



An Organizational Learning Framework: From Intuition to Institution

Author(s): Mary M. Crossan, Henry W. Lane, Roderick E. White

Source: *The Academy of Management Review*, Vol. 24, No. 3 (Jul., 1999), pp. 522-537

Published by: Academy of Management

Stable URL: <http://www.jstor.org/stable/259140>

Accessed: 23/09/2009 23:16

Your use of the JSTOR archive indicates your acceptance of JSTOR's Terms and Conditions of Use, available at <http://www.jstor.org/page/info/about/policies/terms.jsp>. JSTOR's Terms and Conditions of Use provides, in part, that unless you have obtained prior permission, you may not download an entire issue of a journal or multiple copies of articles, and you may use content in the JSTOR archive only for your personal, non-commercial use.

Please contact the publisher regarding any further use of this work. Publisher contact information may be obtained at <http://www.jstor.org/action/showPublisher?publisherCode=aom>.

Each copy of any part of a JSTOR transmission must contain the same copyright notice that appears on the screen or printed page of such transmission.

JSTOR is a not-for-profit organization founded in 1995 to build trusted digital archives for scholarship. We work with the scholarly community to preserve their work and the materials they rely upon, and to build a common research platform that promotes the discovery and use of these resources. For more information about JSTOR, please contact support@jstor.org.



Academy of Management is collaborating with JSTOR to digitize, preserve and extend access to *The Academy of Management Review*.

<http://www.jstor.org>

AN ORGANIZATIONAL LEARNING FRAMEWORK: FROM INTUITION TO INSTITUTION

MARY M. CROSSAN

HENRY W. LANE

RODERICK E. WHITE

Richard Ivey School of Business

Although interest in organizational learning has grown dramatically in recent years, a general theory of organizational learning has remained elusive. We identify renewal of the overall enterprise as the underlying phenomenon of interest and organizational learning as a principal means to this end. With this perspective we develop a framework for the process of organizational learning, presenting organizational learning as four processes—intuiting, interpreting, integrating, and institutionalizing—linking the individual, group, and organizational levels.

Organizational learning has existed in our lexicon at least since Cangelosi and Dill (1965) discussed the topic over 30 years ago. Lately, its popularity has grown dramatically (Crossan & Guatto, 1996), yet little convergence or consensus on what is meant by the term, or its basic nature, has emerged (Huber, 1991; Kim, 1993).

In large part, convergence has not occurred because different researchers have applied the concept of organizational learning, or at least the terminology, to different domains. For example, Huber (1991) takes an information-processing perspective of organizational learning, whereas Nonaka and Takeuchi (1995) are concerned with product innovation, and March and Olsen (1975) are interested in exploring how the cognitive limitations of managers affect learning. These works share some common threads, but the domains differ significantly. They concern different phenomena: information processing, product innovation, or bounded rationality. Although the phenomenological domains of various researchers do sometimes overlap, the differences in domains do much to explain the lack of convergence among organizational learning frameworks.

In this article we identify strategic renewal as the underlying phenomenon of interest. Re-

newal harmonizes continuity and change at the level of the enterprise (Hurst, 1995; Hurst, Rush, & White, 1989). Organizational learning can be conceived of as a principal means of achieving the strategic renewal of an enterprise. As we argue in this article, strategic renewal places additional demands on a theory of organizational learning. Renewal requires that organizations explore and learn new ways while concurrently exploiting what they have already learned (March, 1991). In contrast, learning applied to the domain of new product development, for example, tends to focus on the exploration side of the exploration-exploitation tension identified by March. Recognizing and managing the tension between exploration and exploitation are two of the critical challenges of renewal and, hence, become a central requirement in a theory of organizational learning.

For renewal to be strategic it should encompass the entire enterprise—not simply the individual or group—and it should recognize that the organization operates in an open system, rather than having a solely internal focus (Duncan & Weiss, 1979). Although theorists have recognized the strategic importance of organizational learning as a means of providing a sustainable competitive advantage (DeGeus, 1988; Stata, 1989), few organizational learning frameworks have illustrated the tension between exploration and exploitation that is at the heart of strategic renewal (see Table 1).

Here we develop an organizational learning framework to address the phenomenon of re-

We gratefully acknowledge the Canadian Centre for Management Development, the Social Sciences and Humanities Research Council, and the National Centre for Management Research and Development for their financial support of this project.

TABLE 1
Propositions Applied to Established Organizational Learning Frameworks

Source	Strategic Renewal Tension	Multilevel Framework	One Level Affects the Others	Process Linking Levels	Cognition/ Action Link
March & Olsen (1975)	Not considered	No group level	Not considered	Not considered	Yes
Daft & Weick (1984)	Not considered	Not considered	Not considered	Processes described but not a levels perspective	Learning is a change in behavior
Senge (1990)	Not considered	No organizational level	Not considered	Processes focus on individual and group—not a levels-related model	Yes
Huber (1991)	Not considered	Yes	Not considered	Processes within level but no model or processes to link levels	Cognition affects behaviors
March (1991)	Yes	No group level	Not considered	Not considered	Yes
Watkins & Marsick (1993)	Not considered	Yes	Not considered	Six action imperatives of the learning organization	Consistent with Senge's perspective
Nonaka & Takeuchi (1995)	Not considered	Recognized, but not a substantial part of the model	Some discussion of the link between individual and group	Focuses on processes that link individual and group—weak on link between group and organization	Knowledge focus

newal. A framework defines the territory and takes us a step closer to a theory. A good framework has several requirements. First, it should identify the phenomenon of interest: in this case strategic renewal. Second, the key premises or assumptions underlying the framework need to be stated (Bacharach, 1989). Third, the relationship among the elements of the framework needs to be described (Sutton & Staw, 1995; Weick, 1995a; Whetton, 1989). As Sutton and Staw state, "Theory is about connections among phenomena, a story about why acts, events, structure and thoughts occur" (1995: 378). Our framework makes high-level connections. Further theory development will expand and deepen these connections and will enable development of testable hypotheses.

Four key premises or assumptions form the underpinnings of this framework and support one central proposition:

Premise 1: Organizational learning involves a tension between assimilating new

learning (exploration) and using what has been learned (exploitation).

Premise 2: Organizational learning is multi-level: individual, group, and organization.

Premise 3: The three levels of organizational learning are linked by social and psychological processes: intuiting, interpreting, integrating, and institutionalizing (4I's).

Premise 4: Cognition affects action (and vice versa).

Proposition: The 4I's are related in feed-forward and feedback processes across the levels.

As stated in Premise 1, organizational learning reveals a tension between exploration and exploitation (March, 1991). March focuses more on the balance rather than the tension, but he recognizes its fundamental role in strategic renewal: "Maintaining an appropriate balance between exploration and exploitation is a primary

factor in system survival and prosperity. . . . Both exploration and exploitation are essential for organizations, but they compete for scarce resources" (1991: 71).

This competition for resources creates a tension. As we discuss in subsequent sections, this tension is seen in the feed-forward and feedback processes of learning across the individual, group, and organization levels. Feed forward relates to exploration. It is the transference of learning from individuals and groups through to the learning that becomes embedded—or institutionalized—in the form of systems, structures, strategies, and procedures (Hedberg, 1981; Shrivastava, 1983). Feedback relates to exploitation and to the way in which institutionalized learning affects individuals and groups.

As noted in Premise 2, organizational learning is multilevel. A basic assumption is that insight and innovative ideas occur to individuals—not organizations (Nonaka & Takeuchi, 1995; Simon, 1991). However, knowledge generated by the individual does not come to bear on the organization independently. Ideas are shared, actions taken, and common meaning developed (Argyris & Schon, 1978, 1996; Daft & Weick, 1984; Huber, 1991; Stata, 1989). Complex organizations are more than ad hoc communities or collections of individuals. Relationships become structured, and some of the individual learning and shared understandings developed by groups become institutionalized as organization artifacts (Hedberg, 1981; Shrivastava, 1983). There is a reasonable degree of consensus that a theory of organizational learning needs to consider the individual, group, and organizational levels (Crossan, Lane, White, & Djurfeldt, 1995).

The 4I processes introduced in Premise 3 are described in detail in the next section. Throughout the feed-forward and feedback processes, the interactive relationship between cognition and action (Premise 4) is critical—one cannot be divorced from the other (Neisser, 1976). Understanding guides action, but action also informs understanding (Seely-Brown & Duguid, 1991; Weick, 1979). Organizational learning links cognition and action. This differentiates it from the related fields of knowledge management and intellectual capital. In spite of arguments to the contrary (Nonaka & Takeuchi, 1995), the fields of knowledge management (Conner & Prahalad, 1996; Davenport & Prusak, 1997; Foss, 1996; Grant, 1996; Kogut & Zander, 1992) and intellec-

tual capital (Edvinsson & Malone, 1997; Stewart, 1997) remain largely focused on cognition. However, these fields share common ground with organizational learning in recognizing the importance of knowledge to the success of the enterprise. Quinn suggests that "looking beyond mere product lines to a strategy built around core intellectual or service competencies provides both a rigorously maintainable strategic focus and long-term flexibility" (1992: 216). Research in knowledge management and intellectual capital informs organizational learning, but it does not capture the ongoing cycle of action taking and knowledge acquisition found in learning theories.

There have been several reviews of the organizational learning literature (Fiol & Lyles, 1985; Huber, 1991; Levitt & March, 1988), but scholars have not recognized the importance of understanding organizational learning from the perspective of strategic renewal. As noted in Table 1, few of the well-known organizational learning frameworks (Daft & Weick, 1984; Huber, 1991; March, 1991; March & Olsen, 1975; Nonaka & Takeuchi, 1995; Senge, 1990; Watkins & Marsick, 1993) recognize the tension of strategic renewal. Further, the frameworks vary in the degree they address the other key premises.

In the following section we expand these key premises by describing the 4I processes of organizational learning that link the levels, using the well-known story of Apple Computer to illustrate these processes. We then discuss the dynamic nature of the 4I processes as they relate to the feed-forward and feedback processes of learning. Finally, we present implications for research and management.

THE 4I FRAMEWORK OF ORGANIZATIONAL LEARNING

The 4I framework of organizational learning contains four related (sub)processes—intuiting, interpreting, integrating, and institutionalizing—that occur over three levels: individual, group, and organization. The three learning levels define the structure through which organizational learning takes place. The processes form the glue that binds the structure together; they are, therefore, a key facet of the framework. Intuiting and interpreting occur at the individual level, interpreting and integrating occur at the group level, and integrating and institutionaliz-

TABLE 2
Learning/Renewal in Organizations: Four
Processes Through Three Levels

Level	Process	Inputs/Outcomes
Individual	Intuiting	Experiences Images Metaphors
	Interpreting	Language Cognitive map Conversation/dialogue
Group	Integrating	Shared understandings Mutual adjustment Interactive systems
Organization	Institutionalizing	Routines Diagnostic systems Rules and procedures

ing occur at the organizational level (see Table 2). There are a sequence and progression to these processes through the different levels, and while there is some "spillover" from level to level, not every process occurs at every level.

For example, intuition is a uniquely individual process. It may happen within a group or organizational context, but the recognition of a pattern or possibility comes from within an individual. Organizations do not intuit. This is a uniquely human attribute that organizations do not possess. Similarly, organizations do not interpret. Interpreting has to do with refining and developing intuitive insights. The development of language, principally through an interactive conversational process, is a basic interpretive process. The proverbial person on a deserted island could have an intuitive insight and begin to make sense of it through an internal conversational process (i.e., talking to one's self), but the interpretive process is likely to be much richer and more robust if the conversations and interactions are with others. This process spans the individual and group levels, but it does not extend to the organizational level.

When actions take place in concert with other members of a workgroup, the interpreting process quite naturally blends into the integrating process. Integrating entails the development of shared understanding and the taking of coordinated action by members of a workgroup. Actions that are deemed to be effective will be

repeated. Initially, the workgroup informally makes this judgment about what actions should be replicated. Eventually, the workgroup may establish formal rules and procedures, and routines become embedded. The process of institutionalizing occurs.

The process of institutionalizing is an organization-level phenomenon. Organizations, like other social institutions, are socially constructed (Berger & Luckmann, 1966). The routines and rules that make up an enduring organization exist independently of any one individual (although individuals and their actions are affected by these rules and routines).

The 4I's Defined and Developed

We define the learning processes as follows: *Intuiting* is the preconscious recognition of the pattern and/or possibilities inherent in a personal stream of experience (Weick, 1995b: 25). This process can affect the intuitive individual's actions, but it only affects others when they attempt to (inter)act with that individual. *Interpreting* is the explaining, through words and/or actions, of an insight or idea to one's self and to others. This process goes from the preverbal to the verbal, resulting in the development of language. *Integrating* is the process of developing shared understanding among individuals and of taking coordinated action through mutual adjustment. Dialogue and joint action are crucial to the development of shared understanding. This process will initially be ad hoc and informal, but if the coordinated action taking is recurring and significant, it will be institutionalized. *Institutionalizing* is the process of ensuring that routinized actions occur. Tasks are defined, actions specified, and organizational mechanisms put in place to ensure that certain actions occur. Institutionalizing is the process of embedding learning that has occurred by individuals and groups into the organization, and it includes systems, structures, procedures, and strategy.

The four learning processes operate over the three levels. Because the processes naturally flow from one into another, it is difficult to define precisely where one ends and the next begins. Quite clearly, intuiting occurs at the individual level and institutionalizing at the organizational level; however, interpreting bridges the individual and group levels, while integrating links the group and organizational levels. Insights, the seeds of

adaptiveness and exploration, begin with the individual but, if "successful," eventually become embedded in the formal organization.

We describe the framework in a sequential way, although there are necessarily many feedback loops among the levels, given the recursive nature of the phenomenon (as we discuss in subsequent sections). In the following discussion we develop each of the 4I learning processes in greater conceptual detail.

Intuiting

Scholars often assume that learning, whether it be at the individual, group, or organization level, is a conscious, analytical process. However, Underwood (1982) suggests that the links between experience, knowledge, and consciousness are more complex than generally assumed. The subconscious is critical to understanding how people come to discern and comprehend something new, for which there was no prior explanation. A theory of learning needs to be able to address how this occurs. Accordingly, the process of intuiting—a largely subconscious process—is an important part of the framework presented here.

At its most basic level, individual learning involves perceiving similarities and differences—patterns and possibilities. Although there are many definitions of intuition, most involve some sort of pattern recognition (Behling & Eckel, 1991). The expert and entrepreneurial views of intuition are most closely aligned with the framework presented here.

The expert view of intuiting is a process of (past) pattern recognition. A highly sophisticated and complex map enables the expert to perceive patterns that novices cannot (Neisser, 1976). Prietula and Simon (1989) suggest that becoming an expert takes 10 years and requires the acquisition of 50,000 chunks of knowledge. Neisser (1976) has used the example of chess masters to explain expert intuition. One must play a lot of chess, reflect on past experiences, and learn about great plays; all this and much more are required to become a grandmaster. But an interesting thing seems to happen on the way to expertise. What once required conscious, deliberate, and explicit thought no longer does. What once would have taken much deliberation and planning becomes the obvious thing to do. What has been learnt becomes tacit knowledge (Polanyi, 1967).

The expert no longer has to think consciously about action. Having been in the same, or similar, situations and recognizing the pattern, the expert knows, almost spontaneously, what to do. Indeed, if asked to explain their actions, experts may be unable to do so. While the pattern (and associated actions) is familiar, the underlying justification has receded from conscious memory. In a simple way expertise can be thought of as unconscious recollection. This helps explain why expertise is so hard to transfer from one person to another. It is highly subjective; deeply rooted in individual experiences; and very difficult to surface, examine, and explain.

Whereas expert intuition provides insight into the important process of pattern recognition, entrepreneurial intuition has more to do with innovation and change. No two situations are the same, and patterns, while similar, are never identical. The ability to make novel connections and to discern possibilities is also key to intuiting. "Entrepreneurs" are able to make these novel connections, perceive new or emergent relationships, and discern possibilities that have not been identified previously. Whereas expert intuition may be past pattern oriented, entrepreneurial intuition is future possibility oriented.

Expert intuition supports exploitation; entrepreneurial intuition supports exploration. Entrepreneurial intuiting generates new insights. Koestler (1976) suggests that in the natural sciences such insights, when they occur, happen after the individual has had a long period of immersion in the problem, followed by a brief period of disassociation from the specifics of the problem. Although this may be true for breakthrough insights, more mundane acts of innovation may have more humble beginnings (Anderson, 1992). Imagery and metaphor also seem to be important in this process.

For entrepreneurs in a business situation, there is always the question of whether these individuals are intuitive or just lucky. However, this question is difficult to answer because novel, intuitive insights cannot be judged right or wrong *ex ante*. They are simply possibilities. It is rare to see a business entrepreneur able to convert intuitive insight into business reality on a consistent basis. Fred Smith perceived the potential of reliable, overnight, small package delivery, and Federal Express emerged as a very successful business (Maister & Wyckoff, 1974).

He was unable to replicate this success with Zapmail—an electronic mail service. There are exceptions, however. Howard Head, the entrepreneurial genius behind the Head metal ski, was also the inventor of the Prince oversized tennis racket.

The connection between quality of intuition and commercial success is difficult to make. Intuition is the beginning of new learning. Eventual commercial success is dependent upon effective learning at all levels—not simply the original intuitive insights of the entrepreneur.

Intuiting, especially of the entrepreneurial type, appears to be a largely subconscious process. In fact, trying to force it to a conscious level too soon may prevent it from happening (Watson, 1969). The outcome of individual intuiting is an inexplicable sense of the possible, of what might be done. Entrepreneurial intuitions are preverbal, and expert intuitions may be non-verbal as well. No language exists to describe the insight or to explain the intended action. Consequently, intuition may guide the actions of the individual, but this intuition is difficult to share with others (Nonaka & Takeuchi, 1995). Imagery, sometimes called “visions,” and metaphors aid the individual in his or her interpretation of the insight and in communicating it to others.

Scholars have recognized metaphors as a critical link in the evolution from individual intuitive insight to shared interpretation. Individuals use metaphors to help explain their intuition to themselves and to share it with others. As Tsoukas explains, “Metaphors involve the transfer of information from a relatively familiar domain . . . to a new and relatively unknown domain” (1991: 568)—that is, from the known to the unknown, from that for which we share literal language to that emerging insight for which language does not yet exist. As such, metaphors mark the beginning of the interpreting process. Srivastava and Barrett provide the example of a child trying to describe for the first time to his mother that his foot is asleep. The child has no literal language to relay this strange sensation:

In frustration, he says to his mother: “It feels like there are stars hitting my foot.” Having no available literal terms, the child associates a new unfamiliar experience with one he understands. He has a sparkling, glittering, tingling sensation that seems to impact his foot from somewhere outside his body. At the age of four he is unable to

say, “Mother, there is a certain numbness in my foot which is a result of an inadequate supply of blood which I have inadvertently seemed to circumvent” (1991: 568).

In this example the child perceives something he has no words to describe, although the words do exist, and no doubt his mother would explain that the word “numbness” can be used to describe the sensation.

True innovators have a problem akin to the child. They have a sensation—an insight into a possibility—but they have no literal language to describe it. Unfortunately, they do not have a “parent” to provide that language; indeed, none exists if the insight is truly novel. Individuals employ metaphors to bound and describe the insight. As Tsoukas elaborates,

In lay discourse, metaphors constitute an economical way of relaying primarily experiential information in a vivid manner, and they can be used as variety reduction mechanism in situations where experience cannot be segmented and imparted through literal language (1991: 567).

Indeed, for entrepreneurial insights, metaphors may be the only language available for one to communicate with another.

Early in the evolution of the personal computer, Steve Jobs of Apple employed the “appliance” metaphor. This metaphor evokes a whole set of subsidiary images: easy to use, small, affordable. Subsequently, more literal language was used to name more precisely many of the attributes associated with the original metaphor (e.g., graphical user interface). This example also points to the reciprocity between thinking and acting that is inherent in the development of language.

Naming also directs actions towards the object (or image) you have named because it promotes activity consistent with the related attribution (i.e., the name or the metaphor) it carries. To change the name of an object connotes changing your relationship to it because when we name something, we direct anticipations, expectations, and evaluations toward it (Srivastava & Barrett, 1988: 34–35).

Using this reasoning, if Jobs had used a different metaphor to describe his initial insight, perhaps the personal computer as “business assistant,” it would have led to very different actions, and Apple would have become a very different company. Early in a company’s development, when it is far from equilibrium, small differences in

the metaphors employed and the ways in which conversations unfold and language develops may ultimately result in great differences in where the company ends up.

Interpreting

Whereas intuiting focuses on the subconscious process of developing insights, interpreting begins picking up on the conscious elements of the individual learning process. Through the process of interpreting, individuals develop cognitive maps about the various domains in which they operate (Huff, 1990). Language plays a pivotal role in the development of these maps, since it enables individuals to name and begin to explain what were once simply feelings, hunches, or sensations. Further, once things are named, individuals can make more explicit connections among them.

Interpreting takes place in relation to a domain or an environment. The nature or texture of the domain within which individuals and organizations operate, and from which they extract data, is crucial to understanding the interpretive process. The precision of the language that evolves will reflect the texture of the domain, given the tasks being attempted. The well-known example of the Inuit having over a dozen different words for (various types of) snow illustrates the rich interaction between the task domain and the sophistication of language. Moreover, a person with very rich and complex cognitive maps of a domain, like the chess master, will be able to see things and act in ways that others cannot.

The cognitive map is affected by the domain or environment, but it also guides what is interpreted from that domain. As Weick (1979) suggests, people are more likely to "see something when they believe it" rather than "believe it when they see it." As a result, individuals will interpret the same stimulus differently, based on their established cognitive maps. The same stimulus can evoke a different or equivocal meaning for different people (Hambrick & Mason, 1984; Walsh, 1988). This difference is not a result of uncertainty about the stimulus. Uncertainty is related to the quality of information. But for any group of people, even high-quality information may be equivocal: it may hold multiple, and often conflicting, meanings (Daft & Huber, 1987). Although equivocality is an issue in the

development of both individual understanding and shared understanding within a group, equivocal situations are often resolved through a group interpretive process (Weick & Van Orden, 1990).

Just as language plays a pivotal role in enabling individuals to develop their cognitive maps, it is also pivotal in enabling individuals to develop a sense of shared understanding. Interpreting is a social activity that creates and refines common language, clarifies images, and creates shared meaning and understanding. Equivocality is reduced through interpreting by "shared observations and discussion until a common grammar and course of action can be agreed upon" (Daft & Weick, 1984: 291). Groups will have an interpretive capacity related to the makeup of the group and to the group dynamics (Hurst et al., 1989). As the interpretive process moves beyond the individual and becomes embedded within the workgroup, it becomes integrative. Individual interpretive processes come together around a shared understanding of what is possible, and individuals interact and attempt to enact that possibility.

Integrating

Whereas the focus of interpreting is change in the individual's understanding and actions, the focus of integrating is coherent, collective action. For coherence to evolve, shared understanding by members of the group is required. It is through the continuing conversation among members of the community and through shared practice (Seely-Brown & Duguid, 1991) that shared understanding or collective mind (Weick & Roberts, 1993) develops and mutual adjustment and negotiated action (Simons, 1991) take place.

The evolution of language extends the process of interpreting to interactions among individuals: the realm of workgroups, organizations, communities, and even societies. Language developed through conversation and dialogue allows the evolution of shared meaning for the group. As Daft and Weick explain:

The distinctive feature . . . is sharing. A piece of data, a perception, a cognitive map is shared among managers. . . . Passing a startling observation among members, or discussing a puzzling development enables managers to converge on an approximate interpretation (1984: 285).

Language not only helps us learn—it preserves, for better and for worse, what has been learned. For an organization to learn and renew, its language must evolve. Conversation can be used not only to convey established meaning but also to evolve new meaning.

Not all conversational styles are equally effective, however, for developing shared meaning. Isaacs suggests that “dialogue is a discipline of collective thinking and inquiry, a process for transforming the quality of conversation and, in particular the thinking that lies beneath it” (1993: 25). Through dialogue the group can evolve new and deeper shared understandings. This shared meaning can cause those who have participated to more or less spontaneously make mutual adjustments to their actions. As Isaacs goes on to explain,

Dialogue proposes that . . . some of the most powerful forms of coordination may come through participation in unfolding meaning, which might even be perceived differently by different people. A flock of birds suddenly taking flight from a tree reveals the potential coordination of dialogue; this movement all at once, a wholeness and listening together that permits individual differentiation but is still highly interconnected (1993: 25).

The dialogue process attempts to convey both the message and a deep interconnected meaning. A consensual approach that attempts to get agreement on the message without delving into the underlying meaning(s) risks a groupthink outcome (Janis, 1982).

As with the process of interpreting, the context surrounding the integrating process is critical. Seely-Brown and Duguid’s (1991) notion of “communities of practice” captures the importance of the integrative context. These authors and their colleagues have been involved in ethnographic research on workplace practices and suggest that understanding and impacting learning and innovation require one to study and understand the situation in which practice occurs. Neither occurs *ex situ*:

Practice is essential to understanding work. Abstractions detached from practice distort or obscure intricacies of that practice. Without a clear understanding of those intricacies and the role they play, the practice itself cannot be well understood, engendered (through training) or enhanced (through innovation) (1991: 40).

Observations from these ethnographic studies reveal that actual practice is not what is speci-

fied in manuals or necessarily what is taught in classrooms. Rather, it is captured and promulgated by stories told by community members. Storytelling is a significant part of the learning process. Stories reflect the complexity of actual practice rather than the abstractions taught in classrooms. As stories evolve, richer understanding of the phenomenon is developed, and new integrated approaches to solving problems are created. Stories themselves become the repository of wisdom—part of the collective mind/memory (Weick & Roberts, 1993).

Institutionalizing

The process of institutionalizing sets organizational learning apart from individual or ad hoc group learning. The underlying assumption is that organizations are more than simply a collection of individuals; organizational learning is different from the simple sum of the learning of its members. Although individuals may come and go, what they have learned as individuals or in groups does not necessarily leave with them. Some learning is embedded in the systems, structures, strategy, routines, prescribed practices of the organization, and investments in information systems and infrastructure.

For new organizations there are few established routines or structures: there is no organizational memory. Often by the nature of their small size, their open communication, and their formation based on common interest and dreams, individual and group learning dominate in young organizations. As organizations mature, however, individuals begin to fall into patterns of interaction and communication, and the organizations attempt to capture the patterns of interaction by formalizing them.

This institutionalization is a means for organizations to leverage the learning of the individual members. Structures, systems, and procedures provide a context for interactions. Over time, spontaneous individual and group learning become less prevalent, as the prior learning becomes embedded in the organization and begins to guide the actions and learning of organizational members.

Organizations naturally outgrow their ability to exclusively use spontaneous interactions to interpret, integrate, and take coherent action. Relationships become formalized. Coherent ac-

tion is achieved with the help of plans and other formal systems. If the plan produces favorable outcomes, then the actions deemed to be consistent with the plan become routines. There is a need to ensure that the routines continue to be carried out and that the organization produces and performs. This is the role for what Simons calls "diagnostic systems" (1991, 1994). An organization uses these systems to regulate the day-to-day routines of the business—to exploit the current understanding of the business. Simons also identifies another type of formal system he calls "interactive." Organizations use interactive systems to consider how the future can or may be different from the past.

As one moves from the individual level of intuiting/interpreting through group integrating to organizational institutionalizing, the process of learning is less fluid and incremental and becomes more staccato and disjointed. Generally, that which becomes institutionalized in organizations has received, at some point, a certain degree of consensus or shared understanding among the influential members of the organization. Before a formal organizational system or structure is established or changed, the modification generally undergoes some process of consideration. Once something is institutionalized, it usually endures for a period of time.

Changes in systems, structures, and routines occur relatively infrequently in organizations; as a result, although the underlying processes of intuiting, interpreting, and integrating are more fluid and continual, significant changes in the institutionalized organization typically are punctuated. For this reason much organizational change is interpreted as being radical or transformational, rather than incremental, in nature. However, even though the institutional changes may appear disjointed, the underlying learning processes of intuiting and interpreting at the individual and group levels that result in these changes may be more continuous.

Institutionalized learning cannot capture all the ongoing learning at the individual and group levels. It takes time to transfer learning from individuals to groups and from groups to the organization. As the environment changes, the learning that has been institutionalized may no longer fit the context; there may be a gap between what the organization needs to do and what it has learned to do. As the gap widens, the organization places more reliance on individual

learning and initiative. For example, Seely-Brown (1993) reports on studies that examined the informal routines of experienced order clerks in comparison with the formal institutionalized system. Although the product of their day's work gave the appearance that the clerks had followed the formal routine, they had, in fact, improvised in ways that proved more efficient and effective.

Given that the environment is constantly changing, the challenge for organizations is to manage the tension between the embedded institutionalized learning from the past, which enables it to exploit learning, and the new learning that must be allowed to feed forward through the processes of intuiting, interpreting, and integrating. Although the 4I's have been presented in a linear fashion for ease of explanation, appreciating the iterative nature of the processes is critical, as we will discuss in a subsequent section.

In the following section we present the Apple story in a linear fashion to illustrate the 4I processes. The focus of the story is on the exploration side of strategic renewal. We then broaden the discussion to examine the dynamic nature of organizational learning.

Understanding the Learning Processes: The Apple Story

The relationship between each of the levels and processes perhaps can best be illustrated by way of a story—that of Apple Computer.¹ By all accounts, Steve Jobs, through an **intuitive process**, had the insights upon which Apple was founded. Jobs perceived patterns and evolved certain *images*² about possibilities, which developed into a *metaphor* (e.g., the personal computer as an appliance—one in every home) that guided Apple during its early years. These images were based, at least in part, upon his unique experiences and cognitive orientation. He provided much of the insight and energy that were the genesis of Apple.

¹ This description is not represented as an accurate case history. Rather, it is a story we use to help illustrate the conceptual model; we do not employ it as empirical support for the model.

² The italicized words represent the key words used to describe the inputs and outcomes of the processes as shown in Table 2.

But these initial images were necessarily vague when it came to specific actions. At the intuitive stage actions are improvised, rooted more in feeling than thinking (Hurst et al., 1989). The language used to explain improvised action is necessarily underdeveloped, vague, and imprecise. On the basis of Jobs' own experiences and his perceptions of the events, along with Wozniak's technical expertise, these men improvised actions as they went along.

Language plays a pivotal role as insights become more sophisticated and concrete through the **interpretive process**. In part, it was through the group process of *dialogue* and *conversation* that Jobs' own understanding and individual cognitive complexity were enhanced. Talking and acting with others, developing words to describe what had been vague insights, and enacting these insights enabled a deeper meaning to evolve (Bruner, 1990).

Many researchers talk about this evolution of meaning in terms of cognitive complexity and *cognitive maps* (Huff, 1990). Although one must be careful with this metaphor, it is helpful to think of Jobs initially navigating his chosen territory more or less mapless, guided only by some vague vision of what lay over the next hill. As he, with others, experimented and explored the territory, a mental picture or map slowly emerged, with finer and finer levels of detail. (This metaphor is only helpful to a point. Jobs was not just exploring the territory—through his actions he was helping to create or enact the territory.)

As insightful as Jobs was, he could not accomplish his vision alone. He needed to involve others. The conversation and dialogue, which served to develop his understanding, also helped to **integrate** the cognitive maps of the group—to develop a *shared understanding*. Language, which plays a critical role in the development of individual maps, is essential as a means of integrating ideas and negotiating actions with others. Through conversation, workgroups identify areas of difference and agreement, gain language precision, and develop a shared understanding of their task domain. They quite naturally, as a part of this process, use their common language and the conversational process to negotiate *mutual adjustments* to their actions. These adjustments are an integral part of the learning process. The assumption is that a certain coherence of actions should

emerge from a shared understanding of the business situation—that is, the emergent strategy (Mintzberg, 1994).

But what is the context within which shared understandings and mutual adjustments occur? Early in an organization's life, as was the case with Apple, these processes are largely informal and spontaneous. As organizations grow larger and more people are involved, informal interactions do not suffice. What had happened more or less spontaneously must now be arranged; what had been an informal conversation over coffee about the future of the company becomes a formal planning process with *interactive systems* (Simons, 1991, 1994).

The organization naturally outgrows its ability to exclusively use spontaneous interactions to interpret, integrate, and take concerted action. Relationships become formalized and *routines* develop. There is a need to ensure that the routines continue to be carried out and that the organization produces and performs. This is the role of *diagnostic systems* (Simons, 1991, 1994).

In the Apple situation John Sculley was brought in, at least in part, to provide needed systems, structures, and other formal mechanisms. Individual and communal learning became **institutionalized** in the hope that the learning could be more systematically exploited. Institutionalization contributes to more efficient operations, enabling the organization to better deliver on the founder's original vision. With Apple, however, it also may have hindered the organization's ability to renew itself by intuiting, interpreting, and integrating emerging patterns and new possibilities. Unable to realize his new vision within Apple, Steve Jobs left to start a new enterprise, appropriately called NeXT.

Essentially, the process of institutionalizing embeds learned behaviors that have worked in the past into the routines of the organization. Diagnostic systems develop *rules and procedures* to facilitate the repetition of routines. But the process of institutionalizing also feeds back by creating a context through which subsequent events and experiences are interpreted. This context may facilitate and/or impede the organization's ability to (re)interpret and respond to its environment. The Apple example, while useful, is a simplification. In entrepreneurial startup situations like Apple, there is originally little or no past learning embedded in the formal

organization. Indeed, there is no formal organization. Established organizations do have past learning embedded within them. As such, learning and renewal in these situations must deal with this difference in context and its associated challenges.

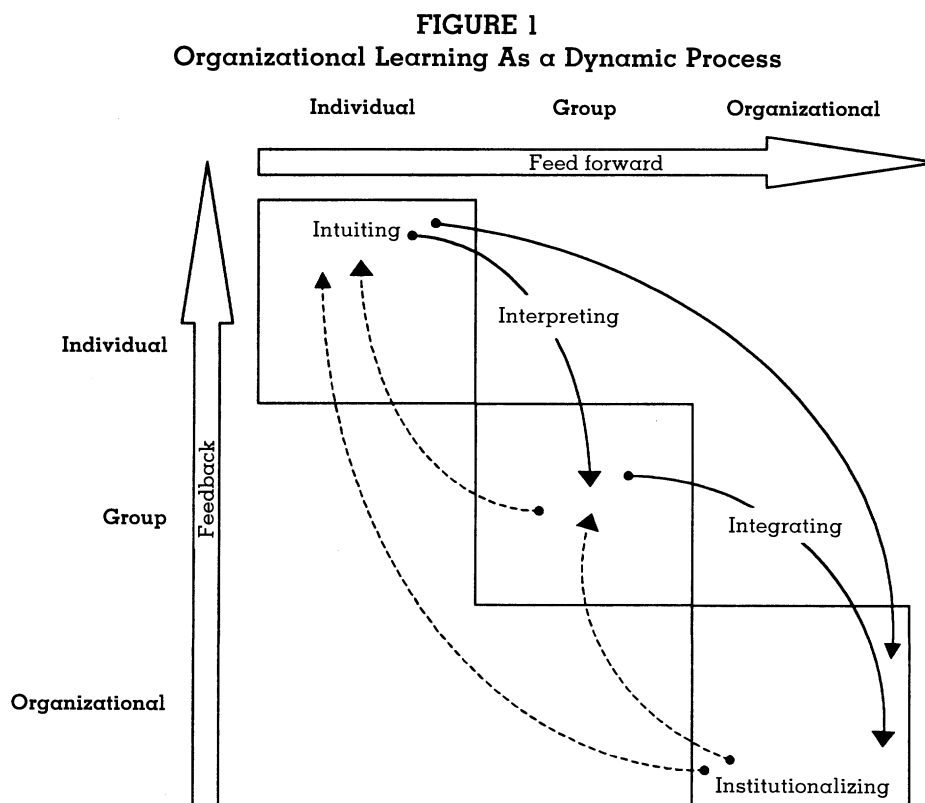
Organizational Learning As a Dynamic Process

Organizational learning is a dynamic process. Not only does learning occur over time and across levels, but it also creates a tension between assimilating new learning (feed forward) and exploiting or using what has already been learned (feedback). Through feed-forward processes, new ideas and actions flow from the individual to the group to the organization levels. At the same time, what has already been learned feeds back from the organization to group and individual levels, affecting how people act and think. The concurrent nature of the feed-forward and feedback processes creates a tension, which can be understood by arraying the levels against one another, as shown in Figure 1. Doing so illustrates that, in addition to the

processes that feed forward learning from the individual and groups to the organization, learning that has been institutionalized feeds back and impacts individual and group learning. The importance of these interactions can be highlighted by two relationships that are especially problematic: interpreting-integrating (feed forward) and institutionalizing-intuiting (feedback).

Moving from interpreting to integrating (feed forward) requires a shift from individual learning to learning among individuals or groups. It entails taking personally constructed cognitive maps and integrating them in a way that develops a shared understanding among the group members. There are many challenges in changing an existing shared reality. The first is that individuals need to be able to communicate, through words and actions, their own cognitive map. Since many aspects of cognitive maps are tacit, communicating them requires a process of surfacing and articulating ideas and concepts. This process makes tacit knowledge explicit (Polanyi, 1967).

Assuming individuals can surface and articulate their maps, a second challenge arises from



the collective interpretation of the maps. Making something explicit does not necessarily mean the understanding is shared. Imprecision of language is complicated by cognitive maps that act as unique filters on the communication; we tend to "see/hear what we believe" rather than "believe what we see." The real test of shared understanding is coherent action. Yet, for novel ideas, shared understanding may not evolve unless shared action or experimentation is attempted. The learning perspective suggests that leading with action, rather than bluntly focusing on cognition, may provide a different migration path to shared understanding. As in experiential learning (Crossan et al., 1995), action provides the opportunity to share a common experience, which may aid in the development of shared understanding.

The second problematic interaction is between institutionalizing and intuiting (feedback). Institutionalization can easily drive out intuition. Intuiting within established organizations with a high degree of institutionalized learning requires what Schumpeter (1959) refers to as "creative destruction"—destroying, or at least setting aside, the institutional order to enact variations that allow intuitive insights and actions to surface and be pursued. This is extremely difficult because the language and logic that form the collective mindset of the organization and the resulting investment in assets present a formidable fortress of physical and cognitive barriers to change. Further, members of the organization must step back from proven, objective successes and allow unproven, subjectively based experimentation.

One example of the tension and the potential for resolution is in the resource allocation process (institutionalized learning). Many resource allocation processes inhibit the development of new insights, given their emphasis on track record and proven success (Bower, 1970; Burgelman, 1983). However, some firms, such as 3M, have recognized this problem and have institutionalized a different resource allocation process that provides funding for new projects, and also holds the business accountable for having a significant portion of the revenue derived from new products (Hurst, 1995). The system tries to ensure that exploitation (feedback) does not drive out exploration (feed forward).

The tension between assimilating new learning (feed forward) and using what has already

been learned (feedback) arises because the institutionalized learning (what has already been learned) impedes the assimilation of new learning. Fully assimilating new learning requires the feed forward of learning from the individual and group to become institutionalized within the organization. Utilizing what has been learned is a feedback loop of institutionalized learning from the organization to groups and individuals. For example, rules and routines that once captured the logic and learning of how to facilitate learning at the individual level may no longer apply in a changed circumstance, yet the systems still focus an individual's energy and attention in ways that impede the assimilation and feed forward of new learning (Mintzberg, 1994). Or an organization structure that has a strong impact on who talks to whom in the organization may impede conversation that could develop valuable new shared understandings. Therefore, any theory of organizational learning needs to recognize the levels, processes, and dynamic nature of the learning process itself that create a tension between the feed forward and feedback of learning.

Conceiving of learning as a dynamic flow raises the possibility that these flows can be constrained. Consider for a moment the parallels between production flow and learning flow. Production flow must ensure that the level of work-in-process inventories does not exceed the capacity of any part of the system to absorb and process them. Concepts like throughput, capacity utilization, cycle time, and bottlenecks have aided our understanding of what it takes to balance a production line to ensure smooth flow. A dynamic theory of organizational learning recognizes that there may be bottlenecks in the ability of the organization to absorb (Cohen & Levinthal, 1990) the feed forward of learning from the individual to the group and organization. Investment in individual learning and pressures for new product innovation may become stockpiled if the organization has limited capacity to absorb the learning. However, in the production process, work-in-process inventory does not "care" whether it is stockpiled, whereas in the learning process individuals (and their ideas) do. As a result, individuals may become frustrated and disenchanted, and may even leave the organization.

A dynamic theory of organizational learning provides a means of understanding the funda-

mental tensions of strategic renewal: the tension between exploration (feed forward) and exploitation (feedback). Although one may be tempted to equate organizational learning solely with the innovative feed-forward process, in doing so one fails to recognize that the feedback process provides the means to exploit what has been learned (Crossan & Sorrenti, 1987). However, because learning that has become institutionalized at the organization level is often difficult to change, it runs the risk of becoming irrelevant and may even obstruct feed-forward learning flows. This has led to the call to liberate organizations and destroy bureaucracy (Pinchot & Pinchot, 1993), yet bureaucracy (or institutionalization) is not necessarily negative. Institutionalizing learning is necessary to reap the ongoing benefits of what has already been learned.

With the 4I framework we identify the flow of learning between levels and the tension between feed-forward (exploration) and feed-back (exploitation) processes as fundamental challenges of strategic renewal. There are many factors that could facilitate and inhibit this process, some of which are part of the institutionalized learning itself (e.g., reward systems, information systems, resource allocation systems, strategic planning systems, and structure). However, in the 4I model we recognize that ideas occur to individuals and that individuals ultimately share those ideas through an integrating process. It is the individuals, and the social processes and group dynamics through which they interact, that may facilitate or inhibit organizational learning. One promising area for further research is to examine the role of leadership and management of the 4I learning process.

IMPLICATIONS FOR RESEARCH AND MANAGEMENT

The central contribution of this work is the 4I's and the related feed-forward and feed-back processes. Further, the interplay between the levels and the processes reveals the tensions associated with strategic renewal. It is our hope that this framework will stir a reaction in the organizational learning community and help scholars research the links among the levels and the tensions inherent in organizational learning.

The same questions that we as researchers seek to answer form the basis of inquiry for

managers. Is there a satisfactory level of intuitive, innovative insights in the organization? Do individuals have the motivation, understanding, capability, and opportunity to interpret their environment? How do individual and group experiences help to develop shared understanding? How well do individual insights become shared, integrated, and institutionalized in the organization? What impediments are there to integrating individual perspectives? How much of the organization's intellectual capital resides in individual heads? Is there enough institutionalized learning? How does institutionalized learning facilitate or impede intuiting, interpreting, and integrating? What is the nature of the interplay between the feed-forward and feedback processes?

The responses to these questions need to take into account the dynamic nature of organizational learning as it relates to strategic renewal. Compartmentalization of the issues will lead to a simplification that disguises the many essential challenges of the phenomenon. For example, in the case of the first question, a simple focus on intuiting may yield a better understanding of the individual processes of innovation. However, such a focus will miss the tension and, hence, challenge of feeding forward intuitive insights with the hope of interpreting, integrating, and institutionalizing them, while concurrently working within a setting where institutionalized learning continues to positively impact upon the performance of the enterprise.

The question of whether individuals have the motivation, understanding, capability, and opportunity to interpret their environment suggests the need to examine more than just individuals. It requires an examination of the link between interpreting and institutionalizing. Individuals may be motivated and capable, but if they turn their attention toward interpreting things that have little impact, the organization will reap few benefits from that learning. Furthermore, even if individuals are interpreting things of relevance, their learning needs to be integrated and institutionalized to realize its future value. This theory suggests it is not simply a matter of transferring data, information, or knowledge—it is a matter of organizational learning.

The role of experience in the development of shared understanding reinforces the learning

premise that cognition (knowledge, understanding, and beliefs) and action (behaviors) are tightly intertwined, and changes in knowledge do not necessarily lead to changes in action. In contrast to knowledge management and intellectual capital, which focus management and research attention on cognition, this view of organizational learning acknowledges the rich interrelationship between cognition and action.

The foregoing examples emphasize the need to pursue questions of organizational learning with a dynamic perspective. We encourage researchers and managers to extend their thinking to consider how different parts of the organizational learning system impact one another. This framework should serve as a map to help researchers and managers expand their horizons.

While this framework should encourage and assist the pursuit of a more holistic understanding of organizational learning, there are two particular areas of research that will help advance theory. The first is understanding the mechanisms that enhance or restrict the stocks and flows of learning. Here we have suggested that learning processes can be compared to production processes. This point should generate substantial dialogue, because it begins to question some of the traditional leverage points for organizational learning. For example, continued investment in individual and even group learning may be counterproductive if the organization does not have the capacity to absorb or utilize it. If this is the case, future research in organizational learning needs to move from the reasonably well-developed understanding of individual- and group-level learning to understanding the flows of learning (feed forward and feedback) between the levels.

Yet, all intuitive insights should not, and cannot, be immediately interpreted, integrated, and institutionalized. What enables the organization to "separate the wheat from the chaff"—the good from the bad—as ideas and practices develop and are refined over time? We have suggested that the strategic context helps to frame things that are more or less relevant, but the decision rules, criteria, and processes are not so clear. For example, if 3M had framed the discovery of a glue that does not stick in a narrow strategic context, we would not have reaped the benefits of Post-It® Notes.

A second area that will advance theory is an understanding of how to reconcile the tension between exploitation and exploration—between continuity and change. The 4I model directs our attention to the interplay of these processes, but it does not specifically address how organizations deal with this tension. Although a few management scholars have considered this problem (Hurst, 1995; Miller, 1990; Pascale, 1990), answers have proven elusive. This important question merits further consideration and investigation.

This dynamic framework of organizational learning will place significant demands on both researchers and managers. It requires capability for cross-level examination with a critical eye for the tensions inherent in the feed-forward and feedback processes. It requires the capability to link human resource management, strategic management, and the management of information technology and systems as a means to facilitate the flow of learning. Although such research poses challenges, the potential benefits are significant. Strategic renewal is one of the central challenges of every organization. This dynamic process of organizational learning could yield important insights into strategic renewal.

In summary, in this article we have pushed in the direction of advancing a theory of organizational learning by describing an organizational learning framework that incorporates the dynamic multilevel nature of the phenomenon and captures the rich interplay between process and level. This framework should provide clarity, promote dialogue, foster convergence (Pfeffer, 1993), and encourage new directions in research that begin to examine organizational learning flows that enable strategic renewal.

REFERENCES

- Anderson, I. V. 1992. Weirder than fiction: The reality and myths of creativity. *Academy of Management Executive*, 6(4): 40–47.
- Argyris, C., & Schon, D. A. 1978. *Organizational learning: A theory of action perspective*. Reading, MA: Addison-Wesley.
- Argyris, C., & Schon, D. A. 1996. *Organizational learning II: Theory, method, and practice*. Reading, MA: Addison-Wesley.
- Bacharach, S. 1989. Organizational theories: Some criteria for evaluation. *Academy of Management Review*, 14: 496–515.

- Behling, O., & Eckel, H. 1991. Making sense out of intuition. *Academy of Management Executive*, 5(1): 46-54.
- Berger, P., & Luckmann, T. 1966. *The social construction of reality: A treatise in the sociology of knowledge*. Garden City, NY: Anchor Books.
- Bower, J. L. 1970. *Managing the resource allocation process*. Boston: Harvard Business School Press.
- Bruner, J. 1990. *Acts of meaning*. Cambridge, MA: Harvard University Press.
- Burgelman, R. A. 1983. A model of the interaction of strategic behavior, corporate context and the concept of strategy. *Academy of Management Review*, 8: 61-70.
- Cangelosi, V. E., & Dill, W. R. 1965. Organizational learning observations: Toward a theory. *Administrative Science Quarterly*, 10: 175-203.
- Cohen, W. M., & Levinthal, D. A. 1990. Absorptive capacity: A new perspective on learning and innovation. *Administrative Science Quarterly*, 35: 128-152.
- Conner, K., & Prahalad, C. 1996. A resource-based theory of the firm: Knowledge versus opportunism. *Organization Science*, 7: 469.
- Crossan, M., & Guatto, T. 1996. Organizational learning research profile. *Journal of Organizational Change Management*, 9(1): 107-112.
- Crossan, M., Lane, H., White, R. E., Djurfeldt, L. 1995. Organizational learning: Dimensions for a theory. *International Journal of Organizational Analysis*, 3: 337-360.
- Crossan, M., & Sorrenti, M. 1997. Making sense of improvisation. In A. Huff & J. Walsh (Eds.), *Advances in strategic management*, vol. 14: 155-180. Stamford, CT: JAI Press.
- Daft, R. L., & Huber, G. 1987. How organizations learn: A communication framework. *Research in the Sociology of Organizations*, 5(2): 1-36.
- Daft, R. L., & Weick, K. E. 1984. Toward a model of organizations as interpretation systems. *Academy of Management Review*, 9: 284-295.
- Davenport, T., & Prusak, L. 1997. *Information ecology: Mastering the information and knowledge environment*. New York: Oxford University Press.
- DeGeus, A. 1988. Planning as learning. *Harvard Business Review*, 66(March-April): 70-74.
- Duncan, R. B., & Weiss, A. 1979. Organizational learning: Implications for organizational design. *Research in Organizational Behavior*, 1(4): 75-124.
- Edvinsson, L., & Malone, M. 1997. *Intellectual capital*. New York: Harper Business.
- Fiol, C. M., & Lyles, M. A. 1985. Organizational learning. *Academy of Management Review*, 10: 803-813.
- Foss, N. 1996. Knowledge-based approaches to the theory of the firm: Some critical comments. *Organization Science*, 7: 470-476.
- Grant, R. M. 1996. Toward a knowledge-based theory of the firm. *Strategic Management Journal*, 17: 109-122.
- Hambrick, D., & Mason, P. A. 1984. Upper echelons: The organization as a reflection of its top managers. *Academy of Management Review*, 9: 193-206.
- Hedberg, B. 1981. How organizations learn and unlearn. In P. C. Nystrom & W. H. Starbuck (Eds.), *Handbook of organizational design*: 3-27. New York: Oxford University Press.
- Huber, G. P. 1991. Organizational learning: The contributing processes and the literatures. *Organization Science*, 2: 88-115.
- Huff, A. S. 1990. *Mapping strategic thought*. New York: Wiley.
- Hurst, D. K. 1995. *Crisis and renewal*. Boston: Harvard Business School Press.
- Hurst, D. K., Rush, J. C., & White, R. E. 1989. Top management teams and organizational renewal. *Strategic Management Journal*, 10: 87-105.
- Isaacs, W. H. 1993. Dialogue, collective thinking, and organizational learning. *Organizational Dynamics*, 22(2): 24-39.
- Janis, I. 1982. *Groupthink: Psychological studies of policy decisions and fiascoes*. Boston: Houghton Mifflin.
- Kim, D. H. 1993. The link between individual and organizational learning. *Sloan Management Review*, 33(1): 37-50.
- Koestler, A. 1976. *The act of creation*. London: Hutchinson.
- Kogut, B., & Zander, U. 1992. Knowledge of the firm, combinative capabilities, and the replication of technology. *Organization Science*, 3: 383-397.
- Levitt, B., & March, J. G. 1988. Organizational learning. *Annual Review of Sociology*, 14: 319-340.
- Maister, D., & Wyckoff, D. 1974. *Federal Express (A) & (B)*. Case No. 9-674-093-094. Boston: Harvard Business School Case Services.
- March, J. G. 1991. Exploration and exploitation in organization learning. *Organization Science*, 2: 71-87.
- March, J. G., & Olsen, J. P. 1975. Organizational learning under ambiguity. *European Journal of Policy Review*, 3(2): 147-171.
- Miller, D. 1990. *The Icarus paradox: How exceptional companies bring about their own downfall*. New York: Harper Business.
- Mintzberg, H. 1994. *The rise and fall of strategic planning*. New York: Free Press.
- Neisser, U. 1976. *Cognition and reality*. San Francisco: Freeman.
- Nonaka, I., & Takeuchi, H. 1995. *The knowledge creating company*. Oxford, England: Oxford University Press.
- Pascale, R. T. 1990. *Managing on the edge: How the smartest companies use conflict to stay ahead*. New York: Simon and Schuster.
- Pfeffer, I. 1993. Barrier to the advance of organizational science: Paradigm development as a dependent variable. *Academy of Management Review*, 18(4): 599-620.
- Pinchot, G., & Pinchot, E. 1993. *The end of bureaucracy and the rise of the intelligent organization*. San Francisco: Berrett-Koehler.

- Polanyi, M. 1967. *The tacit dimension*. London: Routledge.
- Prietula, M. J., & Simon, H. A. 1989. The experts in your midst. *Harvard Business Review*, 61(January-February): 120-124.
- Quinn, J. B. 1992. *Intelligent enterprise: A knowledge and service based paradigm for industry*. New York: Free Press.
- Schumpeter, I. A. 1959. *The theory of economic development*. Cambridge, MA: Harvard University Press.
- Seely-Brown, I. 1993. Thinking, working, and learning. In M. M. Crossan, H. W. Lane, J. Rush, & R. E. White (Eds.), *Learning in organizations monograph*: 81-99. London, Ontario: Western Business School.
- Seely-Brown, I., & Duguid, P. 1991. Organizational learning and communities of practice: Toward a unified view of working, learning and innovation. *Organization Science*, 2: 40-57.
- Senge, P. 1990. *The fifth discipline: The art and practice of the learning organization*. New York: Doubleday/Currency.
- Shrivastava, P. 1983. A typology of organizational learning systems. *Journal of Management Studies*, 20(1): 7-28.
- Simon, H. A. 1991. Bounded rationality and organizational learning. *Organization Science*, 2: 125-134.
- Simons, R. 1991. Strategic orientation and top management attention to control systems. *Strategic Management Journal*, 12: 49-62.
- Simons, R. 1994. How new top managers use control systems as levers of strategic renewal. *Strategic Management Journal*, 15: 169-189.
- Srivastava, S., & Barrett, F. J. 1988. The transforming nature of metaphors in group development: A study in group theory. *Human Relations*, 41: 31-64.
- Stata, R. 1989. Organizational learning: The key to management innovation. *Sloan Management Review*, 30(3): 63-74.
- Stewart, T. A. 1997. *Intellectual capital: The wealth of nations*. New York: Doubleday/Currency.
- Sutton, R., & Staw, B. M. 1995. What theory is not. *Administrative Science Quarterly*, 40: 371-384.
- Tsoukas, H. 1991. The missing link: A transformational view of metaphors in organizational science. *Academy of Management Review*, 16: 566-585.
- Underwood, B. J. 1982. *Studies in learning and memory: Selected papers*. New York: Praeger.
- Watkins, K. E., & Marsick, W. J. 1993. *Sculpting the learning organization*. San Francisco: Jossey-Bass.
- Walsh, J. P. 1988. Selectivity and selective perception: An investigation of managers' belief structures and information processing. *Academy of Management Journal*, 31: 873-896.
- Watson, I. D. 1969. *The double helix*. New York: Mentor Books.
- Weick, K. 1979. *The social psychology of organizing*. Reading, MA: Addison-Wesley.
- Weick, K. 1995a. What theory is not, theorizing is. *Administrative Science Quarterly*, 40: 385-390.
- Weick, K. E. 1995b. *Sensemaking in organizations*. Thousand Oaks, CA: Sage.
- Weick, K., & Roberts, K. 1993. Collective mind and organizational reliability: The case of flight operations in an aircraft carrier deck. *Administrative Science Quarterly*, 38: 357-381.
- Weick, K., & Van Orden, P. W. 1990. Organizing on a global scale: A research and teaching agenda. *Human Resource Management*, 29: 49-61.
- Whetton, D. A. 1989. What constitutes a theoretical contribution? *Academy of Management Review*, 14: 490-495.

Mary M. Crossan is an associate professor in general management at the Richard Ivey School of Business. She received her MBA and Ph.D. in business policy from the University of Western Ontario. Her research focuses on organizational learning and improvisation for strategic renewal.

Henry W. Lane holds the Fred and Darla Brodsky Chair in International Business at Northeastern University in Boston. Until recently, he was at the Richard Ivey School of Business. He received his DBA in organizational behavior from the Harvard Business School. His research interests are international business and organizational learning and strategic renewal.

Roderick E. White is an associate professor in general management at the Richard Ivey School of Business. He received his DBA and MBA from Harvard University and his honors bachelor of arts (business) from the University of Western Ontario. His research interests focus on the renewal of mature organizations and the evolution of social structure.