Finnish college student, Linus Torvald. He wrote the first version of the software and gave it away free on the Internet. Soon a loyal following emerged, and other computer hackers worldwide began adding useful extensions, fixing bugs, and recompiling the open source code so

that it could run on different hardware platforms. This homegrown operating system is now running on 8 million computers worldwide.

This same type of guerilla software development seems to have occurred within Xerox's organizational boundaries. However, in my experience, many of these initiatives are started and rarely produce results. So the questions arise, what enabled this type of activity and what made it successful? A few elements seem to characterize these two initiatives:

1. The individuals who initiated the projects communicated a simple, compelling idea for a product that would benefit a larger community.
2. The initiators had no organizational authority and, therefore, adopted the concept of co-ownership of the process and its resulting products, which made involvement attractive because the other programmers could participate in the creative process.
3. There was no plan, only an objective; therefore, people could have free rein over the creative process, improvise, and take individual initiative.
4. Participation was voluntary, so the programmers were motivated to work toward the common goals.
5. The groups used the technological infrastructure in the form of sharing documents and a computer code library on the Xerox intranet to support their social infrastructure.
6. Participants were highly accountable because each was "responsible for ensuring that the software in question functioned properly in his or her product."

If any one of these elements were absent, the groups would not have achieved success. While most of their practices are extensible to other organizational forms, the technical savvy required to use information technology (IT) in the way in which these groups did may not lend itself well to other functional areas. However, as IT becomes both more ubiquitous and simpler to use, it is easy to imagine an age in which locale and position within an organization become less important, and shared interest becomes the connective tissue.

FEATURE

Conversation with Ikujiro Nonaka

C. Otto Scharmer

Ikujiro Nonaka
Professor
Hitotsubashi University
Xerox Distinguished Professor
of Knowledge
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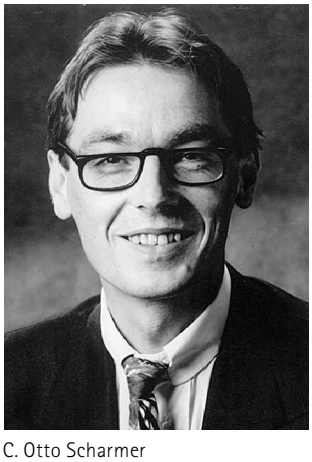

C. Otto Scharmer
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Management
University of Innsbruck, Austria
Research Partner, Generon
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McKinsey & Co. sponsored the interview, which was conducted in February 1996.

C. Otto Scharmer (COS): Why did you become interested in knowledge creation?

Ikujiro Nonaka: Originally, I was interested in information processing. At the University of California, Berkeley, my major was marketing. I studied consumer decision processes under Francisco Nicosia. His major contribution was the conceptualization of consumer decision processes from the perspective of information processing. My interest shifted from marketing to organization theory after I took a sequence of three sociology courses from Neil Smelser's theoretical viewpoint and Arthur Stinchcomb's methodological viewpoint—a beautiful marriage of theory and method. We had to construct our own social theory, so I proposed a theory on centralization versus decentralization.

The turning point in my transition from information to knowledge came when I participated with my colleagues Hirotaka Takeuchi and Kenichi Imai in a Harvard Business School colloquium on productivity and technology in March 1984. I found that the existing theory of information processing was not adequate. The process of innovation is not simply information processing; it's a process to capture, create, leverage, and retain knowledge. I was beginning to theorize how an organization creates knowledge.

COS: What brought you to the insight that information processing is insufficient? Was it your exposure to companies, to particular pieces of literature, or was it your thinking?

Ikujiro Nonaka: When we talked with individuals in innovative organizations, they always started with their beliefs. A belief about images of the world, which you may call a mental model, is subjective. They tried to convert this subjective belief into objective language. They also tried to justify it within their organizations and finally realize it in a concrete form. The whole process originated in their subjective beliefs.

But as you know, Herbert Simon's information processing paradigm tries to separate facts and values. Value problems are always avoided in "science," which has to be based on facts. So in his theory, Simon intentionally excludes value problems. He treats value as a given because it is subjective. Information processing excludes our beliefs and images of reality. But an innovation comes from a subjective belief or an image of the world.

I tried to differentiate two types of information, namely, syntactic and semantic information, and wrote *The Corporate Evolution: Managing Organizational Information Creation*. I shifted from information processing to information creation. With this in mind, I continued research on the innovation process and discovered that information creation is not enough. Finally, I came up with the idea of knowledge creation.

COS: What is the difference between information creation and knowledge creation?

Ikujiro Nonaka: In simple terms, information is the flow, and knowledge is the stock. Information is the flow of a message, while knowledge is created by accumulating information. Thus, information is a necessary medium or material for eliciting and constructing knowledge.

Another difference is that information is something passive. When I switch on a TV, information comes, regardless of my commitment. But knowledge comes from my belief, so it's more proactive.

I emphasize the nature of knowledge as "justified belief and skill." I consider knowledge to be a dynamic human process of justifying personal belief toward the truth. More broadly, knowledge has to do with goodness, beauty, and truth. I found this aspect of knowledge while studying the innovation process. When you look into the innovation process, it really has to do with developing a justified true belief. The innovation process is not simply information creation, but starts from our beliefs and aspirations and is finally crystallized within and between organizations through collaboration.

. . . knowledge has to do with goodness, beauty, and truth.

In the West, there is a long history of philosophical inquiry into knowledge or epistemology, from Plato to Descartes to Michael Polanyi. Drawing especially on Polanyi, I conceptualized knowledge in terms of two types, tacit knowledge and explicit knowledge. Tacit knowledge is personal, context-specific, and therefore hard to formalize and communicate. Explicit knowledge, on the other hand, is transmittable in formal, systematic language.

Tacit knowledge and explicit knowledge are not totally separate but are mutually complementary entities. Without experience, we cannot truly understand. But unless we try to convert tacit knowledge to explicit knowledge, we cannot reflect upon and share it organizationally. Through this dynamic interaction between the two types of knowledge, personal knowledge becomes organizational knowledge. And the knowledge or intellectual infrastructure of an organization encourages its individual members to develop new knowledge through new experiences.

This dynamic process is the key to organizational knowledge creation. The interaction between the two types of knowledge brings about what I call four modes of knowledge conversion, that is, socialization, externalization, combination, and internalization (figure 1).

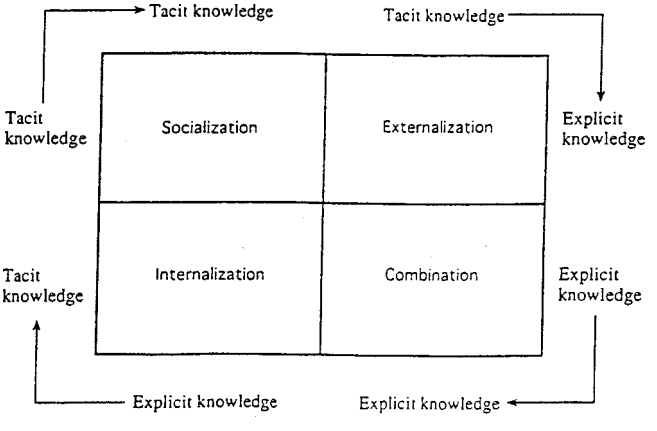
Socialization is a process of creating common tacit knowledge through shared experiences. For socialization, we need to build a field of interaction, where individuals share experiences and space at the same time, thereby creating common unarticulated beliefs or embodied skills.

Externalization is a process of articulating tacit knowledge into such explicit knowledge as concepts and/or diagrams, often using metaphors, analogies, and/or sketches. This mode is triggered by a dialogue intended to create concepts from tacit knowledge. Creating a new product concept is a good example.

Combination is a process of assembling new and existing explicit knowledge into a systemic knowledge, such as a set of specifications for a new product prototype. Often, a newly created concept should be combined with existing knowledge to make it materialize it into something tangible.

Internalization is a process of embodying explicit knowledge into tacit, operational knowledge such as know-how. "Learning by doing or using" triggers this mode. Explicit knowledge documented into text, sound, or video formats facilitates the internalization process. Therefore, manuals, a quintessential example of explicit knowledge, are widely used for internalization.

Figure 1 Four modes of knowledge creation.



COS: On the one hand, you are criticizing approaches to learning that are overly centered in the mind, that lack "learning by doing." On the other hand, you relate learning concepts to internalization, which primarily is learning by doing. How do those two go together?

Ikujiro Nonaka: I would like to talk about the differences between organizational learning and knowledge creation later. But in the theory of organizational knowledge creation, we have to go through all four modes dynamically. It seems to me that organizational

learning theories do not comprehend this whole dynamic process. I limit learning to internalization alone, namely, conversion from explicit knowledge to tacit knowledge. Learning theories cannot explain the innovation process or the total process of organizational knowledge creation.

COS: From what I know about the work of the Society for Organizational Learning (SoL), I would say that Peter Senge's concept of generative learning is essentially about the process of creating. It starts with what people want to create and focuses on the creative tension between aspiration, on the one hand, and current reality, on the other. So his whole notion of personal mastery is based on the methodology of the creative arts. I would like to focus on your work and on the architecture of your theory first, and then discuss how that relates to learning theories and SoL. I think SoL's work is in tune with your theory.

In middle-up-down management, there is a differentiation between roles, and people have only one role. There is a functional differentiation, where different people play different roles and come together in a team for knowledge creation. In the hypertext organization, there is another type of differentiation, and the people participate in all three roles.

As I see it, the hypertext organization is much more related to twenty-first century thought than middle-up-down management, which is more traditional, in my view, because you are saying there are three roles and different people play different roles. So my questions are: How does middle-up-down management relate to the hypertext organization? How do the three levels integrate? What is the integration between the three structural levels and between the three roles?

Ikujiro Nonaka: First of all, I emphasize the positive roles of middle managers. In the US, middle managers are denigrated as cancer. The Japanese see middle managers as key to facilitating the process of organizational knowledge creation. They serve as the strategic knot that binds top management with front-line managers. They are a bridge between the visionary ideals of the top and the often chaotic realities of business confronted by front-line workers. They are the true "knowledge engineers" of the knowledge-creating company.

In the middle-up-down model, top management creates a vision or a dream, while middle management develops more concrete concepts that front-line employees can understand and implement. Middle managers try to solve contradictions between what top management hopes to create and what actually exists. In other words, top management's role is to create a grand theory, while middle management tries to create a mid-range theory that it can test empirically within the company with the help of front-line employees. The middle-up-down model is not an either-or approach; it is an interactive process of both top-down and bottom-up.

COS: Middle managers have to integrate the whole system, right?

Ikujiro Nonaka: Yes. So to promote integration structurally, the hypertext organization comes in. It is the dynamic synthesis of the bureaucratic structure and the task-force structure, and it reaps benefits from both. The bureaucratic structure efficiently implements, exploits, and accumulates new knowledge through combination and internalization, while the task force is indispensable for creating new knowledge through socialization and externalization. The efficiency and stability of the bureaucratic structure are combined with the effectiveness and dynamism of the task force in a hypertext organization. Moreover, another layer, the knowledge base, serves as a clearinghouse for the new knowledge generated in the bureaucratic structure and the task force.

COS: I think I understand this. But what is much less clear to me is the knowledge-base layer. Sometimes you call it the corporate university and sometimes the knowledge base.

Ikujiro Nonaka: The knowledge-base layer includes such intellectual capital as corporate vision, organizational culture, databases, and individual knowledge. Once the cross-functional team completes its task, team members move down to the knowledge-base layer and make an inventory of newly created knowledge. Then team members return to the business layer for routine operations until called to another project.

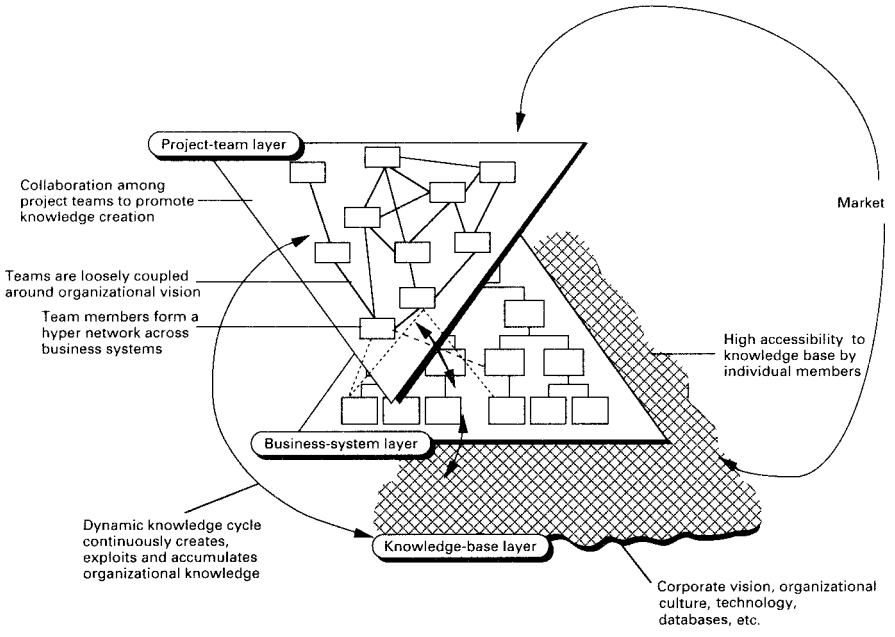


Figure 2 The hypertext organization.

Source: Ikujiro Nonaka and Hirotaka Takeuchi, *The Knowledge-Creating Company,* Oxford University Press, 1995, p. 169; reprinted with permission of the publisher.

COS: So it would not include, for instance, space for reflection? You suggested institutionalizing reflection in action. Would that be a part of the corporate university?

Ikujiro Nonaka: Before going into that, let me add what I call "enabling conditions" for organizational knowledge creation. There are five enabling conditions in my theory—intention; autonomy; fluctuation or creative chaos; redundancy; and, finally, requisite variety. Intention is embodied in an organizational vision. Autonomy increases the chance of serendipity. Fluctuation and creative chaos stimulate interaction between organizations. The benefits of creative chaos are possible only if members can reflect on their actions; otherwise, chaos leads to destruction. Redundancy includes intentional overlapping of information about business activities, management responsibilities, and the company. Requisite variety means a minimum internal variety for the purpose of organizational integration and a maximum internal variety for an effective adaptation to the environment. Organizational information and knowledge must match the external complexity.

COS: Different levels of knowledge may require different infrastructures and methods?

Ikujiro Nonaka: A hypertext organization is a structural device that incorporates these enabling conditions. What is unique about a hypertext organization is that three totally different layers or contexts coexist within the same organization (figure 2).

COS: I am wondering if you would agree to my putting this in different terms. The first row is about knowledge creation. The second row is about knowledge application. And the third row is about knowledge dissemination.

Ikujiro Nonaka: Yes, so the three layers are interactive.

COS: In that sense, wouldn't the corporate university, because it's dealing with dissemination, include all the infrastructures dealing with capacity building and creating new capabilities? I would have drawn that the other way around. Knowledge creation, knowledge application, and, in between, knowledge dissemination. Because the basic dialectic is between these two, and the other is in between. That, in a way, is a major innovation conceptually, because the task force level has been thought about before.

Ikujiro Nonaka: You may be right. That's an interesting idea and good suggestion.

COS: Concerning your five stages or model of organizational knowledge creation, from the view of Western companies, the most crucial ones are steps one and five (figure 3). In your writings and based on your experience, you are focusing mostly on externalization, which is also very important. But I think steps one and five are even more important.

Ikujiro Nonaka: Socialization, right?

COS: Yes, because you have the infrastructure in place in Japanese companies, whereas the infrastructure is missing in US and European companies. In the US, there are different conditions. How could you create such an infrastructure to give a point of departure for the whole process?

Ikujiro Nonaka: First, I'll answer your question about organizational structure. I wrote a Japanese-language book on the US Marine Corps. The Marine Corps has a unique organizational system called the Marine Air-Ground Task Force (MAGTF). The idea is to keep the air, land, and logistical elements together as an integrated team.

COS: . . . fractal structure, right?

Ikujiro Nonaka: Yes. It moved very quickly from a group to an organization without losing the basic functions of an organization. Without a fractal configuration, the organization has to dissolve.

Most cross-functional teams in Japanese companies consist of 10 to 30 members with diverse backgrounds, and there are 4 to 5 core members, each with multiple functional backgrounds. Is socialization crucial? Yes, but companies like 3M or Hewlett-Packard are very team-oriented and individual-oriented. Organizationally, Japanese companies enforce the formation of cross-functional teams, but in 3M's case, it's more voluntary, spontaneous, or autonomous. But the difference is a matter of degree, not kind.

I have to admit that socialization is difficult to achieve in the US because of its individualism and incentive systems. The Japanese incentive system is more team-oriented, and, in principle, we don't lay off people. Consequently, it is relatively easy to share experiences at Japanese companies. I admit there are infrastructural differences, but nonetheless, socialization is possible in the US. With socialization, American teams are stronger than Japanese ones, because Americans are strong individuals. Strong individuals and a strong team are complementary. Japanese teams may not necessarily be so.

To institutionalize team-oriented spirit, however, US organizations may need strong corporate cultures, such as those at 3M, HP, or the Marine Corps. For the Japanese, it's relatively easy to do that without strong organizational cultures.

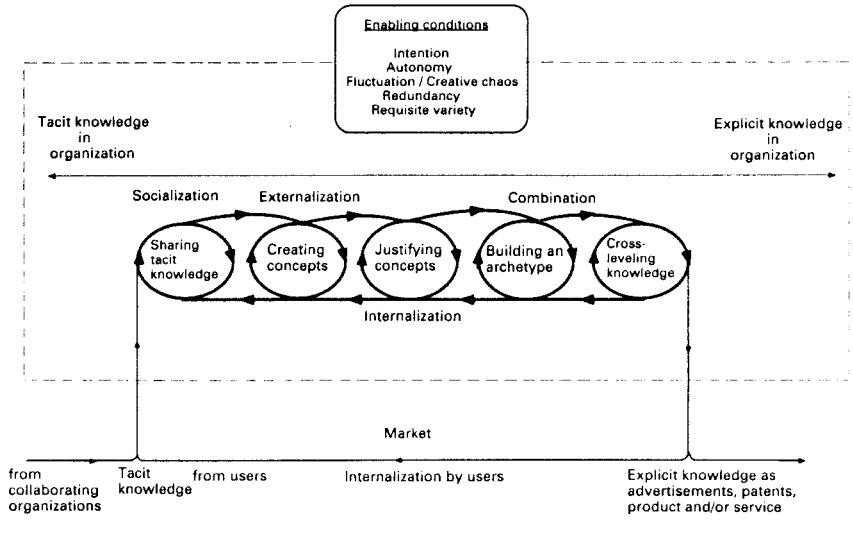


Figure 3 Five-phase model of the organizational knowledge-creation process.

Source: Ikujiro Nonaka and Hirotaka Takeuchi, *The Knowledge-Creating Company,* Oxford University Press, 1995, p. 84; reprinted with permission of the publisher.

COS: In the process model, is cross-leveling really a fifth phase, or is it a higher level of the previous four? SoL has had success in some projects, but in organizationwide dissemination of learnings and results, the whole corporate system reacts. The dissemination process does not work right.

Ikujiro Nonaka: Again, fractal or holographic structures help.

COS: What exactly does fractal mean in terms of different functions or different hierarchical levels?

Ikujiro Nonaka: Both are related. Autonomous individuals function as part of the fractal or holographic structure, in which the whole and each part share the same information and knowledge. Original ideas emanate from autonomous individuals, diffuse within the team, and then become organizational ideas. In this respect, the self-organizing individual assumes a position that is analogous to the core of nested Russian dolls. From the viewpoint of knowledge creation, an organization is more likely to maintain greater flexibility in moving from an individual to a group, to a department, a division, and corporation, and again back to the individual.

What we call the hypertext organization is made up of interconnected layers or contexts: the business system, the project team, and the knowledge base. In the case of Sharp, the Urgent Project System gives its members, who could be recruited from any section or department, the same "gold badge" authority as corporate directors during the project period. Once the team develops a concept and a prototype, they are quickly transferred to the relevant divisions for crystallization. In the hypertext organization, you have to have strong support from top management to form this type of team.

. . . the self-organizing individual assumes a position that is analogous to the core of nested Russian dolls.

COS: You sometimes define a hypertext organization as the ideal situation in which its members can switch to the context they need. But in your examples, it's not that flexible. If I'm appointed by the president to a top-priority team, that doesn't mean that I can switch the context whenever I choose. I haven't seen this instant switch in your examples. I have seen it only in your definition.

Ikujiro Nonaka: Of course, changing the context within the company is constrained by management. But the friction among individuals and groups in setting their task boundaries is greater and more dynamic in the hypertext organization. Once top management approves the members of the Urgent Project Team, they are empowered to do whatever they like to complete the project within a limited time. Also, they closely interact with top management. The roles and functions of top, middle, and lower-level managers may rotate depending on the context within this compressed process. For example, a project leader may take the role of a top manager, and a CEO can be below him or her, depending on the phase of the project.

Why knowledge creation? The most fundamental idea is that we can synthesize various theories and methods from the perspective of knowledge or knowledge creation. In neoclassical economics, the market is conceptualized as the place for competition, mainly in terms of price. What has not been explored so far is that the market can be viewed as a reservoir of knowledge. As Friedrich Hayek pointed out, the most critical knowledge in the market is contextual, namely, tacit knowledge.

How to build a system to convert tacit knowledge in the market to explicit knowledge and finally crystallize it into a product is an organization's fundamental function. Organization design can be conceptualized totally from the perspective of knowledge creation.

We can also reconceptualize business strategy from the knowledge-creation perspective, that is, how to capture, create, leverage, disseminate, and retain intellectual capital or knowledge. Leadership processes are also conceptualized from the perspective of initiating,

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promoting, and maintaining the four modes of knowledge creation. Knowledge engineering is the key process of leadership behavior. Corporate culture is further conceived from the perspective of shared experiences of acquiring, creating, exploiting, and retaining knowledge. Furthermore, it may be possible to construct basic disciplines of knowledge creation, such as the economics, sociology, or psychology of knowledge creation.

COS: Your criticism of Western theoreticians such as Peter Senge is that they lack theory. So you're using an argument that Western folks usually use against, for instance, Japanese approaches.

Ikujiro Nonaka: The learning model is rooted in the Skinnerian behavioral paradigm, but our theory is rooted in epistemology.

COS: I agree that learning concepts are about combination and internalization. But the work at SoL includes the externalization piece. For instance, dialogue plays a critical role in SoL's work. Dialogue, based on the work of David Bohm, is understood as collective inquiry into underlying assumptions and shared mental models. For Bill Isaacs, the director of the Dialogue Project, developing a theory of dialogue is essential. This is a field theory, so it describes the factors that determine the quality of the field. This is, especially for US and European companies, crucial because that's where the problem is in many cases.

For instance, there was a highly successful project at Ford, but the larger system resisted, so the dissemination process was not successful. Research has found that one leverage to improve quality and team learning is to improve the level of trust among team members. In SoL's work, I see all four angles that you describe in your work. However, your criticism may also shed some new light on what SoL is doing.

Ikujiro Nonaka: Since the introduction of our theory, I have seen a number of papers from the learning school incorporating the four modes of knowledge creation with different labels. I have two criticisms of learning perspectives:

First, they have not developed any comprehensive theory. They lack a view on the fundamentals of epistemology: what is knowledge, what is the nature of knowledge, and what constitutes learning. They are not clear about how the knowledge is captured, created, leveraged, and disseminated. They tend to focus on methods and tools of internalization. They are focused on the relationship between individuals and groups, but are not clear about the relationships between individuals, groups, organizations, and interorganizations.

Second, they generally consider learning to be an adaptive process. They are trapped in the behavioralistic concept of stimulus-response. They lack an active stance toward the environment. They view "double loop learning" as a special task.

COS: I agree with your criticism of the learning school, but I think that you are referring to only one part of the learning field. I see four paradigms of learning. One reason I was so intrigued by your work is because of your basic dimensions with ontological and epistemological distinctions. I also used those distinctions in my dissertation thesis, but in a different way.

In my thesis, the epistemological axis is the distinction between idea and experience. The ontological axis is the distinction between materialism and spiritualism, which could be called simple modernity and reflective modernity. Then you have four paradigms: the rationalistic view, the adaptive concept of learning, the emergent concept of learning, and the generative concept of learning. Senge's approach would be the latter in my view. And the Skinnerian approach is the adaptive approach. It is experienced-based or actual behavior, but only in the mode of simple modernity. So it is only the materialistic, external view, not the spiritualistic, internal view.

Your criticism of Senge is that the emergent type of learning is less emphasized and the main emphasis is on the generative concept of learning. But that concept also includes knowledge creation. You imply that Senge does not take into account the embodiment and unity of mind and body. Some of the new writings shed light on practical experiences. In *The Fifth Discipline Field Book,* Senge and others show that there is a lot of collective inquiry, to use your terminology, in the externalization mode.

Ikujiro Nonaka: In our framework, learning is internalization.

COS: Would you agree that there is a need for deeper theoretical reflection? The main focus of SoL's work is not to create consistent theory, but to create a new . . .

Ikujiro Nonaka: . . . practice.

COS: Yes. To cooperate with real companies. To create a group of companies that has practical experiences in projects. In other words, to generate data that could generate a new theory.

Ikujiro Nonaka: American pragmatism is fine. Everything is packaged. That's something that is a fundamental difference between pragmatism and epistemology. We have to go back to Plato and Descartes.

COS: I agree. But the American contribution may come from a philosophical tradition that is primarily based on pragmatism and an action orientation.

Ikujiro Nonaka: Yes.

COS: There may be other contributions from Japan and Europe that could develop the epistemological foundation on a global scale.

Ikujiro Nonaka: You may be right, and I understand that Dr. Senge has a more profound philosophy behind the developed techniques.

COS: There are also many other approaches toward organizational development and learning. Russ Ackoff makes the following distinction: First, there is data, then information, then knowledge. So information is about *know what,* and knowledge is about *know how.* The next level in his terminology is understanding, or *know why.* To transfer knowledge, you use training; to disseminate understanding, you use education. Would you agree with Ackoff's distinction between knowledge and understanding?

Ikujiro Nonaka: Understanding is built in knowledge. In our dynamic theory of organizational knowledge creation, *know how* is acquired mainly in socialization, *know why* is in externalization and combination, and understanding is achieved after internalization. Through one cycle of the knowledge spiral, we truly understand. We view knowledge as a dynamic human process of justifying personal belief toward the truth. The complete cycle across four modes is a transcendental process in which individual knowledge becomes group, organizational, and interorganizational knowledge, and then back to the individual.

FEATURE

Sharing Knowledge in Heterogeneous Environments

Natalia Levina

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On October 8 and 9, 1999, the first SoL Research Greenhouse brought together about 75 researchers, practitioners, and consultants to share ideas on leadership, organizational learning, and change. The exchange of ideas took several forms, including informal and formal conversations ("germination sessions"), poster and paper sessions, and panel debates.

As the conference organizers Karen Ayas (SoL) and John Carroll (MIT Sloan School) emphasized the importance of reflecting on the Greenhouse, this paper is a summary of my reflections based on my experience, memories, available research papers, and session tapes and notes. I center on the topic of knowledge sharing across boundaries—a focus of the Greenhouse's discourse and a subject of my own research.

The Community of Communities

In setting the stage for the Greenhouse, John Carroll stated that one goal of the event was to build relationships and nurture research in and around the SoL community. But the notion of "community" calls for a closer examination. Is SoL a single community? Karen Ayas noted that SoL unites researchers, consultants, and practitioners. These are three very different communities. Moreover, members of SoL belong to different national cultures, organizations, professions, and even research fields—all constituting communities in their own right. The realization that we live in a world of multiple communities is not new. However, in the past decade, research on learning has focused on homogeneous communities using a "communities of practice" lens (Brown and Duguid, 1991). The Greenhouse underscored a need to consider the heterogeneity within a community and its larger social context.

Dvora Yanow (California State University at Hayward) led one germination session in which 15 researchers discussed situated learning, knowledge, and knowledge transfer. The most prominent questions raised were:

- How does local knowledge connect to the collective knowledge in a productive way?
- What skills are necessary to achieve such connections?
- What are the limits to what we, as outside researchers, can learn about local practices?

With these questions as a base, presenters at the Greenhouse discussed how to successfully share knowledge across boundaries. They also talked about the leader's role and qualities in facilitating learning activities in heterogeneous environments as well as methodologies of studying learning.

In this paper, I pull together common themes from some of the case studies discussed and identify prominent success factors as a way to share academic knowledge with consultants and practitioners.

Reflecting on Case Studies

Most of the case studies focused on sharing knowledge across different boundaries inside heterogeneous groups and across different groups. I have found it useful in my own research to identify specific boundaries posing barriers to knowledge sharing. In the next

section, I classify types of boundaries relevant to the case studies, give an overview, and discuss their success factors.

Different types of boundaries pose distinct barriers to knowledge sharing (table 1). Some boundaries overlap (for example, status and relationship boundaries, and organizational and spatial/temporal boundaries), but each poses different challenges. For example, it is possible to have a relationship boundary characterized by a low level of trust between people who are in the same organizational unit, practice the same profession, have the same organizational status, and are collocated in time and space.

Selected Case Studies

Next I briefly summarize the case studies in the order of presentation. I indicate the groups in the collaboration, their goals, and the boundaries to knowledge sharing that they encountered.

Silicon Alley
Theresa Lant (New York University) studied the formation of Silicon Alley, a new community delivering Internet content, located in New York City. This new economic agglomeration spanning many organizations came together through converging boundaries of previously separate communities—traditional publishers, film-makers, broadcasters, journalists, graphic artists, entrepreneurs, and technologists. Different communities gathered to create a new single community with a unique identity. The boundaries to knowledge sharing, according to my classifications, were relationship, spatial/temporal, inter-organizational, and professional.

Xerox PARC
Sim Sitkin (Duke University) reported on his study of Xerox PARC projects conducted with John Seely Brown (Xerox PARC). They examined collaborations among artists, scientists, engineers, and designers or marketers. These cross-disciplinary collaborations were created in order to enhance innovation opportunities among individual specialists, while maintaining the separate goals and identities of the communities involved. The boundaries I identified were relationship, inter-organizational, intra-organizational, and professional.

Surgical Teams
Amy Edmondson (Harvard Business School) studied the introduction of new technology into surgical teams, highlighting the importance of knowledge sharing between physicians and nurses and across various medical care settings (for example, intensive care unit and primary care physicians). The goal was to adopt new medical technology as efficiently as possible into an already diverse community. The boundaries were relationship, spatial/temporal, inter-organizational, intra-organizational, professional, and status.

MIT-Visteon
Janice Klein (MIT Sloan School) studied the effectiveness of virtual teams by reflecting on lessons learned in the research collaboration between MIT and Visteon Automotive Systems, a parts supplier for Ford. The distributed team was located in several countries in Europe and the United States. The goal of the collaboration was to create a jointly defined research agenda and process. The boundaries were relationship, spatial/temporal, inter-organizational, professional, and national.

World Bank and Detroit Edison
Joyce Fletcher (Simmons College) and Katrin Kaeufer (MIT Sloan School) studied characteristics of distributed leadership in large organizations. At the World Bank, they looked at the effort to move the organization closer to clients in the field. At Detroit Edison, they examined the effort to address work/family issues. The boundaries to knowledge sharing here were spatial/temporal, inter-organizational, intra-organizational, and national.

The Natural Step
Hilary Bradbury (Case Western Reserve University) studied how change was achieved in The Natural Step trans-sectorial initiative on sustainable development. The initiative in-

Table 1 Classifying Boundaries.

Type of Boundary	*Boundary between*	*Major Barriers to Knowledge Sharing*
Relationship	People who had no history or poor history of prior interaction.	Low level of trust
Spatial/Temporal	People distributed in time and space.	Lack of contextual clues or details Memory loss Discontinuity in progress toward goals
Inter-organizational	People who belong to different organizations.	Differences in organizational cultures and goals
Intra-organizational	People who belong to different organizational units or groups.	Differences in: Unit sub-cultures Unit goals Local problem constraints
Professional	People with different professional backgrounds and training.	Differences in: Professional cultures Professional goals Specialized languages and methodologies
National	People belonging to different national cultures or ethnic subcultures.	Different national cultures and natural languages
Status	People who occupy different levels in the organizational hierarchy.	Inability to voice relevant knowledge Unwillingness to listen

cluded both scientific and business communities. The goal of the collaboration was to create and implement sustainable development initiatives. The boundaries were relationship, spatial/temporal, inter-organizational, professional, and national.

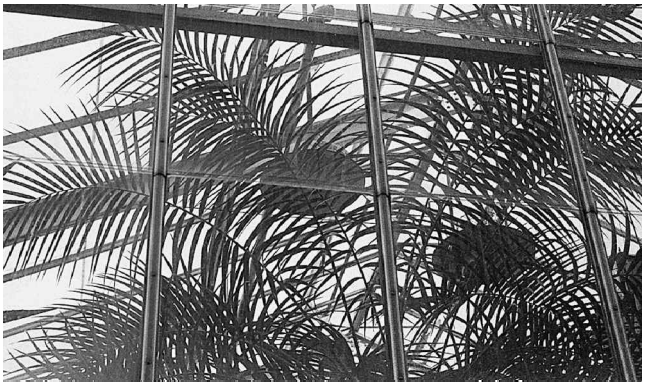
Total Quality Management (TQM) Studies
Nelson Repenning (MIT Sloan School) studied TQM and other process improvement techniques in various manufacturing organizations. These techniques were used to aggregate the knowledge of local unit operations into a model of a collective production system. The goal was to improve operational efficiency, for example, to reduce the number of production defects. The major boundary was intra-organizational.

Shell
Bill Brenneman (Shell, Texaco, Aramco's Equiva Services, LLC) and his colleagues used deep root cause analysis of major failures to move managers from a local focus to macro systems thinking. (Root cause analysis is a technique designed to use systems thinking for analyzing problems.) The goal for senior managers was to recognize which existing global structures were unsuitable for achieving performance, learning, and change in local organizational units. The boundaries were intra-organizational and status.

Nuclear Power Plants
John Carroll (MIT Sloan School) studied the implementation of root cause analysis techniques for major accidents in nuclear power plants. His goal was to share knowledge across organizational unit boundaries to understand what caused an industrial accident and make improvements. Instead, the approach was used for minute criticism on the local level, rather than for achieving understanding on a larger scale. The boundaries were spatial/temporal, intra-organizational, and status.

Ford
Nancy Dixon (George Washington University) studied how 37 Ford plants shared explicit knowledge on frequent, routine tasks among groups with prior related professional

knowledge.[1] Each plant's goal was to increase productivity by 5% a year. The boundaries were spatial/temporal and intra-organizational.



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British Petroleum (BP)
Nancy Dixon studied the Peer Assist program at BP, which shared site exploration expertise across different sites. At BP, unlike Ford, there was a need for sharing tacit knowledge of non-routine tasks among teams from somewhat different backgrounds. The goal was a successful site exploration. The boundaries were spatial/temporal and intra-organizational.

Teachers' Empowerment Group
John Meyer and Jean Bartunek (both from Boston College) studied the processes for developing and maintaining memory in a teachers' group with frequent turnover of members. The goal was to create programs to empower teachers. The boundary was spatial/temporal.

Network Technicians
Alessandro Narduzzo (University of Trento) conducted an ethnographic study of how network technicians installed wireless networks for customers across wide geographical areas. The goal was to improve the quality and efficiency of the installations. The boundaries were spatial/temporal, inter-organizational, and intra-organizational.

Community Organizers
Dvora Yanow discussed her field study of Israeli community organizers who were sent by a government agency to remote locations.[2] The goal was to organize local communities and to learn about their needs. The boundaries were spatial/temporal, intra-organizational, and status.

Success Factors

Although the case studies occurred in different settings and crossed various boundaries, many had common success factors in facilitating knowledge sharing. When researchers analyzed the data, they found the following 12 factors critical to successful knowledge sharing. I pull these factors together across case studies, provide my commentary on the effectiveness of a given factor in overcoming certain boundaries to knowledge sharing, and illustrate each factor with a few prominent examples.

1. Networks

Networking is important for overcoming relationship boundaries because it builds a history of positive interactions. In the Silicon Alley case, the ability to network and form relationships with actors from different backgrounds was critical in establishing a new community and pursuing entrepreneurial opportunities. In the surgical teams case, boundary spanning, which included networking with referring physicians and intensive care unit physicians, was the strongest predictor that the organization would adopt the new technology.

2. Tolerance for Mistakes

Having tolerance for mistakes gives groups time to build a relationship for long-term benefits despite a history of poor results, helping them overcome relationship boundaries. In the Silicon Alley case, a high risk tolerance among community participants meant that entrepreneurs and even established firms would rather make errors of commission than errors of omission. At Xerox PARC, managers believed in the value of learning from mistakes. They perceived that a lack of failures by collaboration teams indicated missed innovation opportunities. In the surgical teams case, psychological safety, described as "openness about mistakes," predicted successful technology implementation.

3. Group Stability

Group stability helps overcome relationship boundaries by giving people time to establish trust through multiple interactions. It also helps people cross spatial/temporal boundaries by developing the group's memory and facilitating continuous progress toward goals. In the formation of Silicon Alley, the repeated interaction between community members was a crucial element in legitimizing the community. In the surgical teams case, team stability was the strongest predictor of a team's efficiency in adopting the new technology. On the other hand, the lack of stability in the teachers' empowerment group, which had regular membership turnover, meant that lessons learned in earlier interactions were forgotten.

4. Structures for Interaction

Many Greenhouse presenters emphasized the value of structures in facilitating heterogeneous interaction. Structures help overcome relationship boundaries: some, such as formal selection processes, elevate levels of initial trust, while others create formal agreements for dealing with problematic relationships. Structures also help overcome spatial/temporal boundaries by building group memory and establishing processes for reaching goals.

In the Silicon Alley case and in the MIT-Visteon collaboration, physical infrastructures (for example, computer networks, meeting spaces, video-conferencing equipment) as well as scheduled repeated interactions among group members were important structures for organizing. Xerox PARC institutionalized the process of selecting candidates for the collaboration and created other structures for sustaining the effort and dealing with problems. Ford used several structures to institutionalize the transfer process: a computer information system, organizational routines for knowledge contributions and responses to the system, and measures of outcomes.

5. Shared Narratives

Narratives are a critical mechanism for overcoming spatial/temporal boundaries because they express a group's memories and describe contextual details. Members of the teachers' empowerment group relayed stories to share knowledge not readily available in a tangible form. The network technicians also shared narratives face-to-face and over the phone to convey procedural and historical knowledge.

6. Shared Artifacts

Shared artifacts are practical for overcoming many boundaries and were present in most of the case studies. As part of social structures, they inherit various roles that structures

play in overcoming barriers to knowledge sharing. In addition, shared artifacts help cross relationship boundaries by providing tangible results of work, capturing agreements between parties, and representing common investments. They help overcome spatial/temporal boundaries by allowing group members to see tangible steps in their progress toward a goal, building memories, and forcing members to be more explicit about contextual details. Shared artifacts are helpful in overcoming inter- and intra-organizational, professional, and national boundaries as they can facilitate the creation of common cultures, goals, languages, methodologies, and problem descriptions.

Shared artifacts help cross relationship boundaries by providing tangible results.

At Xerox PARC, images as diverse as network graphs, art collages, photographs, and Escher drawings conveyed ideas. In the surgical teams case, new, minimally invasive surgery created a challenge to provide effective illustrations and communicate ideas through images. The human body could not be used, which necessitated using less vivid, technology-based representations. This created significant communication problems: poor representations meant that team members had to learn to communicate verbally about things that were best described visually or through other senses. In The Natural Step and BP cases, experts involved in knowledge sharing relied heavily on charts and drawings on blackboards and walls. Finally, the network technicians used "official" artifacts (for example, an installation manual) and "unofficial" tools (for example, a temperature simulation tool) to aid their work.

7. Boundary Spanners

Boundary spanners often play the role of trusted agents for multiple parties. They know the details of different contexts and have memories of dispersed interactions, which helps them cross spatial/temporal boundaries. They aid in overcoming inter- and intra-organizational, professional, and national boundaries by belonging to multiple cultures, speaking many languages, sharing different goals or acting impartially, and understanding different methodologies and problem constraints.

In The Natural Step initiative, the leader of the effort was a boundary spanner between scientists and businesspeople. Shell senior managers integrated knowledge from many local business units. Network technicians working for the supplier company bridged the gap between the supplier and customers' organizations. Yanow's community organizers helped managers learn about local needs.

8. Common Language

Like shared artifacts, a common language is a joint investment that helps cross relationship boundaries. It overcomes differences in culture and languages in order to cross inter- and intra-organizational, professional, and national boundaries.

Silicon Alley needed a shared language that would also help establish a new, unique identity. The result was a language full of jargon. Xerox PARC's common language was a major accomplishment in aiding cross-disciplinary collaborations. Unlike Silicon Alley's specialized language, Xerox's was widely accessible to a large community of diverse individuals. In the MIT-Visteon collaboration, establishing English as the common language helped communication in a globally dispersed team. In The Natural Step initiative, not only was there a necessity for a common language, but participants had to perceive the language as neutral. The language of science served this purpose.

9. Using Process Improvement Techniques

Process improvement techniques both create structures for interaction and encompass shared artifacts. In addition, they are powerful tools for integrating constraints encountered in different local contexts, facilitating knowledge sharing across intra-organizational boundaries. They also help overcome status boundaries by allowing low-status organizational members (for example, line managers) to share their knowledge.

In the TQM studies, process improvement methods were used to aggregate knowl-

edge from various local contexts into a comprehensive systems model. Similarly, at Shell, root cause analysis techniques helped managers understand how global structures constrain local action. However, in the nuclear power plants case, root cause analysis methods were not used to share knowledge, but rather to punish individuals.

10. Goal Alignment

Goal alignment, marked by shared and individual, non-conflicting goals, is a direct mechanism for dealing with differences in goals created by inter- and intra-organizational and professional boundaries.

For the MIT-Visteon collaboration, a key lesson related to the misalignment of goals between academics and practitioners: a long-term academic focus versus a short-term industry focus. In The Natural Step initiative, self-interests needed to connect to common interests to effect change. For example, IKEA, a participating organization, wanted to appeal to a well-educated European market by implementing good environmental policies. Participating scientists wanted to both publicize their ideas about environmental issues and collaborate with other scientists.

11. Norms of Reciprocity

Reciprocity is a mechanism for dealing with differences in goals without achieving alignment. It helps share knowledge across inter- and intra-organizational and professional boundaries by facilitating collaboration based on mutual help.

Each Ford plant had to increase productivity by 5% a year. This incentive made all plant managers look for ways to improve processes. Reciprocal behavior occurred because each manager had to contribute ideas to the system, while their implementation was voluntary. At BP, the success of site exploration was a performance criteria for the teams: getting valuable advice from others was key to enabling success. Knowledge exchange was based on the norms of reciprocity. Since there was a need for outside expertise at many sites, it was common for one site to support another without any monetary compensation.

12. Small Scale

Starting small is important for overcoming all types of boundaries because sharing knowledge on a large scale is difficult. Starting small mitigates the risks associated with failure and allows participants to learn through experiments in overcoming various barriers.

Xerox PARC initiated the interdisciplinary collaboration projects on a small scale by carefully handpicking a group of scientists and local artists to work together. In the surgical teams case, the new technology was introduced in a few procedures, with adoption rates changing depending on the success of initial trials. Participants in the MIT-Visteon collaboration decided to start their virtual interaction in only three locations. In The Natural Step initiative, the project started from several conversations involving some scientists and later a few corporations. Ford began its effort in a face-to-face exchange of process improvement ideas between two plant managers and then moved to a formalized technology-supported exchange. At BP, the initial exchanges began with a few teams asking for help.

To summarize, networks, tolerance for mistakes, group stability, structures for interaction, shared artifacts, boundary spanners, and a common language (factors 1–4, 6–8) all played a role in dealing with relationship boundaries. Group stability, structures for interaction, shared narratives, shared artifacts, and boundary spanners (factors 3–7) were important for crossing spatial/temporal boundaries. Shared artifacts, boundary spanners, a common language, process improvement techniques, goal alignment, and norms of reciprocity (factors 6–11) were useful in overcoming inter- and intra-organizational, professional, and national boundaries. Process improvement techniques (factor 9) were also important for overcoming status boundaries. Finally, a small scale (factor 12) appears to play a role in overcoming all types of boundaries in knowledge sharing.

While I have given only a few illustrations, I suspect that these success factors were applicable across most of the Greenhouse case studies.

Leadership Role and Qualities

A few presenters reflected on the role and qualities of leaders in their case studies, some of which I list below. I then comment on how these qualities help overcome various barriers to knowledge sharing.

In the surgical teams case, the role of team leaders (surgeons) was critical for implementing procedures successfully. The surgeons' behavior included carefully selecting team members and coaching them on creating an open environment, leading discussions, nurturing trust, and focusing on teamwork.

Starting small is important for overcoming all types of boundaries because sharing knowledge on a large scale is difficult.

At the World Bank and Detroit Edison, leaders were able to speak from experience, voice what was going on around them, and deal with conflicting situations. In these two organizations, leaders who wanted to share local learning with the larger collective often had to struggle with the fact that their roles were invisible and that their actions provided only an opportunity for change—the actual change had to happen through the collective actions of others.

In The Natural Step initiative, the leader had to play the role of a boundary spanner between scientists and businesspeople. He had symbolic power (in this case, the power of science) and economic disinterestedness.

At Shell, a key role of senior managers was to understand the interrelationship between many local settings. Such understanding allowed for more effective strategy development and an ability to enrich local settings by introducing collective knowledge.

In reflecting on the distributed leadership qualities shown in the case studies, I think that the effective leaders were responding to various knowledge-sharing barriers (table 1). Clearly, many leaders were boundary spanners. In addition, most leadership qualities included fostering relationships, reconciling conflicting goals, and creating structures to enable collaboration. The leaders played crucial roles in overcoming status boundaries. They used their power to voice others' concerns and create open environments. The effective leaders in heterogeneous environments were instrumental in designing and implementing various success factors in practice.

Methodological Issues

Can researchers, as outsiders, study local knowledge? Most of the Greenhouse researchers collaborated with insiders, were insiders themselves, or became "partial insiders" through the use of ethnographic methods. For example, Sim Sitkin conducted his research with John Seely Brown, the head of Xerox PARC, while Amy Edmondson collaborated with a medical doctor and a technology and operations researcher. Bill Brenneman was an insider in the corporation that he studied. Alessandro Narduzzo spent seven months studying the work of network technicians using ethnographic methods. Many other researchers demonstrated that collaborating with insiders or becoming insiders is necessary to study local knowledge.

Greenhouse researchers often played the role of boundary spanners themselves. They had to cross all types of boundaries to share knowledge with their study participants. They had to establish trust, learn new languages, create shared artifacts, provide structures for collaboration, define shared goals, and often start their research on a small scale.

Conclusion

Telling stories, discussing what worked, building theories, and reflecting on methods was how SoL researchers shared their heterogeneous experiences. While I have attempted to consolidate some common themes, it is clear that 12 success factors are hard to track and implement in practice. The multitude of factors indicates that knowledge sharing across boundaries is difficult. Here I have analyzed what made various factors effective—that is, they helped people overcome specific barriers to knowledge sharing.

Identifying the barriers to knowledge sharing in a given context and then designing strategies for overcoming them is a practical way to address knowledge-sharing challenges. The Greenhouse provided a repertoire of useful strategies, some more useful than others in certain environments. For example, sharing artifacts is often more practical than engaging boundary spanners because of the psychological stresses that boundary spanners have to overcome and their limited availability (Star and Griesemer, 1989). Also, some success factors described here may have wider applicability than was apparent from the Greenhouse cases. For example, a study of an emergency room found that a white board—a shared artifact—helped deal with status boundaries by giving nurses a place to express their knowledge (Østerlund, 2000). Some success factors that are applicable in one situation may not work at all in another. For example, sharing narratives is extremely effective for overcoming spatial/temporal boundaries (Brown and Duguid, 1991); however, if there is a difference in natural or professional languages due to the presence of other boundaries, sharing narratives may be impractical.

For the SoL community, the Greenhouse represented *ba*—a shared space that provided a platform for advancing individual and collective knowledge. I find this concept, borrowed by Nonaka and Konno (1998) from the Japanese philosophy of existentialism, useful in describing a meeting place for a community of communities. We all have *bas* inside our communities and organizations. SoL can be seen as a *basho*—a collection of researchers', consultants', and practitioners' *bas*. The discovery of similarities in analyzing the same phenomenon from different angles during the Greenhouse is an invitation to use this *basho* for further collaboration and cross-pollination of ideas.

Notes

1. Nancy Dixon reported on the work from *Common Knowledge* (Boston, MA: Harvard Business School Press, 2000). She used examples of Ford and BP to illustrate different knowledge-sharing needs and transfer mechanisms. Her book contains many studies of intra-organizational knowledge sharing.
2. Dvora Yanow gave several examples of various organizations using or failing to use bicultural translators—people capable of translating local knowledge into a larger context. I highlight only one example based on Yanow's research.

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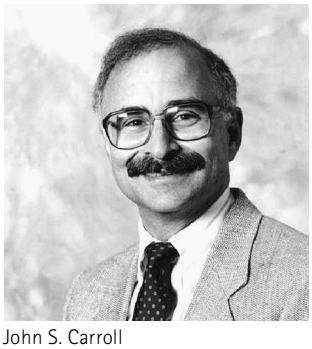

John S. Carroll
Professor of Behavioral and Policy Sciences
MIT Sloan School of Management

Commentary

by John S. Carroll and Karen Ayas

Natalia Levina provides us with a provocative report on some of the discussions held at the SoL Research Greenhouse. We organized the Greenhouse to stimulate conversations and relationships among researchers, consultants, and practitioners in the SoL community. We also invited participants from outside SoL. The multiple communities within and across constituencies offered each other different ways of thinking about research, learning, and change. Levina captures the excitement of a diverse group sharing their experiences as researchers and participants in the creative process within and between organizations. She gives us a glimpse of the stories that were told and the themes that were explored. She uses the theme of knowledge sharing across boundaries to present both the commonalities among the different cases and the richness of each individual

case. By identifying kinds of boundaries and the factors critical to crossing those boundaries, she offers helpful typologies and concepts for researchers and practitioners interested in knowledge and learning.

As Levina summarizes succinctly, a lot of ground was covered in two days at the Greenhouse. Participants explored new and emergent topics and cultivated connections across and within communities. Yet, the Greenhouse also showed how difficult it is to assemble researchers, consultants, and practitioners into common research pursuits, that is, to move from idea exchange to action projects. The Greenhouse featured "germination" sessions in which small groups met informally to develop research collaborations or explore topics. Our hope for the Greenhouse—and, in particular, for the germination sessions—was to cultivate research projects that would involve participation from the practitioner, consultant, and researcher communities. The Greenhouse was a first step in that direction: the conversations and connections laid the foundation for research that can cross boundaries and bridge different communities of practice.

By sharing her paper with the readers of *Reflections,* Levina continues and extends the work of the Greenhouse to build connections and generate new ideas and research activities. We were stimulated to push our own thinking in two directions. First, what nascent theory of knowledge sharing across boundaries is struggling to emerge? Second, how is the research process itself an example of boundary spanning and boundary reshaping?

Knowledge sharing is one of the central philosophical and practical problems of human society. How can one person's knowledge be given to another? How can an organization or a community accumulate and use the knowledge of its individual members? By analyzing discussions of numerous examples at the Greenhouse, Levina offers a typology of boundaries, barriers, and critical success factors. Typologies are a great analytical tool for comparison and simplification. They help us to see the connections among different examples and how the examples apply to our own work. From the typologies, additional questions emerge because the typologies have cleared away so much of the undergrowth: Is knowledge really being "shared" in the sense that the same knowledge is appearing in multiple times and places, or is knowledge being "socially reproduced" to create "progeny knowledge" that embodies its heritage in new combinations embedded in new contexts? Underlying the lists of barriers and success factors, is there a contingency theory or a system map that could offer new insights with a more interactive and dynamic flavor? Can we analyze the barriers and success factors to reveal concepts such as "emotional connection" (group stability, tolerance for mistakes, networks, goal alignment, norms of reciprocity, and so on) and "informational connection" (common language, shared narratives, shared artifacts, structures for interaction, process improvement techniques, and so on) and then understand the details of how combinations of barriers have to be addressed in particular contexts?

The research process itself, at its best, is a great example of knowledge sharing across boundaries. Researchers seek to collect and classify, compare and contrast, juxtapose and differentiate, in ways that build a cumulative knowledge base for all humankind. Research is a systematic and disciplined inquiry process that depends on researchers' personal commitment to deep values (truth, sharing) as well as their playfulness with ideas and possibilities. At its worst, research becomes a doctrinal technique authorized by professional elites who control access to journal space, tenure positions, and social status. What keeps research vibrant and productive is the constant interaction across boundaries: between fields, between generations of researchers, between researchers and practitioners, and between accepted reality and imaginative possibility.

Levina closes her paper with a wonderful metaphor from Japanese philosophy, describing the shared space for advancing knowledge *(ba)* and the meeting place for building a community of communities *(basho).* We designed the Greenhouse to be such a space. SoL is intended to be a community of communities. We believe that research can help us generate and share knowledge and that research can become a more central part of the reflective practice of the SoL community.

Some comments from participants:

Ruthann Prange (consultant member from US)

The Greenhouse attracted great research talent, and the design encouraged rich sharing of work, questions, dilemmas, and possibilities. The genuine interest by researchers in sharing their knowledge and inviting comment, input, and collaboration—and their desire to be truly relevant—was very unlike the stereotypes of "academics." The gathering provided a chance for researchers from many institutions to connect with one another in fruitful ways. I believe partnerships with researchers can be very powerful in pursuing our SoL objectives.

Karen Ayas
Associate Editor
Reflections

Alessia Contu (researcher from Italy)
We had the opportunity to exchange ideas and reflect together on what we really value and on the meaning of our practice.

Peter Schutte (consultant member from Netherlands)
It was good to see that some good, serious research is developing and coming together. Organizational learning beyond metaphors!

Shigehisa Tsuchiya (researcher from Japan)
The two days were so inspiring and stimulating that I felt as if I had spent two weeks interactively learning with participants.

Becky Smith (research member from US)
The Greenhouse was a hotbed of brain power and vision. It was an opportunity to have meaningful exchanges with people from other cultures with common concern about our world and human issues.

dt ogilvie (researcher from US)
My germination sessions were helpful to my thinking about my topic and teaching. Although some don't appreciate organizational learning, I think many of the participants are on to something that can make a difference.

Stella Humphries (research member from US)
SoL has a unique and ambiguous role within the research community, which is both the good news and the bad news. So it is a challenge to envision what a good research event could be—it depends on your vantage. "Pure" academics have more formal expectations of form of communication and rigor of ideas and their presentation. "Action researchers" or practitioners expect to have applied value, more informal exchanges, and more social connection and engagement in exploration of possibility.

We should consider: What is research in the current reality of the workplace? How can research and work become more seamless? How can we be helpful to the practitioners and produce research that has useful application?

Chris Unger (research member from US)
What actions will come of all this? I have a great interest in inquiry groups, seven to ten people with similar questions and interests. These could be generated from a larger event, like the SoL Greenhouse. This kind of activity could be a worthwhile experiment within SoL.

Hilary Bradbury (research member from US)
Balancing the facilitation between scholars and practitioners might be helpful—and having the role of a discussant be shared among them too (much as *Reflections* does).

Peter Senge (SoL chair)
I would like to get people excited about the possibilities of achieving significant change, beyond just the intellectual excitement of new ideas. Academics are often sadly isolated from the pulse and passion of deep change, and if they were only a little closer to it, it would fire their intellectual imaginations as well. This does not mean that skepticism should be thrown out in favor of passion. The two can co-exist, and are both desperately needed.

The spark of SoL comes, I believe, when the best thinkers and the most talented practitioners meet and when significant new ideas lead to significant results and people begin to feel viscerally the types of extraordinary innovation that are possible, and desperately needed.

FEATURE

Business Evolution: A Manager's Reflection

Barbara B. Lawton

This story is about an internal consulting group formed to support a company's purposeful transformation of its business model. The CEO recruited me to design and manage this group. Our efforts reflect the best knowledge my colleagues and I had in the areas of organizational development, organizational learning, knowledge management, process reengineering, and total quality management.

I wish I could say that our efforts were highly successful, but they were not. But neither were they complete failures, as I had often felt when I first left the company. Our time at the company was tumultuous and rich in experience. My goal here is to share what we learned through this effort.

I begin with a description of the company and its challenges. I describe my goals and assumptions and the design of our consulting efforts. Next I briefly discuss our failures and successes and, finally, review our key learnings.

Barbara B. Lawton
Knowledge Strategist
TIS Worldwide

The Company

Storage Technology Corporation (StorageTek®) is a manufacturer of electronic data storage devices (tape, disk, and tape libraries). The company has had a bumpy history over its nearly 30 years of existence. At one point, it was among the fastest growing companies in the US, and at another, it filed for bankruptcy protection. Throughout the nineties, it had a leadership position in mainframe tape and tape libraries.

With the Internet and the explosive growth of digital data in the nineties, the data storage industry is experiencing 20% to 50% growth rates. This growth, however, is primarily in the open-systems storage market rather than in mainframe data storage. To benefit from this growth, StorageTek needed to leverage quickly its success with mainframe data storage into the open-systems market. While there are numerous technical challenges in this change, the organizational and cultural challenges are at the heart of this case study.

The company's culture is complex, influenced greatly by the perceived source of its success, namely, the technical superiority of its products and the repercussions of its repeated layoffs for poor financial performance. At the risk of gross oversimplification, the culture valued technical ingenuity that fueled a "not invented here" (NIH) syndrome. The use of leading-edge technology often created significant delays in the development and delivery of new products, which in turn hurt the company's financial performance. The turnaround CEO who brought the company out of bankruptcy and led StorageTek until the mid-1990s had a strong, top-down management approach. His style was reflected in the company's highly centralized organizational structure and employees' "don't rock the boat" mentality.

When I joined in June 1997, the company was in transition. Its revenues from its legacy business lines were at an all-time high, and there was real optimism throughout the company about the new CEO's ability to lead the needed business transformation. The CEO quickly broke the centralized structure by creating independent business groups and dissolving most corporate functions. The goal was speed through local decision making and action. He hired new talent for the organization's leadership positions and began working with the leadership team to crystallize the company's core purpose and values.

Because of the company's sensitivity to poor product quality, a contributing factor to its earlier bankruptcy, corporate quality was one of the few corporate functions that had not been dissolved. Yet this function was outdated. I joined StorageTek to take over the corporate quality function and to reconceive its role, given the company's goals and challenges.

In my experience, it has been more effective to change an organization through its work . . . than through programmatic change. . . .

Corporate quality's domain included business processes fundamental to the company's future success, namely, the development of new products (that is, the PMP or program management process) and the marketing of new products and services. While we could not "own" these processes, especially in a decentralized environment, we could act as stewards for their health and evolution. By default, we owned the definition and maintenance of the company's corporate quality systems. And we were asked to investigate knowledge management with our partners in HRD (human resources development) and to begin to introduce it to the company. HRD had the explicit charter to guide the company's business transformation. Neither group had a charter to make StorageTek a learning organization.

As a student and veteran of several change efforts, I was satisfied with our challenge and opportunity. In my experience, it has been more effective to change an organization through its work—for example, working on the core PMP and marketing processes—than through programmatic change, such as implementing total quality.

Goals and Assumptions

The cultural and organizational changes StorageTek needed to be successful in the open-systems market were transformational. The open-systems arena was a relatively immature market space where first entrants had the ability to rapidly develop dominant positions and create de facto standards. In this environment, players soon sort out into one of two categories—the quick and the dead. StorageTek rapidly needed to become quick and agile, almost a direct antithesis to its current state.

My goal as head of corporate quality was to develop the company's capability to evolve rapidly, particularly in our areas of responsibility. This seemed the most important contribution we could make to the company's success, and any alternatives, such as an expert content model or centralization of core processes, were completely untenable under the circumstances.

Evolution is a process of ongoing learning and adaptation. It involves sensing changes in the environment (internal and external), interpreting those changes, creating a model or theory for action, and then acting accordingly. I'll list my beliefs on evolutionary speed, as they shaped the fundamental design of my group. You'll likely notice the resemblance to the human brain, which has the most advanced learning capability in evolutionary history.

- Distributed intelligence, that is, local sensing, interpreting, and acting, is of the essence. Each individual can see different parts of the environment, because of both what they have access to and what they are sensitive to. As changes in the environment affect their work, they are also in the best position to develop locally adaptive responses.
- The intelligence within the group must be connected through a fine-grained web of interaction. The degree of connectivity certainly determines the speed at which learning in one part of the organization can be accessed by other parts of the organization. Beyond this most basic function, it also represents the organization's potential for sensing and interpreting complex signals and for developing new and cohesive responses. For example, the fine-grained connectivity between individual brain cells creates the learning prowess of the human brain.
- The group must then have the capacity to act on new ideas and directions. First and foremost this requires leadership. Second is the know-how to make an organization change.

Based on these assumptions, we redesigned the corporate quality group to (1) develop connectivity within the organization to accelerate learning and sharing of core business

processes, and (2) increase its capacity to change systematically at the local level, as required by the business needs. We renamed the group Business & Quality Processes (BQP).

Concrete, Specific Concepts

Finding Strengths to Build on

We began with an informal search to find effective practices for sensing change and collective learning within the company that we could build on. We found in several professional groups (for example, service engineering, reliability test, organizational development, software development), CoPs (active communities of practice)—informal gatherings of people who work in similar professions that come together to share information, experiences, and questions and to help one another along the way.

The most active, sophisticated group came from the software development community. The group members were connected through numerous channels, each devised for different purposes. They created a seminar series to share work and introduce ideas from outside the company. A subset of the community formed, with professional assistance, a curriculum to support development of new levels of expertise. Discussion groups, e-mail lists, and web sites were among their other communication vehicles.

We believe that this connectivity made sensing and learning within the community highly effective and efficient. Connectivity broadens the information base accessible to everyone. Individuals within the community have some information sources that they share and many others that are unique. The network is efficient in that individual members act as information filters and signal enhancers, reducing the time it takes for any single person to find useful information. The interpretation that members add to information, based on their own experience, enhances its value. Perhaps most importantly, the ongoing interaction between community members supports development of the common understanding and commitment necessary to take action for change.

The software community began when software development was a centralized corporate function. The community members are now dispersed among the different business groups. The CoP, however, continues to adapt and thrive to meet the needs of its members. (In my mind, I visualize it as an amoeba, changing shape in response to its environment.) The one part-time person who supports this community by organizing meetings, locating speakers, and so on, has been funded by various people who have recognized the CoP's value.

We also looked for effective process improvement and change efforts within the corporation. Here there were many, ranging from ROS (rapid organizational start-ups) supported by the internal organizational development group, to major process reengineering associated with implementation of an ERP (enterprise resource planning) system and active process improvement in manufacturing to reduce defects.

There were a few obvious factors common to each success, such as active leadership and a common understanding of the business reasons for change. We made two other observations that shaped the design of BQP. First, people had a high level of comfort with and acceptance of process and change work within the company. Second, they expected that a very qualified person would facilitate (that is, consultants) and lead the change process. Employees did not believe that they should know how to do that themselves.

Based on our assessment of StorageTek's strengths, we developed a concrete, specific design for our group. We adopted the CoP model as the primary way to enhance learning and share through connectivity. Second, we adopted the process consultant model as the primary means for enhancing the change capability and capacity within the company.

Selecting Communities of Practice

The software community became our role model for an effective CoP. By profiling the role and duties of the person supporting the software CoP and some external benchmarking, we created the role of practice manager. A practice manager position was then set up for each of the three core processes we were expected to support—marketing, program management, and quality—and a fourth part-time position to give a permanent home to the de facto soft-

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ware practice manager. Where possible, we hired the practice managers from inside the community, and members of the community interviewed the candidates for this position. An external consultant specializing in CoPs provided initial training to the incumbents, and an internal organizational learning specialist provided ongoing support.

Creating Change Capability

We believed that the leadership for business process change had to come from the business groups, where there was need for performance improvement. Only the general managers or their designees had the authority to sponsor and lead such a change within a business group.

We chose to establish a business process consulting group with expertise in process innovation and improvement, as well as organizational development. The senior hires in this group, called business unit consultants, had MBAs and significant consulting experience outside of StorageTek. They had a dotted-line reporting relationship to the general managers of each business group and were to help them prioritize and drive change, as well as facilitate specific change efforts.

BQP's Timeline

I dissolved the old corporate quality group in fall 1997 and formed BQP. During that winter, we staffed the new group and, in the early spring, provided training and coaching in organizational learning and systems thinking. One year later, corporate headquarters had an eye-opening ISO 9000 audit of its quality systems. The quality systems that were once a great strength were in jeopardy from benign neglect. BQP's primary focus became the development of quality systems within the new business groups and the renewal of systems within the legacy businesses. During the course of the same year, the company's stock price fell from a high of $50 per share to less than $20. As the work and priorities of the group changed with time and events, I and many of my staff felt that this was no longer the work we came to do. When the company offered a voluntary separation program in spring 1999, most of the BQP group took advantage of the program, including me.

The two years we worked at StorageTek were tumultuous and rich. In the following sections, I describe our failures and our successes during this time and what we learned.

Our Failures

We failed to accomplish any of our major goals, namely:

- Establishing CoPs based on the software CoP role model in marketing and program management.
- Facilitating the development of core processes (program management and marketing) with performance competitive in the open-systems market.

Our Successes

Successes were hard to recognize while we were at StorageTek. Our goals were so large and the disappointments so regular that it was often difficult to see what change we did engender. Our most significant successes included the following.

Connectivity for Sharing Ideas

Connectivity happened, but not as we intended. Our model was to grow "fine-grained" connectivity between individuals within specific communities that would support the rapid sharing and adoption of new ideas. Instead, the practice managers and process consultants became accepted community hubs that acted as matchmakers, linking those seeking to learn and adapt with those who had experience. It was our hope that as the

number of successful linkages grew, a network of relationships would develop among the community members themselves.

Changed Culture

StorageTek started with a culture of NIH or reject new ideas that were "not invented here." After the ISO 9000 audit in 1998, the pressure to develop internal processes quickly escalated. The groundwork we laid to establish CoPs created a climate in which it was okay to see what other business groups had in place. Those who sought ideas from the other business groups were pleasantly surprised as the practices found in another area could, with modification, be adopted in theirs. Seeking and sharing became routine within certain groups. We feel this turned the corner toward creating a culture of SIS or "steal ideas shamelessly."

Scenario Thinking

Senior managers were concerned about the possible effects of Y2K on the company's economic performance. We were able to propose and lead scenario thinking across the corporation. After creating scenarios for potential changes in customer buying patterns, we involved key people across the company's value chain to examine the effects of these changes and develop potential response scenarios. This was perhaps our most effective intervention in terms of introducing new ways of dealing with uncertainty and in developing a consensus and state of readiness throughout the company.

Productive Conversation Skills

Our close relationship with the organizational development group enabled us to recommend a speaker for the company's biannual leadership conference. We brought in a renowned, extremely effective consultant who led the group through several exercises in productive conversation. Based on participant survey results, this event was one of the top two at the conference. This consultant continued work with the senior managers, and over time, several key leaders changed their behavior.

New Quality System

The extremely poor ISO 9000 audit in 1998 brought the need for process infrastructure to the forefront of managers' consciousness. Business managers now had to devote time and resources to retain the company's ISO 9000 registration. Our role was to lead and coordinate the creation and maintenance of a process infrastructure across the corporation. We used this opportunity to present process as a means for capturing knowledge and ratcheting up organizational performance. We also promoted a policy of enabling employees and learning through process rather than one of control. The relatively short time frame for this work promoted sharing, and the community responsible for making it happen rapidly formed an active CoP.

Our Learnings

Tapping the Company's Energy

So much of our model did not work at first. We designed a system based on our high-level assessment that, in essence, would work everywhere and nowhere at the same time.

Establishing a new CoP turned out to be an almost impossible task for the practice managers for various reasons. Our model's key assumption was that professionals would be motivated to become involved in a CoP by their desire to continue learning about their field and to network with others doing similar work. We had not accounted for their much greater need to "survive," that is, complete their extremely heavy workloads under very tight schedules.

The general managers of the legacy businesses were not interested in change. They too were driven by more immediate business needs, such as the timely completion of product projects underway. This is a vicious cycle. Without improving their core processes, they will always be late. If late, they will never have time to improve their processes.

The heads of the new businesses did not want consultants. These groups were chronically understaffed, and they wanted people who would do the work of process development and documentation rather than facilitate it.

With anxiety about failure driving our learning, we found that success depended on our ability to:

1. Sense where the energy (that is, pain or desire) in the company existed.
2. Be opportunistic in finding ways simultaneously to address our clients' immediate needs and fulfill our goals.

When we stopped forcing our model to work and started listening, we not only found opportunities to contribute, such as the scenario planning, but also found ways to evolve and adapt for joint success.

Program managers within one of the new business groups quickly saw the benefit of meeting with each other to discuss difficulties they were personally facing and to gather insight or information from others. Once this group coalesced, the members began inviting people from other business groups who had similar interests. Starting small allowed the CoP to grow in a natural, sustainable fashion.

Program managers in other business groups, while not interested in spending time in community discussion groups, were very interested in having the practice manager participate in all their meetings and thus be the conduit for information flow within and across business groups. While this was not the original plan, it did fulfill our goal of creating a greater level of connectivity than previously.

Using the energy already in the system, we chose to drive process development and improvement through projects that focused on specific products. We identified the potential business failure modes for the business groups' most important upcoming products. From there, we helped each identify the processes most critical to near-term product success. In one business group, this analysis led to a focused effort to define the product launch process in preparation for an upcoming product launch. In another, it drove improvement of the software test process to reduce the time it would take to test an upcoming product.

The Foundation

Developing the capability to rapidly learn and change or evolve is, in many ways, an extension and enlargement of the ideas and methods of total quality and continuous improvement. Certainly, the domain expands from continuous to discontinuous change and requires another level of human skill in learning. What is important here is that the earlier excellence through quality effort at StorageTek created a foundational belief and skill set that is an important stepping stone to organizational learning. The program developed the skills for process improvement, created a customer focus within the organization, and reinforced the importance of collaboration and teamwork. It also drove the creation of a healthy process infrastructure necessary for the predictable operation of all but the smallest companies. This was a hard-won success for the corporation.

When I joined StorageTek, I felt that the underlying quality culture was secure, so we put all our resources and energy into taking the next steps forward. But with the formation of new business groups that had no process structure, and the hiring of hundreds of new people each year into the corporation, the quality foundation was diluted and eventually lost. This was a serious oversight. Without that common cultural and technical foundation and an effective process backbone, we could not engage the corporation in organizational learning and knowledge management. Several groups within the corporation actually lost ground during this time.

All advances build on previous gains. I now believe that the plan for any advance should include the conscious streamlining and maintenance of the foundation.

Evolution

There are many possible titles for this last learning point. It could also be called, "Capability is grown, not assembled," or "You can only learn on so many fronts at any one time." While I describe this point in terms of BQP's experience, it is also very true for the whole corporation.

BQP was never able to perform to its full potential. Assembling a disparate group of highly talented people is not enough to deliver on a high-level vision. It takes time to develop a team and for people to get to know each other and feel comfortable working together. It takes even longer to develop a common vision and goals, to develop a common conceptual framework (that is, understanding organizational learning and its role in evolution), and to build new skill sets such as dialogue and systems thinking. This growth and development work requires a significant investment of time and energy.

Beyond this, the group members had only the most basic job description as a starting point. The positions we created did not exist in the corporation before, and no one had held jobs just like these before. Each person had to define his or her own role in the client organizations, the work, and how it was done. This job ambiguity, the struggle to find appropriate work in the client organization, and the need to demonstrate our ability to create value generated a great deal of stress for everyone. Lastly, we had to create our own organizational structure—how did we find work, how do we communicate and make decisions, what are our work processes?

At times, the sum total was overwhelming. And often, just as capabilities developed and connections became clear, there would be shocks to the system (for example, a mandate to go to zero-based budgeting within six weeks) that would alter the direction and undermine any confidence gained. The end result was a general failure to thrive within the group.

The upshot is that the course of development and evolution (learning and adaptation) takes time. Just as with an infant's brain, all the components (cells) are there. The connectivity that yields intelligence, however, is developed over time through use: sense, interpret, act, or adapt in a supportive environment.

Leadership

The BQP group set out to make significant change in a large company. Leadership for change, from the CEO and the business managers, is probably the most fundamental, critical ingredient for success. Unfortunately, there was an acute business downturn soon after our group formed that took management's focus away from the chronic problems at the root. The general atmosphere became one of living through today so that we have a future to worry about tomorrow. We consultants did what we could to fill that leadership void by building and maintaining some momentum for change. Regrettably, much of the company became trapped in doing the same old thing harder, further reducing the time available to change. Only leadership can break that vicious cycle.

Closure

BQP is still a viable group within StorageTek, though now reporting through the COO rather than the CEO. Since the ISO 9000 audit in August 1998, its primary charter is the redevelopment of the quality system and the rebuilding of the corporation's quality foundation. This includes support for the development of core business processes, as requested by the business groups.

Many seeds we planted continue to grow. The quality CoP, which involves people from all across the corporation, continues to strengthen and grow. An organizational effectiveness CoP grew from the remnants of the CoP for BQP consultants and practice managers. This new CoP connects all the internal consultants at StorageTek (for example, from BQP, organizational development, education) and helps them learn from and support one another in their work. The corporation's quality framework is shaped by and infused with the ideas and values we brought to the company. Some other ideas we introduced, such as scenario thinking and dialogue, are sprouting in various little ways throughout the corporation.

We in the BQP group learned a lot through this experience. Our hope and belief is that we've added something to the company's capability to evolve and thrive in a rapidly changing environment.

Nancy M. Dixon
Associate Professor of
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The George Washington University

Commentary

by Nancy M. Dixon

I applaud Barbara Lawton for writing an article about what did not work. We need more understanding of why change interventions fail when they do, and only when people have the courage to talk about them in this public way, can we hope to learn. At the same time, I found I did not learn much from Lawton's experience.

Lawton's article resembles what Argyris, in his latest book, calls *flawed advice*. Flawed not in the sense that it is incorrect, but in the sense that we as readers cannot do much with the advice because we do not know whether we would agree with her conclusions, and if we did agree, we do not know how to carry them out.

For us to learn from Lawton's advice, we have to know, for example, what she said when she talked to the CEO about the difficulties the Business & Quality Processes (BQP) group faced; and if she did not raise these issues with the CEO, we need to understand her reasoning for not doing so. In a sense, Lawton is asking us to learn from the conclusions she has drawn from her experience (for example, that, in a change effort, the organization's leadership is essential; that change takes time; that change agents need to find where the energy is and take advantage of it; and that it is important to maintain a conceptual foundation) but has not given us enough data to determine if we would draw the same conclusions.

Moreover, we do not know how to follow her advice if we find ourselves in a similar situation. What would we do or say differently to accomplish what Lawton could not? How would we, for example, deal with the general managers of the legacy businesses who were not interested in change?

Lawton explains that her purpose in writing the article is to "share what we learned through this effort," but the article does not accomplish that for me because the advice that she gives is not actionable. For me, as reader, to learn from efforts such as Lawton's, the article would have to be written quite differently—outside the standard format of a journal article. And that is what I want to advocate here, that we seriously consider altering how we present the experiences from which we hope others might learn.

Employing Argyris' concepts, and using Lawton's experience as an illustration, such a presentation might include:

1. Framing the dilemmas she faced when working with managers and giving examples of the dialogue in which she tried to address those dilemmas with the managers. What did she say? What did they say?
2. Helping us understand the dilemmas that her client groups faced and how she talked with them about those dilemmas or how she now thinks she should have talked with them.
3. Examples of the dialogue she had or would have that would lead to better or different results.

As a community we need to learn from what courageous people like Lawton do in their daily practice. But to do so, we have to make substantial changes in how we present our conclusions to the community.

Response

by Barbara B. Lawton

As the title of the article states, this is a personal reflection and nothing more.

It is not meant to be "advice," but rather a story—a sharing of experiences, thoughts, and reflections, akin to a conversation overheard at the water cooler. As humans, most of our learning is not from objective sources. Beyond our personal experiences, we listen to and learn from people we trust. While the audience for this article has no basis for trust, they may relate to my situation, assumptions, and thoughts. My personal learning may become someone else's hypothesis or may help him or her see the situation in a different light.

As a former academic, I appreciate Nancy's call for more data, but even a complete recounting of actual dialogue would be incomplete data. The nuances of movement, facial expression, and tone, and the context and history are at least as important to the meaning of a conversation as the dialogue itself.

So my hope is still that this article is of some value to others. I would be personally satisfied if it spurs them to think and consider different alternatives, and if it also serves as motivation, encouragement, and support.

FEATURE

Leveraging Change: The Power of Systems Thinking in Action

Peter David Stroh

Many years ago, Digital's telecom director asked a colleague and me to improve the effectiveness of his worldwide organization, which consisted of a corporate group and field personnel, approximately 800 people. He indicated that the corporate and field staffs were not working well together and asked us first to assess the situation.

We knew that the managers who sponsor such assessments typically face several challenges in applying the findings. The first is to make sense of the frequently bewildering amount of data produced. The second is to develop a focused, effective action plan. The third is to motivate people to implement the plan.

Most assessments are presented as themes, clusters of strengths and weaknesses, or models that explain *what* is going on in the organization without really explaining *why*. Recommendations are typically lists of actions that are neither prioritized nor sequenced. As a result, managers often assume that the different issues represent separate, equally important problems and sponsor several independent improvement projects to solve them. This tends to create confusion, to diminish required coordination, and to slow implementation. Consequently, the motivation to change often erodes as well.

To help the managers in this case better understand the data and develop a targeted action plan, we organized our findings differently. I had begun teaching systems thinking at the time and was impressed by the ability of "causal loop diagrams" to translate complex data into simple, yet compelling explanations of not only what was happening, but also why.[1] The "why" that systems thinking explains is typically a set of non-obvious interdependencies between factors such as:

- Different units in the organization
- Corresponding actions taken by the organization and its customers or competitors
- Quantitative variables (such as revenue growth) and qualitative ones (such as burnout or how people think)
- The short- and long-term consequences of managerial decisions

Once managers understand these interdependencies, they can use the principle of *leverage* to target a few critical relationships to change in sequence so the whole system can perform more effectively. Focusing on these few key areas reduces the number of changes they must direct at any one time and provides a compelling rationale for making them. It also reduces confusion and the dispersal of limited resources.

We decided to organize the telecom function's data into a collection of themes and a few causal loop diagrams that showed the connections between the themes. We offered the diagrams to explain why several particularly frustrating problems persisted despite people's best efforts to solve them. The diagrams illuminated such questions as:

- Why does field effectiveness keep declining despite so many corporate-sponsored improvement projects?
- Why do we keep putting out individual fires and never feel that performance is really improving?

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- Why do we have to keep justifying our unit's value-added even after we respond to management's requests to make certain changes?
- Why does our workload keep increasing despite our best efforts to delegate more work to subordinates?

When people saw the findings this way, the results were astonishing. As we anticipated, the diagrams made sense of people's frustrating experiences and indicated a few high-leverage changes they could make. *What we didn't expect were the deep feelings of acceptance and readiness for change that people expressed after our explanation.*

For example, when we presented the diagram of the relationships between corporate staff and field staff, the senior managers of both groups said, "This is us!" And it was not a pretty picture. Each group had acted to improve field effectiveness in a way that made it more difficult for both itself and the other group to be successful. Moreover, both groups had conveniently found ways to blame their failures on each other.

Each group now acknowledged its own responsibility for the situation. Specifically, in seeking to be helpful by initiating many improvement projects, the corporate staff had made it more difficult for the field staff to shape and then implement any of the projects. The field in turn had reacted to corporate's ineffectiveness by using limited resources to create its own solutions, each isolated from the others, which then required corporate to develop yet another project to integrate them.

It was as if we held up a mirror that communicated a clear, undeniable picture of reality. People saw their own roles in producing the problem and how the whole system operated. Each group understood the words of Pogo, "We have met the enemy, and it is [all of] us." Because all parties could see how their actions were inextricably linked, each could acknowledge the futility of simply blaming others for their frustration and recognize how they (and others) needed to change to improve performance. We discovered that systems thinking not only increased understanding and focused problem solving, but also generated *motivation* for people to change and stimulated *collaboration* instead of blame.

It was as if we held up a mirror that communicated a clear, undeniable picture of reality. People saw their own roles in producing the problem and how the whole system operated.

The outcome in this case was that both the corporate and field groups made several changes. The corporate staff agreed to shift some of its own resources from project development to helping field groups with project implementation. This decreased the number of projects under development at one time and increased the likelihood that the projects under way would be implemented. It also reduced the delay in getting new improvements from corporate staff to the field staff. The field groups in turn agreed to wait out the shortened delay. Moreover, both groups decided on development standards that field groups could adopt in more urgent cases. This ensured that short-term solutions to meet a particular customer need were implemented so that they did not undermine the overall integrity of the company's telecom architecture.

Since this experience, my colleagues and I have used systems thinking to help managers make sense of complex data, make better decisions, and create sustainable change in a variety of situations. We have learned that:

1. There are not only common problems but also *common ineffective solutions* to these problems that show up in a wide variety of organizations. Understanding both accelerates sound decision making and sustainable problem solving.
2. Systems thinking helps managers meet four challenges to achieving effective change: motivating people to change, generating collaboration among groups that blame each other for the current situation, focusing limited change resources, and ensuring continuous learning once the decision to change is made.
3. A reliable, repeatable process for applying systems thinking can benefit organizations in the short run to achieve breakthroughs on particular intractable issues. Systems thinking can also become a competence that produces long-term competitive advantage for those who master it.

Developing Effective Responses to Common Problems

In *The Fifth Discipline*, Peter Senge describes several system archetypes, typical structures that recur in both our organizational and personal lives.[2] These structures depict different ways that people act to improve performance or reduce pressure in the short run, only to create long-term stagnation or decline. This occurs because:

- We are not aware that the same action can produce opposite results over time.
- There are many ways to make things better in the short run that seduce us into thinking that we are making sustainable progress.
- Negative consequences of our actions are often manifest first in another part of the organization, and we are aware neither of their impact nor of our own role in producing them.
- Even patterns of successful growth will eventually reach a limit and have to be regenerated.

Understanding these archetypes enables managers to develop more effective solutions to typical organizational problems. Each archetype has a recognizable story line, is manifest as a series of recurring problems, and suggests ways to deal with the situation once it appears. An even more powerful benefit of familiarity with the archetypes is that managers can use them to anticipate and avoid a wide range of problems.

I'll elaborate on one archetype, "fixes that backfire," because it occurs frequently. This archetype describes people's tendency to apply a quick fix to a problem that is effective in the short run, but produces unintended consequences that make the problem worse in the long run. Some ways in which this plays out in organizations are:

- Making many separate changes at once temporarily improves performance in a few areas, but only creates more confusion and slows down system-wide performance improvement over time.
- Increasing the number of product variations or stock-keeping units reverses declining profits in the short run, but only leads to both increased costs and reduced revenues in the long run.
- Consolidating suppliers to improve bargaining terms works initially, but only leads to increased supplier leverage and a weaker bargaining position later.


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Let's look at the first two examples in more detail. Several years ago, a consumer products company asked me to help make sense of its business process reengineering effort. The company had initiated reengineering to increase both cost competitiveness and the success of new product introductions. The consulting firm it worked with had organized seven reengineering teams to redesign seven major business processes simultaneously. Overwhelmed by details, the participants in these design teams were concerned that they were losing sight of the forest for the trees. They did not understand which steps were most important to change in any one process, much less how the changes across multiple business processes would then be integrated.

Several members of the management team thought that systems thinking might help design team members to prioritize their work and ensure more coordinated solutions across the seven processes. They convened the supply chain redesign team because the company's supply chain costs were especially high, according to industry benchmarks. At the same time, they brought in representatives from the other six teams to work with the supply chain team to ensure that its recommendations would be integrated in all seven major processes.

After introducing the principles of systems thinking and some basic archetypes, including fixes that backfire, I asked the participants to identify the most frequent recurring problems they faced in managing the supply chain. Members of the supply chain team talked about high inventories and order management costs. Attendees from the sales and marketing teams referred to the growing unreliability of shipments; it was difficult for them to make timely and complete deliveries to all their customers. The customer service representative noted that shipment problems had led to increasing customer complaints. All three units—sales, marketing, and customer service—assumed that the shipment problems stemmed from breakdowns in the supply chain. In addition, the information systems representative said that it had become more difficult to forecast sales accurately, a problem that the sales and manufacturing people affirmed and were expecting the information systems redesign team to fix. *How* people thought about the problems was as revealing as *what* they described. This thinking is very typical in organizations and can be characterized as:

How people thought about the problem was as revealing as what they described.

- We have many different problems to address.
- The sources of these problems are obvious.
- Certain units, other than my own, need to make changes in how they operate in order to solve them.
- We have tried to solve these problems before and have been unsuccessful, either because we haven't been able to influence the offending units or because they are somehow not capable of changing.

I encouraged them to consider different assumptions:

1. The problems they experience might be connected.
2. The relationship between problems and their causes is often indirect and not obvious; furthermore, everyone is likely to see part of the situation clearly, and no one is likely to see how the whole system operates to produce the behavior they describe.
3. We unwittingly create many of our own problems.
4. Effective solutions usually lie in improving relationships among different parts of the organization.
5. Only a few key coordinated changes sustained over time will produce large systems change.

I then asked the participants to break into small groups to address the problems they saw as most important. Despite their assumptions about where the problems occurred and what should be done about them, they all acknowledged their lack of success in solving them. So I challenged them to experiment with the new assumptions and spend 90% of their time understanding *why* the problem occurred. I asked them to tell the story of the issue from their respective viewpoints, listen for a few key variables embedded in all their stories, and then trace how these variables changed over time. This served to both legitimize each participant's experience and begin to draw out commonalities. I then asked them to probe for cause-effect relationships between the variables that could produce the behavior they described and to bring these together in a causal loop diagram, using one of the basic archetypes as a starting point if it made sense. The small groups then presented their findings to each other.

They discovered not only that their "independent" problems were related, but also that problems in the supply chain were symptomatic of decisions made in other parts of the organization. Actions that sales and marketing took to improve their performance, actions that made perfect sense given their perspective, had created problems elsewhere. Over time, those same actions had even made life more difficult for sales and marketing. When we put the small groups' diagrams together, we saw an example of fixes that backfire (figure 1).

In order to reverse declining profits and increase revenues, the sales and marketing groups had developed a policy of "selling everything to everybody." The increased product mix had in fact increased revenues and profits in the short run (fix for growth in figure 1). However, it had also produced several unintended consequences that undermined other parts of the company and ultimately the performance of the sales and marketing organizations.

One unintended result of a high product mix was that it led directly to higher raw materials inventory and subsequently greater order management and production costs (inventory implications). Another consequence was that it became difficult to forecast demand accurately, a problem that the sales, marketing, and information system groups had commented on. The decline in sales forecast accuracy led manufacturing to pad inventories even higher (forecast implications). Finally, the expanded product mix reduced the ability of the distribution organization to make timely and complete deliveries to all customers. The shipping problem, raised initially by the sales and marketing and customer service groups, eroded both customer satisfaction and revenues over time and put renewed pressure on profits (revenue implications). The ultimate irony, typical of a fix that backfires, is that the sales and marketing groups responded to the long-term decline in profits by increasing the product mix further, thereby starting the same ineffective cycles again.

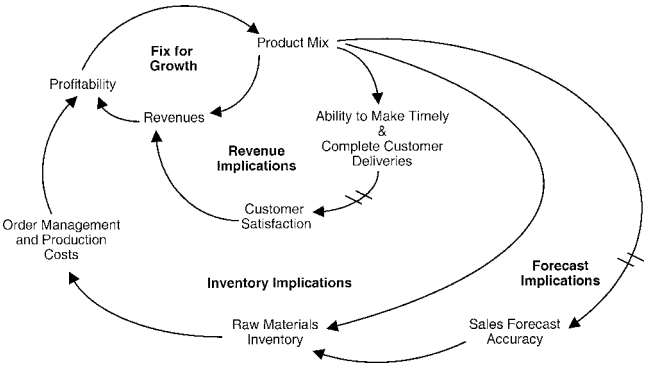

Figure 1 Reengineering the supply chain.

The meeting had three major benefits. First, from a business perspective, it became clear that redesigning the supply chain made little sense without first addressing the sales and marketing commitment to a wide product mix. As a result of these insights, senior management rationalized the company's product portfolio and was able simultaneously to address problem symptoms associated with high supply chain costs, inaccurate sales forecasts, and declining customer satisfaction. Second, from both business and organizational perspectives, the ability to focus on high-leverage actions and link the seven redesign initiatives meant that the company's limited resources could be reallocated to focus on the most influential changes. Third, from an organizational perspective, relationships among all the participating units improved because each could see that they and others had good intentions, but had limited awareness and understanding of the full impact of their actions.

Becoming familiar with fixes that backfire and the other system archetypes enables managers to identify more effective solutions to a range of common business and organizational problems and prevent them. Combining the archetypes with other tools such as engaging diverse stakeholders, encouraging a viewpoint of personal responsibility, shared visioning, and facilitating productive conversations also helps people manage complex change more effectively. [3]

Meeting the Challenges of Complex Change

Consider the example of RetailCo, a major retailer that needed to develop and implement a new strategy to be competitive. The company's chairman brought in a new managing director with strong strategic credentials to change a culture that historically was driven by operations. In addition, there was extensive mistrust among the management team, in part because the managing director's predecessors had managed team members one-on-one and discouraged collaboration. RetailCo was managed by a subset of senior executives, supported by some of their direct reports, who used their informal ties and power as department heads to get things done. The dominance of a few key executives led others to spend extensive time lobbying for support, suppressed potentially constructive conflict, made cross-functional work impossible, and prompted the departure of many good people. Moreover, an intense focus on weekly operational results produced a firefighting mentality that displaced time spent on strategic initiatives.

The company had hired a well-known consulting firm to identify strategic options, but the managing director was concerned that his team would be unable to agree on the new strategy or implement it. He asked us to work along with the other firm and "breathe life" into the strategic planning process. He wanted us to align his team around a new vision and mission so that they could agree on a sound strategy and then to assist with implementation.

We have learned that aligning people around a shared vision and mission is not enough to make the alignment stick. People also need to have a shared picture of reality and to understand their contribution to the existing situation. Without this picture,

people can't agree on how to get where they want to go because they can't agree on where they are. Furthermore, they resist acting differently because they do not feel responsible for their current circumstances. They tend to blame others or forces beyond their control and believe that others must change first.

People also need to have a shared picture of reality and to understand their contribution to the existing solution.

Therefore, before the first retreat with the management team, we assessed how the organization was functioning. The goal was to learn about existing opportunities and challenges and to sketch a picture of current reality that might integrate the perspectives of all members of the management team. We first used a tool called "unwritten rules of the game" to identify the motivators, enablers, and incentives that guided the current behavior of the team and their direct reports.[4] We then developed a causal loop diagram that described how people currently worked and how those same behaviors would undermine their ability to implement any new direction and strategy.

We presented this assessment at the beginning of the retreat to ground the visionary and strategic development. We showed the relationship between how people worked now and the strategic approach RetailCo's chairman and the new managing director expected. We stated that developing a vision and strategy without also addressing how they currently worked would be a waste of time. Some team members, those who were not part of the inner network, readily understood this message. The few dominant executives held back, understandably reluctant to give up their power. It was important to affirm their contribution, and we showed how their strengths in making informal deals and managing crises had kept the company going until now. However, we also pointed out that the same approach would not produce the step-level performance improvement that was expected and would block any strategic path they chose.

In fact, everyone acknowledged that the few strategic initiatives they had attempted in the past had failed and that they had little confidence of being successful in implementing new ones. Competition was growing. Members of the inner network were overwhelmed by their indispensability, and the other management team members were frustrated at being underutilized. The managing director seemed to be more team-oriented, and the potential for collaboration was at least worth considering. The team members began to accept that, if they were going to become more competitive, they would have to make different choices, learn new skills, and support others to do the same. A causal loop diagram became an anchor point for the team's move forward (figure 2).

The strong initial emphasis on current reality, including subjects that had been undiscussable, signaled that whatever followed would be equally candid. We worked extensively during this first retreat to clarify a vision and mission for the company to which all management team members could commit. It took the team members three attempts to develop consensus on a mission statement, in part because they had never tried to make decisions by consensus before, and in part because they had trouble identifying what they could genuinely commit to. Having set a precedent of being authentic, we challenged them to speak from their hearts and come back to the mission until it had meaning for all. The mission statement that finally emerged was powerful: it focused on being at the heart of the communities where they operated and making every day special for their customers. It went well beyond a focus on financial performance, and this too was essential.

The combination of a meaningful shared vision and mission with a deep, shared understanding of current reality established the creative tension that propelled the team forward. Supported by the new managing director, the team agreed to a new way of working. In keeping with the idea of leverage, they worked intensively on three areas:

1. Valuing and engaging each other fully to break the dependence on informal networking among a few members.
2. Focusing on long-term direction as well as operations to shift the balance from firefighting to an increased focus on strategic initiatives.
3. Involving others in the organization to reinforce the executives' commitments to cross-functional strategic work at lower levels.

These three foci led to several actions. In order to value and engage each other more fully, the team members learned to give each other feedback, mostly positive and only selectively negative, to begin to dissolve the mistrust between them. They established and monitored ground rules to shape their behavior. Sparked by the bridges they were building, and without facilitation advice or support, they took time during subsequent retreats to have personal conversations, sharing, for example, photographs and pieces of music that evoked particularly meaningful times in their lives. In so doing, they further broke down the status, class, and cultural differences that had kept them apart. They moved from blaming each other to holding each other accountable and raised disagreements with each other in team meetings so that they could effectively resolve problems together.

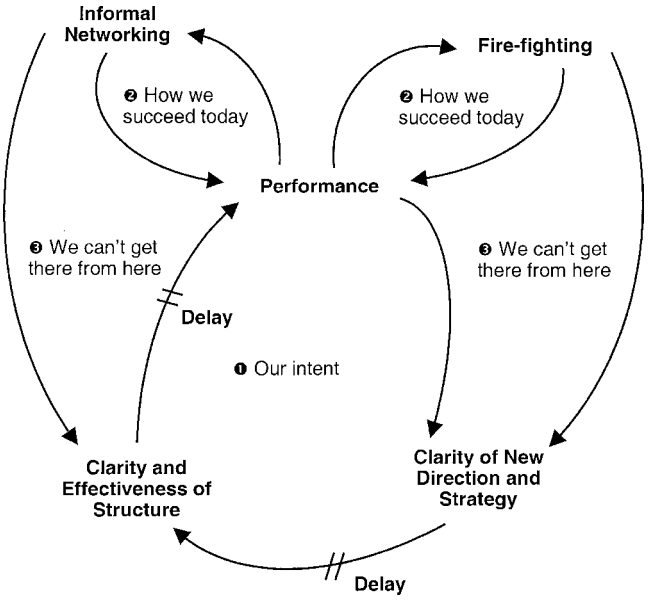

Figure 2 An anchor point for change.

In order to focus on long-term direction and operations, the team members established five strategic initiatives and committed cross-functional teams to achieving them. They had their direct reports and those below them focus significant time to flesh out and achieve the initiatives and supported their teamwork within and across their respective functions. They also had regular reviews of the initiatives as a way to stop micromanaging. Finally, they involved all 30,000 employees in small group sessions to reflect on what the new company mission meant to each individual.

The change did not always proceed smoothly. An ambitious plan to bring the leaders and members of the five strategic initiative teams together regularly was shelved because of the time required. Furthermore, despite an agreement to focus on a few strategic initiatives, other initiatives were not dropped, and new ones continued to be introduced as the year unfolded. Efforts to prioritize these additional projects failed. In the middle of the year, the market turned downward, and the company had to focus more attention on delivering operational results. To the senior management team's credit, it insisted that the strategic work would continue simultaneously, but this created additional stress.

Despite some good progress, people began to burn out by the end of the year. Some key staff left, and there was serious doubt about how long every one could continue at the same pace. The senior management team requested an end-of-year audit to explore how they and their direct reports had changed their way of working. They particularly wanted to understand why people were so overworked and why new initiatives kept proliferating despite their own well-intended efforts to establish and maintain priorities.

Using systems thinking, we uncovered the root cause of these problems. Despite their complaints about workload and lack of time, people at all levels consistently chose to create new initiatives because this gave them visibility and importance. Finishing projects, by contrast, was less valued. People were faced with a choice: continue to experience high levels of stress or create alternate ways to feel challenged and respected. Understanding the negative consequences of their own actions more fully, they determined to satisfy their motivations differently. As a result, the company finally prioritized all existing initiatives and has begun to reward people for focusing on and meeting those commitments.

A year after the initial retreat, RetailCo had its best year. It had developed a new mission and strategy, made significant progress on five strategic initiatives, and engaged all 30,000 employees in reflection on the meaning of the mission. One person remarked, "The mission has had a huge impact on people. You can rally around it, and it has given us clear understanding." The senior management team members continued to become closer to each other and more effective. Another person noted, "The executive team has shown enormous leadership in working more collaboratively." The direct reports acknowledged the shifts they had to make in their own behavior as a result. One observed, "There is more honesty, encouragement to challenge, more acceptance of challenge." The result was significant improvement in the quality of cross-functional teamwork. A fourth employee noted, "The 'Way We Work' team has tackled some big issues. I can see some deliverables:

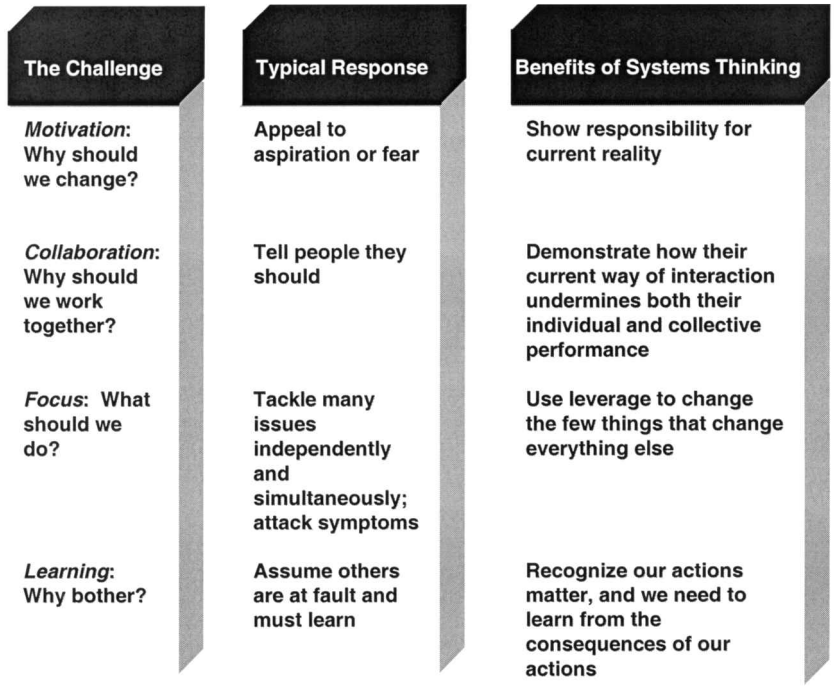

Figure 3 Using systems thinking to meet four challenges of change.

the mission, rules, organization structure, new roles, and responsibilities." Furthermore, the company accomplished all this while still improving its operational performance. It outpaced competitors and achieved its highest revenues and profits ever in a depressed market. An audit at the end of the year and subsequent decisions to act on the findings prepared the company to achieve its goals more easily the following year.

In conclusion, we have found that systems thinking is a powerful way to stimulate a change process because it makes the consequences of people's current choices very real. More specifically, systems thinking:

1. Respects why people don't believe they need to change (they are usually able to achieve their goals in the short run).
2. Demonstrates why change might be in their best interest (their behavior is making their own lives more difficult over time, and it is undermining the effectiveness of others and the organization as a whole).
3. Explains how people's thinking and behavior interacts with others' to produce the dynamics they all experience (it doesn't make sense to blame each other because we're all in the same boat).
4. Suggests what each party can do differently to improve his or her own performance, others', and that of the entire organization (we have alternatives).

This case further demonstrates how systems thinking helps organizations meet four challenges of managing complex change over time. Figure 3 summarizes the challenges, typical responses, and the particular benefits of using systems thinking to leverage change.

What You Can Do to Put It All Together

How can you take advantage of systems thinking in strengthening your own problem-solving and change management skills? I have found seven steps to follow.

1. Look for Opportunities

Consider applying systems thinking when you want to make sense of a messy or confusing situation; solve a chronic problem about which people have very different views; or increase the motivation, collaboration, and focus required to manage effective change.

2. Align People around the End Result

Determine who appears to contribute to the current situation or is affected by it. Engage them in the process as soon as possible, get their viewpoint on what is happening, and align them around a shared vision of the desired outcome.

3. Generate Data

Data about the current situation is crucial because people often have strong assumptions about what is wrong, who else needs to change, and in what ways to fix it. Because of the inherent complexity of systems as well as people's natural biases, these assumptions are usually incomplete and inaccurate. Careful data gathering helps everyone involved alter his or her assumptions. Consider that each stakeholder correctly sees part of the system and that no one stakeholder sees how the whole system functions.

4. Make Systemic Sense of the Data

A systemic assessment legitimizes and integrates multiple perspectives. A portfolio of techniques can make sense of complex, often contradictory data, ranging from certain basic questions and simple causal loops to more complex loop diagrams and computer models. Whatever technique(s) you choose, verify the analysis by ensuring it validates people's good intentions and unexplained frustrations.

5. Building Understanding and Commitment

Seeing a confusing, often contradictory reality reflected in a way that reveals its underlying coherence usually leads people to new, more productive conversations. They can recognize their responsibility for the problem and accept that others are also acting in well-intended but self-defeating ways. It is also effective to use such facilitation approaches as dialogue and skillful discussion to support people's increased openness and help them adopt different assumptions.[5] Finally, have people consider the benefits of the existing system, not just its costs, before they commit to redesigning it.

6. Identify Interventions

Actual systems change occurs at multiple levels, beginning with people's initial intent to address a complex problem systemically and by clarifying the end result around which they are aligned. It continues when you engage people in contributing to, understanding, and building commitment to the systemic analysis. The next step is to identify and sequence the few ways in which the current systems structure can be "rewired" or redesigned to create a new chain of cause-and-effect relationships.

7. Follow-through

Follow-through involves engaging additional key stakeholders in the problem-solving process; building short-term momentum by implementing a few key changes in organizational policies, processes, procedures, and/or perceptions; and continuing to deepen people's understanding about the system as changes are made. Whenever possible, involve additional stakeholders by first helping them develop their own insights about why the system functions as it does, and encouraging them to clarify what they want to create.

Summary

Systems thinking can catalyze new change efforts and increase the leverage of existing ones. It can be used to change how managers think about their business, improve organization effectiveness, or both. Systems thinking strengthens people's abilities to make sense of complex data, identify more effective solutions to chronic problems, and make decisions that prevent potential problems from occurring. Because organizations have a growing need to

establish more effective connections both within and across their boundaries, developing capacity in systems thinking can ensure that the whole is greater than the sum of its parts.

Notes

1. While there are many approaches to systems thinking, this article uses the one made popular by Peter Senge. See P. Senge, *The Fifth Discipline* (New York: Doubleday, 1990). A causal loop diagram shows the cause-effect feedback relationships between two or more variables. Two examples of these diagrams are included later in this article.
2. System archetypes explain non-obvious interdependencies between what Kurt Lewin described as the forces pushing for and against change. See K. Lewin, "Frontiers in Group Dynamics, part 1," *Human Relations* 1 (1947a):5–41. While this section focuses on systems archetypes as a way of identifying ineffective solutions to common organizational problems, there are many other useful approaches. For example, Barry Oshry describes the pitfalls experienced by people at different organizational levels: top, middle, and bottom. See B. Oshry, *Seeing Systems* (San Francisco: Berrett-Koehler, 1996). Stafford Beer identifies how an overemphasis on operations at the expense of development and control at the expense of coordination reduces the viability of an entire system. See S. Beer, *The Heart of the Enterprise* (New York: John Wiley, 1995). Bill Isaacs, building on the work of David Kantor, has written about common "structural traps" that organizations fall into. See W. Isaacs, *Dialogue and the Art of Thinking Together* (New York: Doubleday, 1999). Perhaps the most challenging trap is when the traps themselves cannot be discussed, a problem addressed by Chris Argyris in his groundbreaking work on how to surface and resolve this bind. See C. Argyris, *Overcoming Organizational Defenses* (Boston: Allyn & Bacon, 1990).
3. The art and tools of managing complex change, including the importance of clearly distinguishing the present and desired states of the system, were strongly influenced by the pioneering work of Richard Beckhard. See R. Beckhard and R. Harris, *Organizational Transitions* (Reading, MA: Addison-Wesley, 1977).
4. This approach is described by Peter Scott-Morgan. See P. Scott-Morgan, *The Unwritten Rules of the Game* (New York: McGraw-Hill, 1994).
5. For these and other productive conversation tools, see P. Senge et al., *The Fifth Discipline Fieldbook* (New York: Doubleday, 1994).

Nelson P. Repenning
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Commentary

by Nelson P. Repenning

I've had a stormy relationship with the "systems archetype." When I first was introduced to the field of system dynamics and its more popular offspring, systems thinking, I found the feedback view incredibly exciting and looked for loops wherever I went. When I read *The Fifth Discipline*, I was equally enthralled by the set of system archetypes that Peter Senge presented. I often fantasized about someday discovering one of my own.[1] Unfortunately, this euphoria was short-lived.

Studying system dynamics and experimental psychology suggested that people's ability to infer the behavior that a dynamic system might generate is exceedingly limited, thus implying that causal loop diagrams, unaided by formal models, offer relatively little insight into how systems really work. Similarly, it didn't take much study of the broader trends in social science to realize that reality is a pretty slippery concept, and any method that claimed to help people understand it was subject to a number of fairly serious criticisms. Compounding these intellectual challenges was the fact that I was a graduate student desperately trying to absorb a set of technical modeling tools, while new consultant-converts seemed to be earning big bucks by just drawing pretty pictures without using the formal tools I was working so hard to acquire. Thus, I entered a period in which I was rabidly against causal loops in any form, and the archetypes became Exhibit A in my prosecution of them. Now that I'm on the other side of the classroom, I use and teach causal loops extensively and even resort to the occasional archetype to make a point.

I was reminded of this somewhat sordid history while reading Peter Stroh's paper. Stroh makes significant use of the systems archetypes and provides compelling evidence that they are powerful tools for inducing change in organizations. While I am strongly sympathetic to the main message of this paper—it is always nice to know that the tools one teaches actually work on occasion—it

also serves as a powerful reminder of the dangers in building an intervention practice around the archetypes. In what follows, I'll try to explain my main objections, not as criticism of Stroh's arguments or practice, but as a direction for future work and research in the field.

Analyzing a problem using causal loop diagrams is harder than it looks. My visits to the various systems thinking and system dynamics conferences suggest that there are relatively few people with the skills required to do a thorough analysis using these tools and even fewer with sufficient skill to use such diagrams as a facilitation tool in real time. In contrast, the systems archetypes are much more accessible. Most people find it relatively straightforward to start with a template and then change the variable names as needed to map their personal situation into the given story. Further, they dramatically simplify the facilitator's job. Rather than working from a blank sheet of paper to create an original diagram that emerges from the conversation, the facilitator can begin with the various templates and work from there. Thus, it should come as little surprise that many within the field, including some of its most famous practitioners, have gravitated toward the archetypes as the primary manifestation of the systems thinking perspective.

Unfortunately, I'm not sure this is a good thing. It seems well accepted that the value of modeling of any type lies primarily in helping people forge a tighter connection between their mental models and the underlying structure of the systems in which they reside. Further, as any skilled practitioner can attest, doing this well is hard work. In the process of using the systems thinking perspective, people must confront their own flawed mental models and often come to accept that many of the difficulties they face are of their own creation. My fear is that extensive use of the archetypes defeats this objective.

Stories based on structures like the "fixes that backfire" are easy to tell, they are typically compelling, and they often make a lot of sense. Why? My own hypothesis is that they provide an easy way to connect the structure of complicated systems with personal experience. We've all probably had the experience of staying up a little too late to finish some project, only to see the quality of our work slip the next day due to fatigue, thus necessitating another late night. With this experience in hand, it is easy to understand how an organization can become mired in a similar trap. But within the utility of this approach lie at least two grave dangers.

First, there is little reason to believe that our experiences as individuals will regularly help us understand the experience and performance of organizations. A central tenet of the systems thinking movement is that one cannot understand the performance of the whole by analyzing the individual parts. Thus, if one takes this view seriously, any tool that helps us understand organizational performance by building directly on our individual experience may miss a good chunk of what's important. A frequently asked question in organizational theory is, "Is this phenomenon isomorphic across levels of analysis?" which roughly translates to, "Does this concept/construct/theory usefully describe what is happening when analyzing both specific individuals or groups and entire organizations?" The answer to this question is usually not particularly obvious and is often highly controversial. This suggests, to me at least, that practitioners face an important trade-off when choosing their approach to intervening in groups. To the extent that things like the archetypes help people map intuition developed as individuals to understand organizational issues, people will probably proceed more rapidly and feel more confident about their resulting analysis. However, there is also an increased likelihood that many of the dynamics that arise only at the organizational level will be missed.

A second danger is that, independent of any issues with the level of analysis, the ease with which one can use the archetypes may prove to be an impediment to the deep examination necessary for success. The goal of a systems thinking intervention, at least as I understand it, is to challenge and improve how the group in question understands and creates its environment. Doing this well is often difficult work. The ease with which the archetypes allow users to create new stories that resonate with their own experience suggests that, in some cases, users may not be improving their understanding of the system, but simply swapping one strongly held, uncontested mental model for another. When this happens, I'm not sure anybody has learned anything particularly useful. Further, despite having failed to challenge any deeply held assumptions, participants may feel that they have made a major breakthrough. In such situations, the true source of the organization's difficulties remains unidentified so the chance that the intervention will produce significant results is slim.

This creates a big dilemma for both teachers and consultants. On the one hand, the more people struggle, the deeper they dig into their own mental models and the more they confront their own limitations. This dramatically increases the likelihood that the intervention, *if it is followed through to completion*, will produce dramatic results. On the other hand, struggling, digging, and confront-

ing are all hard work. The more the process requires these activities, the more people are likely to abandon it. Practitioners and teachers want to produce dramatic results, but a necessary prerequisite for this success is that people use the methods that they offer.

My personal view is that archetypes are akin to the common themes found repeatedly in the great works of literature. A story like Shakespeare's *Romeo and Juliet* repeats itself in forms ranging from musicals to recent film adaptations because, despite the dramatic changes in society, its themes of love and familial conflict continue to resonate in modern society. Similarly, the dynamics first identified in Forrester's classic "market growth" paper remain as relevant in today's world of dot.coms and aggressive growth strategies as it was when it was written almost 40 years ago.[2] Despite these similarities, however, I don't think any English teacher would ever ask a student to create a story by simply erasing the character names in *Romeo and Juliet* and substituting those of the student's choosing (although it does appear that some movie scripts are created this way). Unfortunately, current approaches to systems thinking using the archetypes amount to little more than this fill-in-the-blanks approach. While students of systems thinking should be deeply familiar with the archetypes and the stories that underlie them, in my view, they do not constitute a useful or appropriate starting point for an intervention.

It is worth noting that I am far from unbiased on this topic. I've invested a lot of time and energy in acquiring the full set of system dynamics tools, and both my research and teaching focus on using them in their full glory. Thus, it shouldn't come as a big surprise that I am promoting their use at the expense of the simpler but more accessible tools like the archetypes. What's really needed here is some careful research on how the various tools influence what happens in the organizations that use them. In the past 10 years, I've probably seen at least 100 papers or conference presentations that aim to do exactly what Stroh's paper does so well: report the outcome of one or more successful systems thinking interventions. Unfortunately, to sort out issues like those raised here, more is needed. I suspect that some readers will react negatively to my characterization of the archetypes, and I'll be happy to listen to their objections. I'll be much happier, however, when errors in my thinking are revealed via data rather than debate.

Testimonials are useful, but at this point, I'm not sure that we are learning much from them. I am certainly willing to grant that, on occasion, using systems thinking tools like the archetypes makes groups feel good about what they are doing and that these episodes are sometimes followed by improved performance. I am not, however, willing to accept the assertion that these were the best tools for the issue at hand or that there is necessarily a causal linkage between the intervention and the improved results. These linkages can be established only by research that moves beyond single, best practice cases to comparative studies of multiple interventions that carefully document the state of the system before and after the intervention.

Unfortunately, I fear that academia will be slow in picking up this charge. For a variety of reasons, none of which are worth discussing here, this topic doesn't fit the constraints typically imposed by the university setting. Thus, it is largely up to communities like SoL to build the foundations of their own practice. I can think of few better places to start than improving the understanding of the utility and efficacy of the oft-used but little studied systems archetypes.

Notes

1. Senge, P. *The Fifth Discipline* (New York: Currency/Doubleday, 1990).
2. Forrester, J. "Market Growth as Influenced by Capital Investment." *Industrial Management Review* 9 (1968): 83–105.

Response

by Peter David Stroh

I share Nelson Repenning's concerns about depending exclusively on archetypes when applying systems thinking in organizations. They are a good way to introduce systemic concepts, and that is why I emphasize them here. At the same time, both in teaching systems thinking and applying it, identifying archetypes can become an overly simplistic process of forcing easily understood solutions onto realistically messy problems.

The seven steps described toward the end of the article are an effort to summarize the actual process that my colleagues and I use. While introducing the archetypes typically employs deductive

reasoning (moving from the general case to specific examples), both consulting and true capacity building use inductive reasoning (let's describe the problem first and then consider the archetypes as possible lenses through which to develop insight about why it occurs). In practice, the archetypes often serve as departure points for an analysis, although they are not always the end point of a complete explanation.

The utility of the archetypes ultimately depends on two factors. First, the final analysis explains the pattern of behavior that people seek to understand and is recognized by them as accurate (through what usually proves to be a visceral response of recognition). Sometimes, this can be accomplished only with a more formal model, and I agree with Repenning's recommendation that further research be done on the comparative effectiveness of various systems thinking tools. Second, people commit to changing because they see that their current actions, however well-intended and even immediately rewarding, are not producing the long-term results they want, and that alternatives do exist. This commitment frequently requires the kind of struggle that Repenning refers to and is facilitated by illuminating issues of mental models, personal responsibility, and underlying purpose.

Commentary

by Linda Booth Sweeney

Linda Booth Sweeney
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My sincere thanks to Peter Stroh for his candor and discipline in putting together this article. It is one thing to talk conceptually about the implementation of systems thinking and its related disciplines, and another to describe the successes and failures of real-life implementation experiences. Stroh has done the latter in a way that has created a provocative, practical learning tool. Those in the position of utilizing systems thinking tools and related concepts in their own organizations will find this article invaluable.

It is obvious that the people Stroh consulted with were all intelligent, perceptive, and hard-working. As I read the article, I was left to wonder: What led them to believe they did not have the capacity to address the complex, chronic issues that challenged the effectiveness of their organization worldwide?

I believe part of the answer lies in the nexus of our educational systems and the changing face of today's work world. Nearly a decade ago, I was introduced to several systems thinking concepts—that is, circular "feedback loops" and stock and flow relationships—in a five-day workshop. I found the concepts to be tremendously useful as a way to understand the dynamics that I observed in my professional work. Yet these concepts were not part of my academic training and are, in fact, conspicuously missing from most education today. The curriculum taught in grades K through 12 and in US higher education is typically reduced to a set of separate, disconnected parts; literature is taught in one class, math in another, history in another, and never the twain shall meet. Russell Ackoff calls this "machine age education" (Ackoff, 1974). In such an environment, it's difficult to consider the interdisciplinary and interconnected nature of real-life problems and to look at problems from multiple viewpoints. Both these skills are useful when attempting to understand the behavior of dynamic systems such as the impact of oil spills on the environment, boom and bust cycles in the marketplace, or the dynamics of burn-out in an organization.

Add to this the emergence of a new work environment—called the knowledge-based economy, the new work order, the new capitalism, among other labels. In this new environment, new information technology, more accessible media, and shrinking global borders collide to create an increasingly interconnected landscape. We're left with the overwhelming sensation that everything, everywhere, is connected to everything else.

Anyone working today knows that the nature of professional work is changing. To thrive in this new environment, today's practitioner needs to be deliberately more reflective, attuned to complex causality, and able to recognize oversimplified models of the world. These demands on the cognitive capacities of the modern adult beg the question: How can present and future professionals—whether in industry, government, healthcare, education, or nonprofit organizations—learn to address the dynamic complexity generated by an increasingly interconnected world?

This is not a new question. Business leaders, educators, environmentalists, social scientists, and government leaders have recognized, albeit separately, the need for improved systemic reasoning[1] or the ability to:

- Represent and assess dynamic complexity (for example, behavior that arises from the interaction of a system's agents over time), both textually and graphically (Booth Sweeney and Sterman, 2000).
- See patterns of interdependence and mutual causality (for example, feedback).
- Understand how a system's behavior arises from the interaction of its agents over time.
- Challenge the boundaries of mental models.
- Select appropriate time horizons for understanding systems of interest.
- Recognize delays (temporal, informational, material) and understand their impact.
- Complement analysis with synthesis.

As a researcher and consultant interested in revealing and developing systemic reasoning capacity, I have witnessed a dramatic increase in the application of a family of systems thinking frameworks[2] to organizational and social system problems. Under the leadership of many educators, particularly those at The Water's Foundation and system dynamicist Jay Forrester,[3] there is now some integration of systemic reasoning tools and concepts in K-12 curriculum around the country. However, there has been little systemic research in understanding how systemic reasoning skills are best taught and learned.[4]

My curiosity led me to investigate whether the development of systemic thinking skills—perhaps under the guise of "problem solving" or "critical thinking"—had been investigated by other researchers. I found that studies of problem solving in professional practice have been a fixture on the educational research agenda since the 1920s in the writings of Eduard Lindeman (1926) and John Dewey (1934). In fact, many fields in the social sciences have sought to improve adult problem-solving skills (Brookfield, 1987; Kuhn, 1962; Lewin, 1948; Polya, 1957; Polyani, 1958). However, the lion's share of problem solving in professional practice today—whether in schools, industry, government agencies, hospitals, or nonprofit organizations—remains deeply influenced by the classical scientific technique; for example, take apart the problem and then seek to understand it by studying the characteristics of its parts. The legitimacies of "technical rationality," in Schon's (1983) words, are notable and numerous, that is, the discovery of atoms, chemical elements, and basic needs.

However, as we all know, analysis-reliant frameworks historically have not measured up when faced with the messy, ill-structured problems found within nonlinear, dynamical systems. Many social scientists (Boulding, 1988; Gee et al., 1996; Churchman, 1971; Schon, 1983; Waddington, 1977) have noted the limitations of the technical rational approach. These include a disregard for problem settings, treatment of problems as independent of each other, dependency on agreement about ends, no explicit framework for exploring conflicting paradigms, lack of ethical vigilance, and little awareness for the emergent nature of many problems. In fact, many adults today who went to school 10, 30, or 50 years ago probably suspected that much of what they were taught about "problem solving" was essentially static and linear in its perspective: the world stood still while we analyzed it.[5]

My conclusions? First, it's not their fault. When we want people to be systems thinkers after a three-day systems thinking course, we have to remember that:

- They are being asked to learn new language—one that talks of mutual causality, feedback, stocks and flows, and so on—which takes time.
- Thinking systemically requires consideration of the long-term consequences of actions, yet there are enormous forces in our society that drive us to a short-term focus, including the media, the political system, the stock market, interest rates, and so on.
- Surfacing, testing, and mapping mental models requires time, skill, and patience. As stated before, much of our educational and professional training emphasizes analysis and fragmentation. It will take time to rebuild atrophied systems-thinking muscle.
- Organizational settings don't always support the use of systems thinking approaches. There is still a great deal to be learned about the cultural conditions necessary to develop and apply systemic thinking tools and concepts. Edgar Schein, for example, advises that a learning culture must be "built on the assumption that the world is intrinsically complex, nonlinear, and overdetermined" (Schein, 1992). What is the role of the leader who seeks to foster a learning environment? According to Schein, one task of learning leaders is to develop their own personal insights about the nature of the complex and interdependent world around them and to help others achieve these insights as well.

Second, I couldn't agree with Stroh's statement:

"Systems thinking can [my addition] strengthen people's abilities to make sense of complex data, can help them identify more effective solutions to chronic problems, and can help them make deci-

sions that prevent potential problems from occurring." Yet we have to first understand the barriers to thinking systemically, that is, how people, when faced with complex problems, make sense of those problems and why they choose the solutions they choose. Thanks to the work of John Sterman and other researchers looking into misconceptions about a variety of complex science concepts, we are beginning to understand the cognitive and affective bottlenecks that make it difficult to "learn in and about complex systems" (Sterman, 1994). In order to support practitioners', educators', and consultants' faith in the efficacy of systems thinking concepts and tools, we must make understanding the development of systemic reasoning a high priority on our collective research agendas.

Notes

1. The term "systems thinking" has been used for more than 30 years. English social scientist Frederick Emery edited a book, *Systems Thinking,* in 1969, Peter Checkland wrote *Systems Thinking, Systems Practice* in 1981, and Peter Senge brought the term to mainstream organizational audiences with *The Fifth Discipline* in 1990. I use the term "systemic reasoning" to suggest a set of higher order reasoning skills that are synthesized from a variety of systemic problem-solving methods. For other writings related to systems thinking, see the works of these authors in the reference section: Ackoff, 1974/1985; Oshry, 1996; Banathy, 1991; Brown and Campione, 1990; Forrester, 1994; Gould, 1993; Grotzer, 1993; Mandinach and Cline, 1994; Roberts, 1983; Richmond, 1993; Boulding, 1988; Capra, 1996; Gore, 1996; Havel and Wilson, 1997; and Churchman, 1968.
2. During the past three decades, a distinctive "family" of systems-based approaches to understanding dynamic complexity has emerged. These include approaches that (1) *seek primarily to understand and explain a system's behavior* (that is, chaos theory, complexity theory, and decentralized thinking [Resnick, 1995], as described by Mitchel Resnick of MIT's Media Lab), (2) *seek to improve decision making and policy creation* (that is, systems thinking as a discipline of organizational learning and system dynamics), and (3) *seek to create idealized design of systems*, for example, schools, organizations, and communities (that is, interactive planning, as described by Russell Ackoff).
3. The Water's Foundation founded the Creative Learning Exchange (CLE) to serve as a networking hub for K-12 educators interested in using system dynamics in schools. The CLE website address is: www.clexchange.org. The system dynamics in education project (SDEP) is run under the tutelage of Jay Forrester and guidance of Nan Lux and can be found at Sysdyn.mit.edu.
4. Several exceptions here can be found in the ongoing assessment-related research conducted by The Water's Foundation, as well as in the work of Gunther Ossimitz and colleagues in Bonn, Germany.
5. The *McKinsey Quarterly* (1995) makes a similar argument in an article about the use of system dynamics.
6. The exceptions here include the work of Bakken et al. (1992), Cavaleri and Sterman (1995), and Mandinach and Cline (1994).

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Response

by Peter David Stroh

I agree with Linda Booth Sweeney's observation that systems thinking is not applied as much as it could be in organizations. Building on her own excellent observations, I believe there are two broad challenges, one concerning motivation and the second involving capacity building, and that it is possible to meet both of them.

People are not motivated to apply systems thinking in part because they are not aware that their actions have unintended consequences. A client who was recently exposed to the idea of unintended consequences has enthusiastically adopted it as a new and important one for managing the business. Moreover, organizations focus primarily on the success of their individual units and struggle with how to reward cross-boundary performance. Another factor that discourages the use of systems thinking is that it challenges managers to think strategically, not just act operationally, in an environment that places a premium on short-term results.

Developing the ability to apply systems thinking effectively takes commitment and time. One client just completed 10 days of training and project work for 20 internal change agents, and understands that the organization is at the beginning of the learning curve. The change agents appreciate that systems thinking is a discipline and that the discipline implies not only practice with a set of tools but also cultivation of a certain life orientation. For example, they understand that effective application depends as much on compassion and courage as on sound analysis. They recognize that a system changes gradually and that there is power in using the tools over time to both track and influence how it evolves.

I hope articles like this one that describe successes and also explain why the approach is effective will increase management's motivation to use systems thinking. In addition, combining real project work with skill building is likely to build the business case for systems thinking further, while providing fertile learning for new practitioners.

The Interlevel Dynamics of Systemic Learning and Change

FEATURE

David Coghlan

Levels of analysis are rarely used as levels of aggregation to understand how individual learning becomes organizational learning (Kim, 1993; Argyris and Schon, 1996; Roth, 1996; Coghlan, 1997). In this article, I explore how organizational learning and change comprise individual, team, and interdepartmental group learning, and how levels of aggregation work as a recursive system. I present a case story and examine the change process in the light of systemic learning and change as a complex iteration of individual and team learning.

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The Thoul Plant

A pharmaceutical supplies company plant was working through a five-year transformation program. In many ways, the plant was a product of the traditional industrial model inherited from the 1950s and before. Several trade unions competed for members. There was strict demarcation of job and role. The managers' style, particularly that of front-line supervisors, tended to focus on control and discipline. The plant itself was inefficient and losing money, but corporate managers did not want to close it because to do so would have been costly. So they installed a new plant manager with a directive to turn the plant around and make it profitable in five years. The new plant manager initiated a total quality management (TQM) program. As the TQM program developed and took root, espoused attitudes changed. The future success of the plant depended not only on changed output, structures, and behaviors, but also on attitudes and central assumptions about what working in the plant meant, how work was done, and how people worked together. The plant manager decided that the plant needed organization development (OD) interventions to support the TQM program and other changes he had initiated.

Over 18 months, I worked with the plant management team, the production teams' supervisors, the quality control team, and the administrative services team, respectively, in day-long off-site meetings. The goal was to instill team thinking, and practice and build team skills. Each meeting focused on (1) the team's goals, what they were, and how they were decided, (2) procedures for allocating work to achieve goals, (3) processes for communicating information, conducting meetings, solving problems, making decisions, managing conflict, and (4) the relationships between the team members (Beckhard, 1972). We also focused on relationships and work-flow issues with other teams.

For some teams, these meetings were the first time the members could discuss and review company and team-based issues off-site. I worked in a process consultation mode (Schein, 1999); that is, I sat in on the meetings while the teams planned and reviewed work, and I made process observations and led inquiry into how the teams dealt with task and relational issues. In the initial sessions, team members tended to generate engineering hit lists or production issues they needed to resolve, and slipped easily into

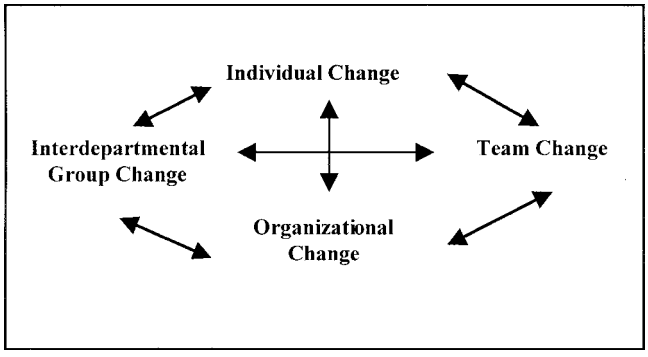

Figure 1 Systemic interlevel change.

discussing them. Through my process interventions, they began to learn how to develop a sense of teamwork. They reviewed procedures for problem identification and resolution, and set up processes whereby they could review procedures and roles. They examined their perceptions of their roles as team members and as supervisors of others. They began to realize that as supervisors themselves, they needed to initiate building a sense of teamwork with their own shift teams by rethinking their roles. Some teams set goals that they did not reach and, through review, learned to ask why things did not get done.

In these team meetings, we identified several areas of learning. First, the team discussion and review of process issues gave the members, who had little prior exposure to an emphasis on process, a learning experience of working on a team. Second, members could apply learning how to work with their supervisors and peers on management teams to working with their subordinates on their own teams. Third, the adaptive learning of applying a team model to their own working situation led to generative learning about the nature of the supervisor's role. In one session, a supervisor asked, "Does this mean I have to ask my people how they are? I have never done that before." He realized that his assumptions about his role were transforming before his eyes. His manager replied that he himself had never done it until a few months before when he had brought that same supervisor into his office, sat him down, and asked how he was. What was happening here was that the individual supervisor's assumptions about his role were changing through his participation in the team process. This supervisor, and others like him, then enacted his newly understood role with his own subordinates in his own production team (figure 1).

This learning did not happen easily or in a single session. Over time, through senior management's approach and actions and the reinforcement of team meetings, many front-line supervisors began to understand the need for cultural change and its implications for their own roles and operating assumptions. The team dynamics provided a time to question individual assumptions and opened the possibility of generative learning.

As I reflect on the case, I see two important learning points. First, the organization was going through generative change. The behavioral changes arising from the TQM program drove attitude changes. Many attitudes and observable behaviors, which were challenged in the new situation, were embedded in the groups with which they were identified: the professional occupational community, such as electricians and fitters; the front-line supervisory group; the managerial group; and the trade union. Second, the change process worked through interlevel dynamics, on which I now elaborate.

Dynamics of Organizational Levels

Managing people requires that dynamic relationships between an individual and the organization, effective functioning of teams, coordination of interfunctional departments, and competitive strategy of the organization be viewed as a behavioral system. One approach to understanding the behavioral dynamics in systemic terms is through the construct of levels of organizational behavior. While we use levels to describe positions in a hierarchy (supervisor, manager, senior manager, and so on), we also use levels to describe increasing complexity—individual, team, interdepartmental group, organization, industry sector, and so on. These are levels of complexity because an industry sector is made up of companies, in turn made up of multiple departments and functions, which themselves comprise teams of individuals.

Rashford and Coghlan (1994) link levels of how people participate in organizations to provide a useful tool for managers, consultants, and teachers of organizational behavior. In their framework, the least complex approach, from the viewpoint of the individual, is the bonding relationship that a person has with the organization, in which he or she uses membership and participation in the group to meet personal life goals. A more complex approach to participation is the establishment of effective working relationships in a face-to-face team. An even more complex involvement is the interdepartmental group

or divisional interface in which teams must be coordinated to do complicated tasks and maintain a balance of power among competing groups. Finally, the most complex, from the viewpoint of the individual, is the relationship of the whole organization to the external environment in which others are competing for scarce resources to produce similar products or services. These four levels, which are evident in the Thoul plant case, provide a useful view of complex organizational realities.

At the Thoul plant, I worked with people to develop skills—the individual level. The managers and supervisors wanted to make the change initiative work so the plant would not close down. These were critical bonding issues for them while they struggled to unlearn their traditional roles. At the team level, members worked on developing team process skills, thereby unlearning a traditional focus on the individual. At the interdepartmental group level, the teams reviewed interfunctional relations in work process flow and consolidation of quality standards. At the organizational level, which was not part of my work with the plant, were issues of the plant's survival and strategic positioning in a business plan.

Systemic Relationships

Viewing organizations through levels of analysis is only one part of the picture. The other part is the dynamic relationship each level has with each of the others. This relationship is grounded in systems dynamics, whereby each of the four levels has a systemic relationship with the other three, with feedback loops forming a complex pattern (McCaughan and Palmer, 1994; Senge, 1990). Dysfunctions at any level can cause dysfunctions at any of the other three levels. A person on the team may express stress as dysfunctional behavior and affect the team's ability to work effectively, which in turn affects the person's ability to cope and ultimately his or her bonding with the organization. A team that is working ineffectively can hinder the interdepartmental group, which may depend on the quality and timeliness of information, resources, and partially completed work from that team. If the interdepartmental group's multiple activities are not coordinated, the organization's ability to compete may be affected. In systemic terms, each of the four levels affects each of the other three.

Viewing organizational levels as simply levels of analysis, without considering interlevel dynamics, misses the systemic relationship the individual has with the team, the team with the interdepartmental group, the group with the organization, and each with the other. A dynamic systemic relationship exists among individual bonding, team functioning, intergroup coordination, and organizational adaptation.

Interlevel dynamics were central to the change process at the Thoul plant (Coghlan, 1997). Individuals' change and learning were stimulated and reinforced by the teams. The teams' change and learning interacted with individual learning and change and that of other teams. In the long term, change occurred in the whole plant, and the Thoul plant survived and developed.

Interlevel Dynamics in Organizational Change

For a large system to change, individuals have to unfreeze and change, team members have to apply themselves to the change agenda, the interdepartmental group must generalize the change, and the organization must adapt to its external markets. The change process involves reactions by individuals, teams, and groups; information sharing, problem solving, and decision making by individuals and groups; and interfunctional teams negotiating for resources from the interdepartmental group to renew the organization. Accordingly, the change process comprises a series of movements across the four levels as individuals and teams deal with the change issues and negotiate them with other people and teams.

In viewing how the change initiative moved through the Thoul plant, we can see that the plant manager initiated it.

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He brought to the management team assumptions of needed changes, both attitudinal and behavioral, to achieve the desired productivity and survival. In time, the management team members understood those assumptions and took them to their respective teams. Within the production teams, the process helped the front-line supervisors understand what they needed to do, which in turn reinforced the processes of their production teams and the senior management team. In this manner, the change agenda, which significantly altered assumptions, moved through the hierarchy, from senior individual to management team to middle managers to middle-level teams, and so on. At the same time, in terms of complexity levels, the change process moved to and fro, from individual to team, reinforced by team and back to individual, so that the progress to organizational change was a complex iteration of individual and team learning and change, with each being a cause and effect of the other.

Phases and Levels of Change

Rashford and Coghlan's (1994) four psychological reactions to change—denying, dodging, doing, and sustaining—map the sequences whereby learning and change move from the first person to the whole organization. In a domino effect, the hierarchy of the organization, after recognizing the need for change, intervenes in the change process. People confront the data, assess it, and respond to it, perhaps by first denying and then dodging. At the doing stage, they take the information to the team for analysis and acceptance. Team members, confronted with the information, may also deny and dodge before accepting the need for change and taking the issue to the wider interdepartmental group for acceptance and action. Reaction at the interdepartmental group level leads to intergroup negotiation on what to change, how, to whose benefit, and what subsystems are affected. When the change has been initiated at the interdepartmental group level and is affecting products or services in the external market, the key individual goes into a sustaining mode and looks for ways to maintain the change in the company's structure. That person also critiques the adequacy of the change in meeting the original or emergent needs.

Denying and dodging are explicit, specific reactions in the unfreezing process as people experience anxiety (Schein, 1996). Because change involves a movement from the familiar and accepted, it is usually threatening and stressful. Therefore, the initial reaction is that change is unnecessary; such a reaction typically shifts to avoidance or dodging. As Schein (1996) points out, the critical issue for movement is the creation of psychological safety to minimize paralyzing anxiety. The doing and changing stages are complementary, as are the refreezing and sustaining stages. Schein's notion of relational refreezing can be understood in terms of the four organizational levels in systemic harmony, sustaining a change and making it work.

In summary, the phases of change through the four levels provide a framework for determining one clear fact rarely considered in the literature; namely, that in organizational change, people learn and change at different paces. Because they have access to information, CEOs are likely to sense the need for change before others lower in the echelon. A sales team may realize the need for change from interaction with customers and then have to persuade the top management team. Rashford and Coghlan's (1994) seven-phase change sequence illustrates that when one person is aware of the need for change and begins initiating it, another person may be caught unaware and typically responds by denying and dodging. As Bridges (1991) points out, managing the time lag as change moves through an organization is critical. A snapshot taken at a specific point in a change process would typically show that some groups are actively promoting the change agenda, some groups are beginning to feel the impact of the change, others are tentatively responding to it, and others are not yet touched by the change (figure 2).

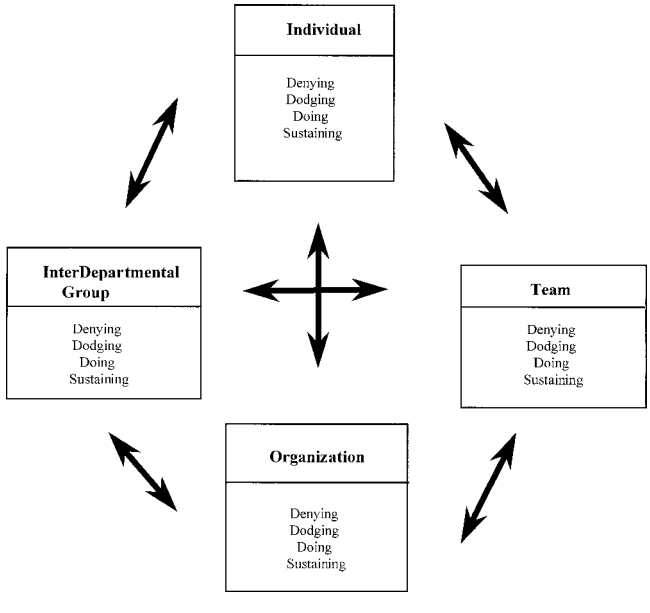

Figure 2 Phases and levels of change.

Toward the end of the 18 months, the Thoul plant manager casually commented on how contented he was that the

change process was now well established. He said that a year before he had been giving a great deal of time and energy to moving the change process along—coming in early and leaving late. Now he felt that he didn't have to do that; in his view, the change agenda was well embedded and there was no going back. Spontaneously, his team turned on him and retorted that they were now the ones who were coming in early and leaving late, putting energy into getting the change process moving and uncertain about the outcome.

The plant manager's comments showed that he had switched from *doing* to *sustaining*, while his team was at the *doing* stage, with many parts of the system *denying* and *dodging* as the change was only beginning to affect them. The supervisor who found his role changing before his eyes expressed *denial* in his incredulity.

The interrelationship and interdependence of the four levels is highlighted in the context of systemic organizational change, whereby an organization attempts to adapt to changing environmental demands. Adaptation requires the interdepartmental group to reconfigure its relationships—the reallocation of resources, access to information, collective bargaining between management and unions, and interteam politics. Each level has its own purpose—bonding, creating a functioning team, coordination among the interdepartmental groups, and adaptation by the organization—that requires management of the interrelationships. Accordingly, interventions need to focus on alignment and mutual support (Schein, 1997).

Conclusion

This article has taken the traditional construct of levels of analysis beyond its usual application to focus on levels of aggregation as the systemic interdependence and interrelationship of the individual, the team, the interdepartmental group, and the organization. The Thoul Plant case illustrates the important role of aggregation levels in the process of learning and change. The interlevel dynamics from individual to team and back, and from team to team and back, brought out both the current mental models in individuals and the groups with which they identified (supervisors, senior managers, and so on) and helped shape changes which were required in that thinking. On the individual level, mental models were named and challenged in the team setting. As process consultant, I contributed to unfreezing assumptions of individuals, teams, and the interdepartmental group and the movement toward change.

Levels of aggregation and interlevel dynamics form recursive behavioral systems at the core of systemic learning and change processes. Such interlevel processes do not receive explicit attention in the change and learning literature. My aim has been to share some OD action research work so that the systemic nature of interlevel dynamics can be further explored.

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Commentary

by C. Sherry Immediato

The Thoul plant experience reminded me of four sets of contributions to organizational behavior literature and practice that I have come to take for granted and that can be better integrated into our models of collective learning.

First, if the Thoul's plant's case had occurred 20 to 30 years ago, the plant manager would probably have initiated a socio-technical work redesign project rather than total quality management (TQM). At a time when technology was catalyzing dramatic transformation of the workplace, there was a great need to take a systemic view of this change. Application of socio-technical design principles provides many examples of doing this effectively. From my own practice, I always experienced the theory as more timeless and far-reaching than its name suggests, addressing issues of multilevel design integrity in many ways. In addition, more general models including the existence and relationship of organizational sub-systems, such as those articulated by Katz and Kahn in *The Social Psychology of Organizations*, at least provide a strong foundation to answer Coghlan's challenge.[1] We would do well to better document and appreciate our intellectual history, returning to some of the early work of Emery and Trist, and later contributions of Walton, Lawler, Passmore, and others, lest we persist in reinventing the wheel.[2] In retrospect, how have these models shown up in practice? What can we learn from efforts to actively apply them? Perhaps *Reflections* can be a forum for sharing and integrating our various theoretical and practical roots, and learnings.

Still, the need for more attention in theory and practice to simultaneously managing the different levels remains. Walton's study of the Topeka plant is a classic example of very effective local change rejected by the larger organization (with thanks to Arie de Geus for helping us recognize organizational immune responses). We are all aware of other examples where formal reorganization is not accompanied by any change at the individual level, with the possible exception of increased cynicism and distrust.

Second, Kantor's multilevel "hour glass" model of individual and organizational dynamics, coauthored by Ober and Yanowitz, is one specific contemporary tool that directly responds to Coghlan's challenge.[3] One way it connects the levels is by noting the dominant models of organizing (open, closed, random; as mental models and as practice) that affect an individual's relationship with the collective, the functioning in and between teams, and the ability of the organization to effectively accomplish key business imperatives. I especially value this thoughtful holographic conception of dynamics within and between levels, and realize that I can use it even more explicitly in my work than I do now.

Third, in imagining how one works effectively with the abstraction of organization levels, I was reminded of the reality that all these interactions occur on the human plane, as individuals attempt to work at these different levels. The contribution of Oshry and the simulation, "The Organization Game," have helped thousands of people to experience the power of organizational structure and its effect on both task and process, by asking people to adopt artificially simple roles and play them out.[4] Coghlan's supervisors learned this in real life. One conclusion recurs: "We (as humans) can do better than this!"

Finally, Coghlan's reflections on the Thoul plant experience illustrate a process for creating and refining models of theory and practice. As a consultant, I find that I am more likely to engage in a review process with colleagues and/or clients that focuses on how to improve practice and results without explicit reference to the underlying change model in use. I can see that my work would improve, and the body of knowledge among us would increase, with a more explicit statement of research agendas and methodologies.

While I can enumerate the factors that discourage me from more actively engaging in research, I also recognize that this is a community issue. There are three things I'd like to propose to facilitate research in our community: (1) clarification of the distinction between reflection and research; (2) development of some simple methodologies that encourage practitioners and consultants to engage effectively in research; and (3) active study of organizational learning pathology.

First, I wonder if we've come to mistake reflection for research. There's no question that good research requires reflection, but I don't see all reflection as research. In particular, I'm interested in defining what good clinical research is in this field. Can consultants and practitioners also be researchers? I hope so, but this requires clear guidance about how to be both an actor and an ob-

server. At a minimum, I think we need to establish a basic framework for clinical research that includes research objectives *prior* to the intervention and clear agreement with our human "research subjects" that an experiment is in process, parallel to practice in other related disciplines.

Second, if we want to increase research, we need to help those who have access to the opportunities to use them. I suspect that both practitioners and consultants need to be educated about the basic tenets of research, and to share in the discussion about a common learning agenda. From this conversation, I suspect we could generate a number of ways to increase clinical research. This has been one of SoL's promises that we have yet to fully realize.

Finally, we need to learn from our mistakes. We have a natural tendency to tell our success stories, but if we don't include the failures, we can't really establish good tests of our causal models. It's too easy to dispense with these cases by saying that there was some personal flaw of the leader or consultant. What do they say about our models?

In closing, Coghlan challenges us to continue to identify key dynamics within and between levels in our organizations. I believe that as we do this, we create more opportunities for all of us to "play our parts well" toward common goals. It is something equivalent to a theory of music: design integrity, personal engagement, and masterful interactions are key ingredients to classical majesty and contemporary improvisation. The field of organizational learning may be one of the best places to articulate this tacit knowledge so that the high commitment we value can find more consistent expression in high-performing systems.

Notes

1. Katz, D. and R.L. Kahn. *The Social Psychology of Organizations,* second edition (New York: Wiley, 1978).
2. For an extensive discussion on the contribution of Emery and Trist to an "open systems" understanding of organizations, see Weisbord, M. *Productive Workplaces: Organizing and Managing for Dignity, Meaning, and Community* (San Francisco, CA: Jossey-Bass, 1987), especially chapters 7 and 8.

   For many years, Walton's work focused on building high commitment. Two representative pieces that mention the Topeka experience are: Walton, R.E. "From Control to Commitment in the Workplace." *Harvard Business Review,* March-April (1985): 77–84; and Walton, R.E. "The Topeka Work System: Optimistic Visions, Pessimistic Hypotheses, and Reality" in *The Innovative Organization: Productivity Programs in Action,* eds. R. Zager and M. P. Rosow (New York: Pergamon Press, 1982): 260–287.

   Walton gives a variety of plausible explanations for the rejection of the Topeka experiment by General Foods. I find that I now use the concept of the organizational immune system as part of my change framework. This concept is described in de Geus, A. *The Living Company* (Boston: Harvard Business School Press, 1997): chapter 9.

   As a complement to Walton, Passmore and Lawler have focused more on high-performing and high-involvement organizations, respectively: Passmore, W. *Creating Strategic Change: Designing the Flexible, High-Performing Organization* (New York: Wiley, 1994); Lawler, E. *High-Involvement Management* (San Francisco, CA: Jossey-Bass, 1986).
3. For the links between individual psychology, group dynamics, organizational design and the external environment, see: Ober, S., J. Yanowitz, and D. Kantor. "Creating Business Results through Team Learning." *The Systems Thinker* 6 (June-July 1995): 1–5.
4. Oshry, B. *Seeing Systems* (San Francisco, CA: Berrett-Koehler, 1995). Also: http://www.fastcompany.com/online/10/camp.html for *Fast Company* article on Oshry's "Power Camp."

Response

by David Coghlan

I used the Thoul case to make the point that levels of aggregation are rarely given explicit attention. I selected the dynamics of change and learning to reflect on how the systemic relationship of individual, team, interdepartmental group, and organization are central to how change moves into and through an organization. That same point can be made with respect to other dynamic processes in organizations.

Socio-technical systems contain an interlevel dynamic. We see this in the studies of Trist and Bamforth, Rice, Miller, Emery, and others.[1] In these studies, individuals' engagement in their task has an impact on the work of teams and groups and then creates a wider impact on shifts and the interrelationships across shifts, functions, and disciplines. The technical demands of the task and the social demands of working relationships apply to individuals working, teams working, inter-team coordination, and, ultimately, organizational effectiveness. This is common across the wide variety of organizations that are featured in socio-technical case studies. I think that an interlevel perspec-

tive for both understanding what is occurring and making interventions is useful and critical with regard to socio-technical systems, total quality management (TQM), business process reengineering, organizational learning, the management of information technology (IT), and IT-enabled change.[2]

The reference to action research was in passing. I could elaborate on how, within the multiple approaches that constitute the action research family, clinical inquiry provides an important frame for conceptualizing how organization development consultants are researchers.[3] Ed Schein has provided a more thorough account of the notion of clinical inquiry.[4] The main tenets are that clinical researchers are in the organization at its behest because it wants help and is likely to reveal important data. Second, clinical researchers are hired to intervene, which allows further data to surface. Third, the richness of the data allows clinical researchers to develop insights into the client system and so develop good theory about what really goes on in organizations.

The underlying assumption behind my account of the Thoul case is that because I was hired to help, I had access to the ongoing struggle to learn and change that I found to be a complex process of individual, team, and inter-team iterations. My presence and interventions in Thoul both helped its members learn and change, and enabled me to understand how learning and change get into and move through a system. So from a clinical inquiry perspective, I was helpful to the client system as a process consultant and articulated some relevant theory as a researcher.

Notes

1. Trist, E. and H. Murray. *The Social Engagement of Social Science. A Tavistock Anthology. Volume II: The Socio-Technical Perspective* (Philadelphia, PA: University of Pennsylvania Press, 1993).
2. Coghlan, D. "The Interlevel Dynamics of Information Technology." *Journal of Information Technology* 13 (1998): 139–149
3. Gummesson, E. *Qualitative Methods in Management Research,* second edition (Thousand Oaks, CA: Sage, 2000); McDonagh, J. and D. Coghlan. "The Art of Clinical Inquiry in Information Technology-Related Research" in *Handbook of Action Research,* P. Reason and H. Bradbury, eds. (Thousand Oaks, CA: Sage, 2000): 372–378.
4. Schein, E.H. *The Clinical Perspective in Fieldwork* (Thousand Oaks, CA: Sage, 1987); Trist, E. and H. Murray. *The Social Engagement of Social Science. A Tavistock Anthology. Volume II: The Socio-Technical Perspective* (Philadelphia, PA: University of Pennsylvania Press, 1993).

FEATURE

The Call of the Time

Judy Rodgers

The Brahma Kumaris, a spiritual and educational organization based in Mt. Abu, in the state of Rajasthan, India, sponsored the dialogue recounted here. The group has general consultative status with the Social and Economic Council of the United Nations and works in cooperation with a number of social sector and interfaith organizations throughout the world. A jewelry merchant in Karachi founded the Brahma Kumaris in 1937. He believed women were best suited to introduce the new teachings and practices of the Brahma Kumaris, so he specified that women would administer the organization, an extraordinarily radical move in India in the 1940s. The organization includes both men and women; the senior women in the administration say that they consult with the men. There are regional offices in London and New York City and more than 3,500 centers in over 70 countries.

Judy Rodgers
President
Communication Architecture Group

At Mt. Abu sits the Brahma Kumaris' Academy for a Better World, atop a mountain plateau. This complex is entirely self-sustaining with wind- and solar-powered generators and a self-contained water purification plant. What makes this especially remarkable is that, due to the remoteness of Mt. Abu, the entire campus was built without the benefit of even a crane. Here, from October to May, the Brahma Kumaris offer classes in Raja Yoga, and they feed and house more than 1,200 students, offering simultaneous translation of all classes in 16 languages.

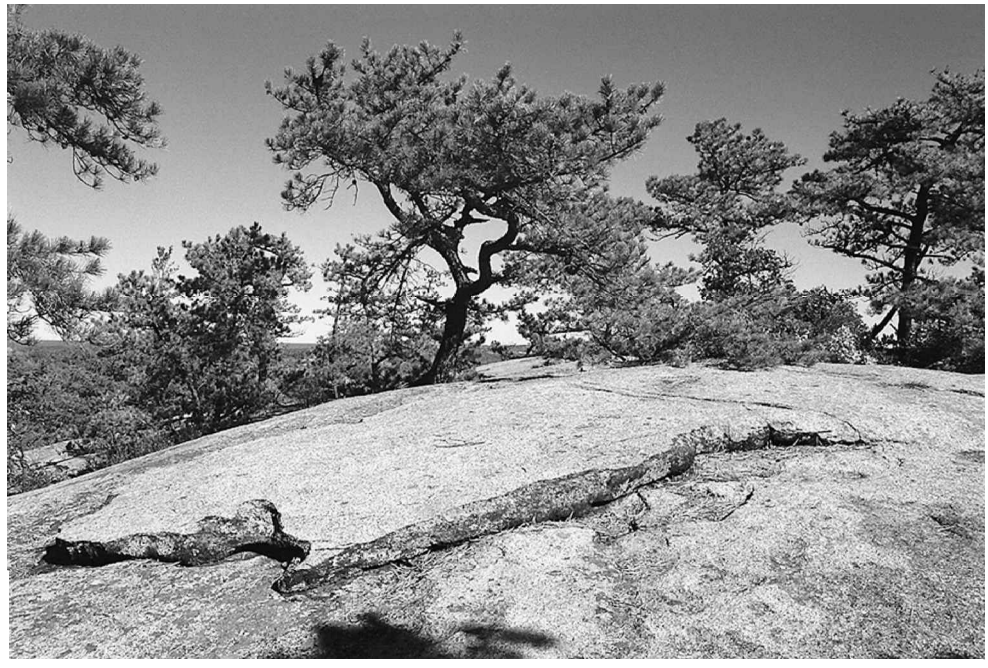
Occasionally, the Brahma Kumaris also invite those people whom they feel are engaged in significant areas of world service to convene on the campus in Mt. Abu to talk and reflect together. These initiatives are born of their belief that now is a special time in which a new era of peace is unfolding. The Brahma Kumaris teach that, as each individual translates this new awareness into her life or his life, the old world evolves, and old institutions are replaced with new ones that reflect a more elevated view of the world.

For four days in September 1999, some 30 men and women from every continent came to Mt. Abu to participate in "The Call of the Time" dialogue. The Brahma Kumaris met attendees at the Ahmedabad airport and personally escorted them to Mt. Abu. The participants were housed and fed at the academy so that they could be unfettered to consider the subject, what is time calling us to do?

After a welcome dinner on the first night, the group reconvened the next morning. The dialogue immediately began to unfold, beginning with a "check in" by everyone. Thomas Odhiambo, honorary president of the African Academy of Sciences, said he was interested in how people use science to improve human life, and that he was searching for reasons why scientists are unhappy. He commented, "The kind of science we have done for the last 250 years urges us to think that truth is to be found in the material world. It prevents scientists from advancing beyond the material world."

Alfredo Sfeir-Younis, special representative of the World Bank to the UN, remarked, "I am looking for an alliance with others who are like-minded in political science. We are failing: 1.5 billion people in the world earn less than $1 a day. One-half of the world doesn't have drinking water. One child dies every second from diseases with known cures. We have a huge challenge, and the tools we were taught in material science and material economics are a waste."

John Williams, general manager at Pacific Power International in Australia, said, "I've decided that business is mad. Everyone I meet in business is afraid. There is no love. It manifests in a range of exhausting behaviors."



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And so on around the room—an architect from Wales, a businessman from Nairobi, a former senator from the Philippines, a political writer from Kuala Lumpur, a woman newly hired to run a leadership program at MIT.

Finally, after all the guests had checked in, Dadi Prakashmani, chief of the Brahma Kumaris and a senior yogi, spoke: "We come together and join in one collective thought. We want to bring benefit and improve this world. . . . We are using nature, but we have lost the connection with the master of nature, the supreme soul. We should give cooperation in the form of mind, body, and wealth to support those who are doing good. Our future is very beautiful and very divine—one world, one kingdom. Unity. So today we are sitting here from different groups. We will create oneness."

But oneness wasn't the next order of the day. Participants took turns listing the daunting challenges they face and extreme injustices they are struggling against. Uner Kirdar, special adviser to the administrator of the UN Development Program, suggested that the respect for the individual needs to be central—that his or her education and awareness are the key to transformation. Someone rejoined that cynicism is the enemy: "We have all become cynical or helpless or both." There were long speeches about the state of affairs in India and about the political corruption in Kuala Lumpur. Someone from a Third World country insisted that governments that control the world have to be responsible. Someone else commented on the devastating effects of colonialism.

As the day wore on, a mood of growing tension and helplessness developed. The microcosm was mirroring the macrocosm. The group was recreating the emotional state that dominates much of the world. At the end of the afternoon, a phone call came from London. It was another senior yogi, Dadi Janki, who had first suggested convening the group. She was too sick to travel, but was thinking about the group and wanted to share her thoughts: "First we have to have faith in ourselves. I have to be able to see the wonder of God's plan for me. . . . We must not worry about problems. The solution to problems comes through silence. Then we don't see problems. . . . We see what we are meant to do. . . . What we need to do is to keep stability in our consciousness and turn our consciousness inward so other souls can see peace and love through us."

Some began to wonder if those who saw the world through a strictly spiritual lens were going to be able to have a meaningful conversation with those who were looking at political injustice, starving children, and greedy business practices. After all, where is the intersection of the spiritual and material worlds?

Later on, after dinner, people settled into seats in the huge auditorium for a classical Indian dance program. Meanwhile, the design team was meeting to reflect on the

conversation. Time was passing quickly, and the team was concerned that the conversation had not yet begun to focus on what might be created and how that creation might happen. Still, the dialogue had to unfold according to its own pace.

The next morning, the participants were asked to pair up and interview each other about their personal callings and the experiences and epiphanies that had brought them to their vocations. They scattered and reconvened after morning tea. The facilitator instructed that, in the next 15 or 20 minutes, a few people could tell the stories they had heard from the person they had interviewed. The 15 minutes turned into an hour and then two hours as each person raised a hand to tell a story. The stories were inspired and inspiring. Clearly, everyone was moved.

Afterward, another senior yogi shared her thoughts: "Negative attitudes are the seeds of problems. When you look at problems with an attitude of brotherhood, they are solvable. . . ."

As the group prepared to break for lunch, it was clear that a sense of urgency had filled the room. The program was scheduled to finish at lunchtime the next day and the participants had yet to discuss what they might do together. Uner Kidar suggested that they meet again after lunch to continue the conversation. The Brahma Kumaris arranged for buses to transport the group to a "Peace Park" about 20 minutes away. After lunch, the skies opened and released a monsoon, but soon everyone poured onto the buses, and as they wended their way toward the park, wind blew the clouds away to reveal a beautiful blue sky.

Each contribution seemed to add a piece to the puzzle and to clarify a new, emerging consciousness.

As the guests stepped off the buses at Peace Park, a Brahma Kumari gave each a rose and led them to a large circular gazebo where tureens of tea and pastries were waiting. Peter Senge, cofacilitator of the dialogue, opened the discussion by inviting the participants to present their thoughts on one question: "What is the call of the time?" To minimize the speeches and ensure that everyone was heard from, there were two rules: no one could talk more than two minutes, and no one could talk twice before everyone had spoken once. Alfredo Sfeir-Younis would keep time.

As the members began to speak, a theme emerged. Someone said, "We have been using science to dominate the Earth; now we have to use it to make the Earth sacred." Someone else asked, "What is the best of the twentieth century that we want to take forward to the twenty-first century?" He answered his own question, "The supremacy of human beings—human rights and human responsibility. Human security versus state security. We need to establish a more human governance." Another said, "The great men and great women of our time are lost in the pursuit of greater wealth." Someone else remarked, "Until we bring a spiritual dimension to economics, forget it."

Each contribution seemed to add a piece to the puzzle and to clarify a new, emerging consciousness that subordinates science, economics, and politics, and puts them in service of life—a new consciousness that considers wealth to be assessed by the well being of people and the health of the Earth. It eschews a competitive dynamic in favor of cooperation and presumes abundance instead of scarcity. The new consciousness is values-based and springs from a feeling of unity. When the participants spoke of spirituality, they were speaking of a need to see people not in terms of the physical attributes and languages that separate them from one another, but in terms of the invisible but enduring qualities that bind people together as part of a larger whole.

When the participants spoke of this new emergent consciousness in conversations at home or at work, it had often seemed implausible, but here, in the special context created for this dialogue, they began to see the strength in their collective vision. They began to believe that not only was it possible to imagine a world living in this consciousness, but also it was hard to imagine a future without it.

By the next morning, everyone had packed suitcases before coming to the morning session. Cars would head down the mountain right after lunch. The most pressing concern seemed to be: How do we continue the conversation? How and when do we meet again? There were plans made for virtual communication and talk of future meetings. The Brahma Kumaris offered their academy and other retreat sites around the world for future gatherings. Finally, before lunch, someone summed up the dialogue in a few sentences.

"We believe in the importance of individual transformation to a consciousness of brotherhood. And in the transformation of institutions to that same consciousness. To that end, we commit to:

- Be a resource to one another on our own fields of service.
- To reconvene periodically."

People clustered together, exchanging phone numbers and making plans to stay in touch. It was clear that bonds were beginning to form and friendships were emerging. Those who had commented on the first day that they were looking for an alliance with other like-minded people had found what they were looking for.

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On the plane from New Delhi to London, I read *The Art of the Impossible,* a collection of speeches by Vaclav Havel. Here he elucidated the dichotomous worldviews the group had been struggling to reconcile: the vast multicultural material world that we have understood to be "the truth," and a morality-based, values-based world that seems to be our best hope for the future:

> "It is clearly necessary to invent organizational structure appropriate to the present multicultural age. But such efforts are doomed to failure if they do not grow out of something deeper, out of generally held values." (Philadelphia, 4 July 1994)

> "We still don't know how to put morality ahead of politics, science, and economics. We are still incapable of understanding that the only genuine core of all our actions—if they are to be moral—is responsibility. Responsibility to something higher than my family, my country, my firm, my success." (Speech to the joint session of the US Congress, 21 February 1990)

It's no surprise that Havel, an artist living and working in the political arena, would be able to articulate the situation so beautifully. However, it's one thing to understand where we have to go. It's something else to go there—to shift the world's major scientific, political, and economic institutions.

As I reflected further, it seemed that the only real way for such a transformation to happen is just the way we were all going about it: speech by speech, book by book, dialogue by dialogue. As one of the yogis had said:

"If we can transform ourselves, we can transform the world. . . . All of us have a specialty. We have the power of thoughts. This affects the quality of our speech and actions. So if we can set right the power of thoughts, all things are set right."

Peter M. Senge
Senior Lecturer, MIT
Chairperson, Council of Trustees
Society for Organizational Learning

Commentary

by Peter M. Senge

As a participant, I have vivid and powerful memories of the Call of the Time dialogue at Mt. Abu. The diverse group (all six continents were represented). The depth of feeling and commitment underlying the work of the attendees. The pain of the first day's acknowledgement of the conditions in today's world. The clarity of where we finally arrived. The extraordinary beauty, simplicity, and tranquility of Madhuban, the founding site of the Brahma Kumaris order. I felt very privileged to be included in this gathering.

It is impossible to account for the changes that take place in oneself from such a time. As I look back today, a few simple thoughts come to mind, none of which do justice to the experience. First was realizing the aim of integrating meditation into a dialogue, something I have wanted to do for many years. In the session, we not only stopped periodically for meditation during working sessions; almost all the participants took additional time for meditation, including even the Brahma Kumaris' 4 AM session, Amrit Vela. Because dialogue is, at its essence, about a deep listening to what is trying to emerge, it can benefit significantly from being more disciplined in quieting the mind. I think we saw that clearly at Mt. Abu.

Second was the challenge presented by the diversity of the group, which was due, surprisingly, not to ethnicity, nationality, religion, or gender but to profession. The group was about equally divided among people from business, government, and NGOs and community organizations. It seemed to me that those from government struggled the most with the dialogic process. Many seemed ill at ease with the lack of formality. Several were slow to join in the candor and reflectiveness that the others seemed to welcome. Several were prone to five- and ten-minute (and sometimes longer) speeches. As I look back on it now, this was a powerful reminder of the world of low trust and high public scrutiny in which government and elected officials live.

But, most of all, Judy's account brought back the pathway traced by the dialogue itself, starting with the somber reflections of the first day. Living in America today, especially amidst the media hype around the New Economy and all the fabulous wealth being produced, it is easy to forget that only a very small fraction of the world's people are actually benefiting from this economic boom. Gaps between "haves" and "have nots" are generally increasing, not decreasing. Americans have never been especially well informed about conditions in the world. We are still a young "teenage culture," inclined to see the world in our own image. Our technological prowess reinforces this illusion. This naiveté fades quickly when confronted with the realities of life for people in India, Malaysia, central Africa, or Colombia. When one also hears first-hand of the continuing destruction of the natural environment and the effects this is having on how people must live, the picture looks bleaker still. Yet, somehow, out of this bleakness, it became obvious that a spiritual revolution was all but inevitable.

Looking back, it still seems a bit mysterious to me how this conclusion became so matter of fact to us. I cannot explain it fully. Judy's account describes some of what happened, starting with the second day. But I have been part of other groups that became similarly inspired by one another's commitments, without reaching such a conclusion. I can only say that among this diverse, pragmatic, non-denominational group of managers, writers, activists, and officials, it became self-evident that an awakening of heart and mind must occur. It was like describing the wall. Given not only the present state of the world, but the direction and momentum of change, there seemed no other real path forward. By the conclusion of our gathering, this tacit awareness had become the common thread that connected us all, even though many had been unaware of it before arriving at Mt. Abu.

I am, of course, speaking personally. Perhaps, a year after the meeting, others do not feel as I do. But it left an indelible mark on me.

From the Chair

Peter M. Senge
Lecturer, MIT
Chairperson, Council of Trustees
Society for Organizational Learning

"The network is the knowledge."

This beguilingly simple statement opens up a host of deeper questions and puzzles at the heart of how we think about knowledge and learning, issues fitting to an issue on "connections."

As a Westerner, I belong to a culture where we inherit an individualized notion of knowledge. We tend to think automatically of knowledge as something we, as individuals, either "have" or "lack." We "acquire" it in places like school or training sessions. We "retain it," or perhaps "lose it." We "share it" with others, or "keep it" to ourselves.

But this misses critical aspects of knowing and learning. "All knowing is doing; all doing is knowing," according to biologists Humberto Maturana and Francisco Varela.[1] What if we accepted this idea, that knowing is always connected to our capacity for effective action? We would accept that real knowing is more about "know how" than "know about." We would accept that learning differs from acquiring new information, that learning is actually a process of enhancing our capacity for effective action, no matter how subtle. We might acquire lots of information in a classroom, but learning occurs only when we find that we can do something we could not do before, whether it is to solve an algebra problem or articulate an insight in a way that it impacts another. In the workplace, we would not confuse knowledge with data or information, and we would always assess our knowing by what we were able to achieve, rather than how bright or clever we were.

Most importantly, to see all knowing as doing reveals the social nature of knowing. In virtually any social setting, we do not act alone. Our "doing" is collective, often more so than we see. For example, I may drive my own car, but I am not alone on the highway. My individual competence is of little good if other drivers are incompetent. I may follow the "rules of the road," but the operating rules are not in some automobile code book on a shelf somewhere; they are being enacted by all the drivers behind the steering wheels of all the cars I pass as I motor along. In this way, driving an automobile is an instructive example. The private car stands as a sort of metaphor for Western individualism. Yet, even here, behind the wheel of my own car, going where I choose to go, when I choose to go there, each day I place my life literally in the hands of strangers. All knowing is doing, and all effective doing in a social domain is collective. Therefore, knowledge is collective.

One particularly useful implication: in any work setting, knowledge may be regarded as capacity to coordinate effective action. Just as the drivers on the highway coordinate their actions to produce safe highways, whether consciously or not, so too do product development and manufacturing coordinate to produce products, just as marketers and salespeople coordinate to sell products, and producers and customers coordinate to create viable marketplaces. This doesn't mean we coordinate as well as we might, but we coordinate well enough to establish a domain of effective acting. So, in any social setting, enhancing coordination capability enhances knowledge. Enhancing shared understanding and shared meaning enhances coordination capability. Enhancing genuine communication enhances shared understanding. And, enabling connections enhances communication—and thereby knowledge. *Ergo*, the network is the knowledge.

Unfortunately, such logic is a weak substitute for experience. A few sentences like those above might challenge the premise that knowledge is something "I have." But, no matter how compelling, they will not change things. The strategic question is, "How do we foster the direct experience that *new connections can produce new knowledge?*"

Three new initiatives within SoL may help.

First, ongoing improvement of the SoL web site is a strategic priority. Since SoL is a community of people working globally, enabling communication and information ex-

change at a distance is crucial to our connecting. A new website was launched in June 2000: SoLonline.org. A group of people, literally from around the world, are now working together on the next-generation website.

Second, Ed Schein and the *Reflections* editorial team are initiating a new feature whereby SoL member companies can pose questions with which they are wrestling and invite responses. These queries and ensuing conversation will be printed in a special section of *Reflections*. It will give us all an opportunity to read the issues that engage leading practitioners, consultants, and researchers, and participate in exploring these issues.

Lastly, SoL and *Reflections* have initiated a new and exciting venture, SoL Connections, which will enable anyone interested in SoL's work to connect with like-minded people, including SoL members. For $100 per year, an individual will receive *Reflections* quarterly (a normal subscription costs $50) and have access to a special area of the SoL website to converse with other Connections affiliates, participate in discussion groups, and co-create gatherings, both virtual and face-to-face. Connections is patterned after the highly successful "Company of Friends" that has driven the number of subscribers for *Fast Company* to a level almost equal to *Fortune*'s, only five years after start-up. According to *Fast Company* editor Alan Webber, the web offers the possibility of a fundamental shift in journalism: "The readers are no longer just 'an audience' but co-creators of the product." Our hope is that Connections will do that as well.

In the coming months, we will all be learning how these new ventures are working. We invite you to be part of the process, to join in the web of connections that will unfold.

Peter M. Senge

Note

1. Maturana, H. and F. Varela, *The Tree of Knowledge: The Biological Roots of Human Understanding*, revised edition (Boston and London: Shambala Press, 1998): 27.