The Link between Individual and Organizational Learning

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All organizations learn, whether they consciously choose to or not—it is a fundamental requirement for their sustained existence. Some firms deliberately advance organizational learning, developing capabilities that are consistent with their objectives; others make no focused effort and, therefore, acquire habits that are counterproductive. Nonetheless, all organizations learn.

But what does it mean that an organization learns? We can think of organizational learning as a metaphor derived from our understanding of individual learning. In fact, organizations ultimately learn via their individual members. Hence, theories of individual learning are crucial for understanding organizational learning. Psychologists have studied individual learning for decades, but they are still far from fully understanding the workings of the human mind. Likewise, the theory of organizational learning is still in its embryonic stage.

The purpose of this paper is to build a theory about the process through which individual learning advances organizational learning. To do this, we must address the role of individual learning and memory, differentiate between levels of learning, take into account different organizational types, and specify the transfer mechanism between individual and organizational learning. This transfer is at the heart of organizational learning: the process through which individual learning becomes embedded in an organization’s memory and structure. Until now, it has received little attention and is not well understood, although a promising interaction between organization theory and psychology has begun. To contribute to our understanding of the nature of the learning organization, I present a framework that focuses on the crucial link between individual learning and organizational learning. Once we have a clear understanding of this transfer process, we can actively manage the learning process to make it consistent with an organization’s goals, vision, and values.

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INDIVIDUAL LEARNING

The importance of individual learning for organizational learning is at once obvious and subtle-obvious because all organizations are composed of individuals; subtle because organizations can learn independent of any specific individual but not independent of all individuals. Psychologists, linguists, educators, and others have heavily researched the topic of learning at the individual level. They have made discoveries about cognitive limitations as well as the seemingly infinite capacity of the human mind to learn new things. Piaget’s focus on the cognitive development processes of children and Lewin’s work on action research and laboratory training have provided much insight into how we learn as individuals and in groups. Some of these theories are based on stimulus-response behaviorism. Some focus on cognitive capabilities, and others on psycho dynamic theory. Numerous other theories have been proposed, debated, and tested, such as Pavlov’s classical conditioning, Skinner’s operant conditioning, Tolman’s sign learning, Gestalt theory, and Freud’s psychodynamics.

Despite all the research done to date, we still know relatively little about the human mind and the learning process. It seems that the more knowledge we gain, the more we realize how little we know. But let’s start at the beginning—we need a common definition of the word “learning” on which to build.

A Working Definition of Learning

Jaques has noted that most words in the field of organizational development—even “manager,” “plan,” and “work”—are ill defined. Such words have “so many meanings that they have value only as vague slogans.” Such is the case with the word “learning,” a term whose meaning varies widely by context.

Levels of Learning: Operational and Conceptual.

The dictionary definition states that learning is “the acquiring of knowledge or skill.” Thus learning encompasses two meanings: (1) the acquisition of skill or know-how, which implies the physical ability to produce some action, and (2) the acquisition of know-why, which implies the ability to articulate a conceptual understanding of an experience. A number of theorists make this connection between thought and action. Argyris and Schon argue that learning takes place only when new knowledge is translated into different behavior that is replicable. For Piaget, the key to learning lies in the mutual interaction of accommodation (adapting our mental concepts based on our experience in the world) and assimilation (integrating our experience into existing mental concepts). As Kolb states; “Learning is the process whereby knowledge is created through the transformation of experience.” Thus both parts of the definition are important:
what people learn (know-how) and how they understand and apply that learning (know-why).

For example, a carpenter who has mastered the skills of woodworking without understanding the concept of building coherent structures like tables and houses can't utilize those skills effectively. Similarly, a carpenter who possesses vast knowledge about architecture and design but who has no complementary skills to produce designs can't put that know-why to effective use. Learning can thus be defined as increasing one's capacity to take effective action.

Another way to think about the two facets is as operational and conceptual learning. This distinction is an important part of the model developed here.

**Experiential Learning Model.**
Experiential learning theory is the school of thought that best accommodates these two aspects of learning." One of the theorists associated with this school is Lewin, whose learning cycle is represented in Figure 1. 12)

As Lewin describes it, a person continually cycles through a process of having a concrete experience, making observations and reflections on that experience, forming abstract concepts and generalizations based on those reflections, and testing those ideas in a new situation, which leads to another concrete experience. This basic cycle has appeared in a variety of settings. In the total quality management (TQM) literature, it shows up as the Deming cycle of plan-do-check-act." Deming himself refers to it as the Shewhart cycle of plan-do-study-act.) In organizational development, Schein calls his version the observation-emotional reaction-judgment-intervention cycle." Argyris and Schon refer to a discovery-invention on-production -generalization cycle of learning."

At the risk of added confusion, I have based my model of individual learning on Kofman's version of the learning cycle, as shown in Figure 2. The observeassess- design -implement (OADI) cycle preserves the salient features of the versions mentioned above, but the terms have clearer connections to activities conducted in an organizational context. In the OADI cycle, people experience concrete events and actively observe what is happening. They assess (consciously or subconsciously) their experience by reflecting on their observations and then design or construct an abstract concept that seems to be an appropriate response to the assessment. They test the design by implementing it in the concrete world, which leads to a new concrete experience, commencing another cycle.

**The Role of Memory**
Although the OADI cycle helps us understand learning, for our purposes it is incomplete. It does not explicitly address the role of memory, which plays a critical role in linking individual to organizational learning. Integrating the role
of memory will require us to make a more explicit distinction between conceptual and operational learning.

Psychological research makes a distinction between learning and memory." Learning has more to do with acquisition, whereas memory has more to do with retention of whatever is acquired. In reality, however, separating the two processes is difficult because they are tightly interconnected-what we already have in our memory affects what we learn and what we learn affects our memory. The concept of memory is commonly understood to be analogous to a storage device where everything we perceive and experience is filed away. However, we need to differentiate between stored memory like baseball trivia and active structures that affect our thinking process and the actions we take. That is, we need to understand the role of memory in the learning process itself. A good way to understand these active structures is the concept of mental models.

**Individual Mental Models.**

In Figure 4-3, mental models are added to the **OADI learning cycle**. Senge describes mental models as deeply held internal images of how the world works, which have a powerful influence on what we do because they also affect what we see." Troubles can arise when we take actions on the basis of our mental models as if they were reality. The concept of mental models differs from the traditional notion of memory as static storage because mental models play an active role in what an individual sees and does.

**See FIGURE 4-3 Simple Model of Individual Learning:**

OADI-Individual Mental Models (MM) Cycle

Mental models represent a person's view of the world, including explicit and implicit understandings. Mental models provide the context in which to view and interpret new material, and they determine how stored information is relevant to a given situation. They represent more than a collection of ideas, memories, and experiences-they are like the source code of a computer's operating system, the manager and arbiter of acquiring, retaining, using, and deleting new information. But they are much more than that because they are also like the programmer of that source code with the know-how to design a different source code as well as the know-why to choose one over the other.
Mental models not only help us make sense of the world we see, they can also restrict our understanding to that which makes sense within the mental model. Senge gives this example:

Have you ever heard a statement such as, "Laura doesn't care about people" and wondered about its validity?
Imagine that Laura is a superior or colleague who has some particular habits that others have noted. She rarely offers generous praise. She often stares off into space when people talk to her and then asks, "What did you say?" She sometimes cuts people off when they speak. She never comes to office parties.... From these particular behaviors, Laura's colleagues have concluded that she doesn't care much about people. It's been common knowledge—except, of course, for Laura, who feels that she cares very much about people.... Once Laura's colleagues accept as fact that she doesn't care about people, no one questions her behavior when she does things that are "non-caring," and no one notices when she does something that doesn't fit the [mental model]. The general view that she doesn't care leads people to treat her with greater indifference, which takes away any opportunity she might have had to exhibit more caring.

People's untested assumptions about Laura play an active role in creating the set of interactions that make their mental model of her a self-fulfilling prophecy. Whenever we take actions on the basis of stereotypes, we risk committing the same error as Laura's colleagues.

**Frameworks and Routines.**
The two levels of learning—operational and conceptual—can be related to two parts of mental models. Operational learning represents learning at the procedural level, where one learns the steps in order to complete a particular task. This know-how is captured as routines, such as filling out entry forms, operating a piece of machinery, handling a switchboard, and retooling a machine. Not only does operational learning accumulate and change routines, but routines affect the operational learning process as well. The arrows going in both directions in the diagram represent this mutual influence.

Conceptual learning has to do with the thinking about why things are done in the first place, sometimes challenging the very nature or existence of prevailing conditions, procedures, or conceptions and leading to new frameworks in the mental model. The new frameworks, in turn, can open up opportunities for discontinuous steps of improvement by reframing a problem in radically different ways.

To make the dynamics of the link between learning and mental models clearer, let's consider a simple example of driving a car home from work. Most of us probably know several ways to get home. The route we use most often
has been chosen based on our beliefs about what makes a "good" route home from work. These belief systems are our frameworks that guide our choice between a route with the fewest stoplights and the one with the most scenic views. Once we have settled on a route, it becomes a routine that we execute whenever we want to go home. Now we can drive home on automatic pilot. If we encounter road construction that blocks our normal route or if our route becomes consistently congested, however, we rethink our criteria of what the best route home means and select a new route. This is our model, then, of individual learning—a cycle of conceptual and operational learning that informs and is informed by mental models.

**ORGANIZATIONAL LEARNING**

Organizational learning is more complex and dynamic than a mere magnification of individual learning. The level of complexity increases tremendously when we go from a single individual to a large collection of diverse individuals. Issues of motivation and reward, for instance, which are an integral part of human learning, become doubly complicated within organizations. Although the meaning of the term "learning" remains essentially the same as in the individual case, the learning process is fundamentally different at the organizational level. A model of organizational learning has to resolve the dilemma of imparting intelligence and learning capabilities to a non-human entity without anthropomorphizing it.

**The Individual-Organization Learning Dilemma**

What do we mean by organizational learning? In the early stages of an organization's existence, organizational learning is often synonymous with individual learning because the organization consists of a small group of people and has minimal structure. As an organization grows, however, a distinction between individual and organizational learning emerges, and a system for capturing the learning of its individual members evolves. Argyris and Schon posed one of the main dilemmas shared by all who tackle this issue:

*There is something paradoxical here. Organizations are not merely collections of individuals, yet there are no organizations without such collections. Similarly, organizational learning is not merely Individual learning, yet organizations learn only through the experience and actions of individuals. What, then, are we to make of organizational learning? What is an organization that it may learn?*
Clearly, an organization learns through its individual members and, therefore, is affected either directly or indirectly by individual learning. Argyris and Schon present a theory whereby organizational learning takes place through individual actors whose actions are based on a set of shared models. They argue that most organizations have shared assumptions that protect the status quo, preclude people from challenging others’ troublesome or difficult qualities and characteristics, and provide silent assent to those attributions; hence, very little learning is possible. For example, when confronted with a leader’s tendency to steamroll over any opposition, people tend to accept it with resignation as “the way X is,” rather than to point out the occasions when the steamrolling occurs. Furthermore, we assume that the person is aware and doing it on purpose, or we assume that the person doesn’t want to talk about it. We don’t make our own mental models explicit. We don’t test our assumptions with that person. Whenever we interact with such people, we “know” they will steamroll, so we act in ways that make it easy for them to do it.

There is little agreement on what constitutes “appropriate” learning, those actions or lessons that should be incorporated into an organization’s memory. Organizational routines, such as standard operating procedures (SOPs), are generally viewed as an important part of an organization’s memory and a repository of its past learning. However, some argue that SOPs are dangerous because they become so institutionalized that they delay the search for new procedures when the environment changes radically. These theorists advocate minimal levels of consensus, contentment, affluence, faith, consistency, and rationality. Levitt and March, on the other hand, caution that such a situation can lead people to make mistakes faster by, for example, specializing prematurely in inferior technologies.

In reality, both views are correct to a degree; the crux of the matter is knowing when organizational routines such as SOPs are appropriate and when they are not. As Winter argues:

Routinized competence clearly does not dictate inattention to considerations that fall outside of the scope of the routines; in fact, it should make possible higher levels of attention to such considerations. But the wider the range of situations subsumed by the routines and the better the routinized performance, the fewer reminders there are that something besides routinized competence might on occasion be useful or even essential to survival.

But how does an organization decide when once-appropriate routines are no longer the correct actions to take? Can an organization anticipate obsolescence of their SOPs, or must it always learn by first making inappropriate decisions in the face of changing conditions? Are organizational SOPs different from individual routines? These are the types of issues that a model of organizational learning must address.
Organizations as Behavioral Systems

Simon proposed the following hypothesis:

A man, viewed as a behaving system, is quite simple. The apparent complexity of his behavior over time is largely a reflection of the complexity of the environment in which he finds himself.

This behavioral perspective can be extended to organizations. For example, Cyert and March see the organization as an adaptively rational system that basically learns from experience. A firm changes its behavior in response to short-term feedback from the environment according to some fairly well-defined rules and adapts to longer-term feedback on the basis of more general rules. At some level in this hierarchy, they suggest, lie “learning rules.”

March and Olsen make a distinction between individual and organizational action in their model of organizational learning (see Figure 4). In this model, individual actions are based on certain individual beliefs. These actions, in turn, lead to organizational action, which produces some environmental response. The cycle is completed when the environmental response affects individual beliefs. Tracing this loop, we see that if the environmental response is static and unchanging, individual beliefs, actions, and therefore organizational actions will also remain unchanged. If there are changes in the environment, however, individual beliefs about the nature of the environment could change, thus precipitating a different set of individual and organizational actions. This will, in turn, set off a new cycle of learning.

See FIGURE 4-4 Model of Organizational Learning

March and Olsen’s model also addresses the issue of incomplete learning cycles, where learning in the face of changing environmental conditions is impaired because one or more of the links is either weak or broken. They identify four cases where the learning cycle is incomplete and leads to dysfunctional learning. Role-constrained learning can occur when individual learning has no effect on individual action because the circle is broken by the constraints of the individual’s role. Audience learning occurs when the individual affects organizational action in an ambiguous way. In superstitious learning, the link between organizational action and environmental response is severed. Thus, actions are taken, responses are observed, inferences are drawn, and learning takes place, but there is no real basis for the connections made between organizational action and environmental response. With learning under ambiguity, the individual affects organizational action, which affects the environment, but the causal connections among the events are not clear. That is, operational learning occurs but conceptual learning does not. Effective organizational learning requires a balance of conceptual and operational learning.
Organizations as Interpretation Systems

The behavioral view above is consistent with the view of organizations as interpretation systems. Daft and Weick propose a model that represents the overall learning process of an organization: scanning, interpretation, and learning (see Figure 4-5). Scanning involves monitoring and obtaining data about the environment. Interpretation is the process of translating events and developing concepts consistent with prior understanding of the environment. Learning is knowledge about the interrelationships between the organization’s actions and the environment as well as the actions that are taken on the basis of such knowledge.

Although Daft and Weick likened interpretation to an individual learning a new skill, I would again separate know-how from know-why and say that interpretation occurs more at the conceptual than the operational level. Their typology of four different interpretation types - undirected viewing, conditioned viewing, discovering, and enacting-is shown in Figure 6. The horizontal axis, organizational intrusiveness, is a measure of an organization’s willingness to look outside its own boundaries. For example, a technology-focused company’s efforts may be inwardly directed (intensive research in core technologies) whereas a marketing-focused company’s efforts are outwardly focused (customer focus groups and market surveys). The two axes represent an organization’s assumptions about the world and its role in it, the combination of which captures an organization’s worldview or weltanschauung. An organization’s weltanschauung determines how it interprets environmental responses, whether it will act on them, and what specific means it will employ if it chooses to act.

The Missing Link: From Individual to Organizational Learning

Various theories of organizational learning have been based on theories of individual learning." However, if a distinction between organization and individual is not made explicit, a model of organizational learning will either obscure the actual learning process by ignoring the role of the individual (and anthropomorphizing organizations) or become a simplistic extension of individual learning by glossing over organizational complexities.

See FIGURE 4-5 Relationships among Organizational Scanning, Interpretation, and Learning

and FIGURE 4-6 Types of Organizational Interpretation Systems
Daft and Weick’s model of organizations as interpretation systems does not explicitly deal with individual actors at all. March and Olsen’s model also largely ignores the interactions between individual learning and learning at the organizational level. In their model, individual learning is driven primarily by environmental responses, and organizational learning occurs when the whole cycle is completed. It implies that all organizational learning must be driven in some measure by what is happening in the environment and does not explain what learning occurs within a firm, independent of the outside environment. Other theorists equate organizational learning with the actions of a group of individuals, such as a top management group. They do not identify an explicit transfer process through which individual learning is retained by the organization. Hence, if individuals should leave, the organization is likely to suffer a tremendous loss in its learning capacity. In the next section, I will attempt to build an integrated model that will address some of these shortcomings.

**AN INTEGRATED MODEL OF ORGANIZATIONAL LEARNING**

An integrated model of organizational learning organizes all of the elements discussed thus far into a cohesive framework (see Figure 7). I call it the OADI-SMM model: observe, assess, design, implement—shared mental models. It addresses the issue of the transfer of learning through the exchange of individual and shared mental models. Analogous to individual learning, organizational learning is defined as increasing an organization’s capacity to take effective action.

See FIGURE 4-7 An Integrated Model of Organizational Learning: OADI-Shared Mental Models (SMM) Cycle

**The Role of Individuals in Organizational Learning**

In the OADI-SMM model, I have substituted "individual beliefs" in March and Olsen's model with the OADI-IMM model of individual learning. The individual learning cycle is the process through which those beliefs change and those changes are then codified in the individual mental models. The cycles of individual learning affect learning at the organizational level through their influence on the organization’s shared mental models. An organization can learn only through its members, but it is not dependent on any specific member, as denoted in Figure 7 by the multiple boxes representing individual learning. Individuals, however, can learn without the organization.

Individuals are constantly taking actions and observing their experience, but not all individual learning has organizational consequences. A person may enroll in a dance class and learn a new dance step, but we would not expect such actions to be relevant to organizational learning.
Although such influences as the development and enforcement of group norms, group polarization, and other factors have an effect on individuals, group effects are not explicitly included in the model.” However, if we view a group as a mini-organization whose members contribute to the group’s shared mental models, then the model can represent group learning as well as organizational learning. A group can then be viewed as a collective individual, with its own set of mental models, that contributes to the organization’s shared mental models and learning. This is consistent with the notion that groups themselves are influenced by organizational structure and type of management style and, therefore, can be treated as if they were "extended individuals.”

The Transfer Mechanism: Shared Mental Models

Organizational memory, broadly defined, includes everything that is contained in an organization that is somehow retrievable. Thus storage files of old invoices are part of that memory. So are copies of letters, spreadsheet data stored in computers, and the latest strategic plan, as well as what is in the minds of all organizational members. However, as with individual learning, such a static definition of memory is not very useful in the context of organizational learning.

The parts of an organization’s memory that are relevant for organizational learning are those that constitute active memory—those that define what an organization pays attention to, how it chooses to act, and what it chooses to remember from its experience—that is, individual and shared mental models. They may be explicit or implicit, tacit or widely recognized, but they have the capacity to affect the way an individual or organization views the world and takes action. Organizational learning is dependent on individuals improving their mental models; making those mental models explicit is crucial to developing new shared mental models. This process allows organizational learning to be independent of any specific individual.

Why put so much emphasis on mental models? Because the mental models in individuals’ heads are where a vast majority of an organization’s knowledge (both know-how and know-why) lies. Imagine an organization in which all the physical records disintegrate overnight. Suddenly, there are no reports, no computer files, no employee record sheets, no operating manuals, no calendars—all that remain are the people, buildings, capital equipment, raw materials, and inventory. Now imagine an organization where all the people simply quit showing up for work. New people, who are similar in many ways to the former workers but who have no familiarity with that particular organization, come to work instead. Which of these two organizations will be easier to rebuild to its former status?

Most likely, retaining all the people will make it easier to rebuild than retaining only the systems and records. In the first scenario, the organizational static memory is eliminated, but not the shared mental models of
the **people in** the second scenario, individual mental models and their linkages to the shared mental models are obliterated. Thus when new individuals come in, they have their own mental models that have no connection to the remaining organizational memory.

Even in the most bureaucratic of organizations, despite the preponderance of written SOPs and established protocols, there is much more about the firm that is unsaid and unwritten; its essence is embodied more in the people than in the systems. Comparatively little is put down on paper or stored in computer memories. The intangible and often invisible assets of an organization reside in individual mental models that collectively contribute to the shared mental models. The shared mental models are what make the rest of the organizational memory usable. Without these mental models, which include all the subtle interconnections that have been developed among the various members, an organization will be incapacitated in both learning and action.

This assertion is not as radical as it may sound. There is some empirical support for it in the form of turnover data. As everyone knows, high turnover is costly in terms of time and money because new recruits have to "learn the ropes" while being paid and consuming an experienced person's time. In fact, the second scenario described above is precisely the case of high turnover taken to an extreme. Companies with a 40 percent to 50 percent annual turnover rate have a hard time accumulating learning because their experience base is continually being eroded. Radical changes brought about by a new CEO or by a hostile takeover are examples of the first scenario. In many such cases, the organization is completely gutted of its previous management style, procedures, and structures and replaced with a different one altogether. Although transitions are times of great upheaval, the organization as a whole usually remains intact.

**Weltanschauung and SOPS.**

As stated earlier, mental models are not merely a repository of sensory data; they are active in that they build theories about sensory experience. Each mental model is a clustering or an aggregation of data that prescribes a viewpoint or a course of action. Conceptual learning creates changes in frameworks, which lead to new ways of looking at the world. Operational learning produces new or revised routines that are executed in lieu of old ones. The revised mental models contain not only the new frameworks and routines but also knowledge about how the routines fit within the new frameworks.

Individual frameworks become embedded in the organization's weltanschauung. The organization's view of the world slowly evolves to encompass the current thinking of the individuals within. In similar fashion, individual routines that are proved to be sound over time become standard operating procedures. Like an individual driving a car, the routines become the organization's autopilot reflexes. The strength of the link between individual mental models and shared mental models is a function of the amount of
influence exerted by a particular individual or group of individuals. CEOs and upper management groups are influential because of the power inherent in their positions. A united group of hourly workers can have a high degree of influence due to its size.

For example, Procter & Gamble’s weltanschauung can be characterized as one in which the company has a sense of community responsibility and believes in the importance of corporate and product brand image. Its weltanschauung is also a reflection of its culture, deep-rooted assumptions, artifacts, and overt behavior rules. All of these things moderate its decision making as it encounters unpredictable, non routine events. Its SOPs, on the other hand, may include things like a marketing plan to launch a new product, procedures for paying suppliers, employee performance reviews, and hiring criteria. These SOPs allow the organization to respond to routine needs in predictable ways.

**Double-Loop Learning**

The OADI-SMM model also incorporates Argyris and Schon’s concept of single-loop and double-loop learning on both the individual and organizational levels. Double-loop learning involves surfacing and challenging deep-rooted assumptions and norms of an organization that have previously been inaccessible, either because they were unknown or known but undiscussable. Individual double-loop learning (IDLL) is traced out in Figure 4-7 as the process through which individual learning affects individual mental models, which in turn affect future learning.

Organizational double-loop learning (ODLL) occurs when individual mental models become incorporated into the organization through shared mental models, which can then affect organizational action. In both cases, double-loop learning provides opportunities for discontinuous steps of improvement where reframing a problem can bring about radically different potential solutions. The distinctions between conceptual and operational learning and between weltanschauung and organizational routines are also integrated throughout the different stages. There is a box around the diagram to emphasize that the whole model is required to represent organizational learning.

**Incomplete Learning Cycles**

March and Olsen identified four possible disconnects whereby organizational learning would be incomplete. I have identified three additional types of incomplete learning cycles that affect organizational learning: situational, fragmented, and opportunistic (see Figure 4-8).
Situational Learning.
An individual encounters a problem, improvises on the spot, solves the problem, and moves on to the next task. Situational learning occurs when the individual forgets or does not codify the learning for later use; the link between individual learning and individual mental models is severed. Regardless of whether the learning occurs at the conceptual or operational level, it does not change the person’s mental models and therefore has no long-term impact the learning is situation specific. Because the individual’s mental model is not changed, the organization does not have a way of absorbing the learning either.

See FIGURE 4-8 Incomplete Learning Cycles

Crisis management is an example of situational learning. Each problem is solved, but no learning is carried over to the next case. Quality improvement is a counterexample; it focuses on minimizing situational learning through systematic data gathering, analysis, and standardization.

Fragmented Learning.
There are many instances in which individuals learn, but the organization as a whole does not. When the link between individual mental models and shared mental models is broken, fragmented learning occurs. In such a case, loss of individuals means loss of the learning as well. Universities are a classic example of fragmented learning. Professors within each department may be the world’s leading experts on management, finance, operations, and marketing, but the university as an institution cannot apply that expertise to the running of its own affairs. Very decentralized organizations that do not have the networking capabilities to keep the parts connected are also susceptible to fragmented learning.

Opportunistic Learning.
There are times when organizations purposely try to bypass the standard procedures because their established ways of doing business are seen as an impediment to a particular task. They want to sever the link between shared mental models and organizational action in order to seize an opportunity that cannot wait for the whole organization to change (or it may not be desirable for the whole organization to change). Opportunistic learning occurs when organizational actions are taken based on an individual’s (or small group of individuals’) actions and not on the organization’s widely shared mental models (values, culture, myths, or SOPS).

The use of skunk works to develop the IBM personal computer is a good example. The company bypassed its normal bureaucratic structure and created an entirely separate, dedicated team to develop the PC, which it was able to do in record time. General Motors' Saturn is an example on a grander scale, as are joint ventures when appropriately structured.
IMPLICATIONS FOR RESEARCH

In the OADI-SMM model, individual mental models play a pivotal role, yet that is precisely an area where we know little and there is little to observe. One challenge is to find ways to make these mental models explicit; another is to manage the way these mental models are transferred into the organizational memory. Clearly, this involves creating new devices and tools for capturing a wide range of knowledge.

Making Mental Models Explicit

If what matters is not reality but perceptions of reality, then fundamental to learning is a shared mental model. However, mental models are a mixture of what is learned explicitly and absorbed implicitly. That's why it's so difficult to articulate them and share them with others. Making mental models explicit requires a language or tool with which to capture and communicate them.

Some progress is being made in this area. However, most efforts at mapping mental models result in static representations of what are usually highly dynamic and nonlinear phenomena. New tools, such as causal loop diagrams and system dynamic computer models, are proving more effective. They allow us to address the problem of incomplete learning cycles.

Beyond Situational Learning.

To close the loop on situational learning, individuals must learn to transfer specific insights into more general maps that can guide them in future situations. This requires having the appropriate tools for the type of knowledge that is being mapped. Although the English language is useful for communicating on many different levels, imprecise words can lead to ambiguous meanings or inadequate descriptions of complex, dynamic phenomena. Thus English may be perfectly adequate for making one's mental model of a Shakespearean play explicit but be grossly ineffective in explicating a mental model of how the wage-price spiral affects capital investment decisions.

The analysis of dynamic systems, in particular, requires a new set of tools. Senge makes an important distinction between dynamic complexity and detail complexity. A system can have hundreds, perhaps thousands, of parts that have to be managed, but the dynamics of the whole system may be relatively simple. On the other hand, a system with only a dozen or so pieces can be extremely complex and difficult to manage. The complexity lies in the nature of the interrelationships among the parts whose cause-effect relationships are highly nonlinear and distant in space and time.

Some of the new tools for mapping such phenomena are systems archetypes, a collection of systemic structures that recur repeatedly in diverse settings. Archetypes can help to elicit and capture the intuitive understanding of experienced managers about complex dynamic issues. They are particularly
powerful for advancing conceptual learning because they help explicate know-why and offer guidelines for operationalizing those insights into know-how.

To illustrate, let's look at an archetype called "tragedy of the commons" and how it was used in a car product development team at Ford. In a tragedy-of-the commons structure, each individual pursues actions that are individually beneficial but that, over time, deplete a common resource and result in a worse situation for everyone. At Ford, component design teams were competing for a limited amount of alternator power output. It made sense for each component team to draw as much power as it required to maximize the functionality of its part. The collective result was an impasse in the design process, as no team could concede what it saw as in the best interest of its own component.

What typically happens in situations like this is that the teams will continue to struggle among themselves until the program timing is jeopardized and someone has to make a decision. This usually means that the program manager has to step in and dictate what each team can have. This makes the teams unhappy because they don't make the decision themselves and some of them don't get what they want. The manager is not happy about having to intervene. The teams think the problem is a heavy-handed manager; the manager thinks the problem is poorly aligned teams. There is no general framework for them to learn from.

The tragedy-of-the-commons structure provides a framework for solving the issue and for transferring learning to the next problem. When the teams saw their situation in this structure, they realized that the problem could not be solved at the individual level; only a collective governing body or an individual with the authority to impose constraints on all the teams could resolve the situation. The course of action was obvious. The program manager would consider all the component designs and decide how much power to allocate to each of them. Those who had to give up some functionality did not like it, but they understood why.

Subsequent teams looked at other common resources, such as available torque, and realized that they too fell into the tragedy-of-the-commons structure. A systemic understanding is emerging among the teams that a heavy-weight program manager with wide authority over the entire car program makes sense (most Japanese car programs are structured that way).

Mapping the teams' interrelationships allowed them to make explicit the underlying dynamic structure. Once there was a shared understanding of that structure, they could prescribe a course of action. The archetype provides a way of mapping the individual instance to a general framework to guide future learning.
Capturing individual mental models alone is not sufficient to achieve organizational learning. There needs to be a way to get beyond the fragmented learning of individuals and spread the learning throughout the organization. One way is through the design and implementation of microworlds or learning laboratories. Senge describes them as the equivalent of fields where teams of managers can practice and learn together.

The spirit of the learning lab is one of active experimentation and inquiry where everyone participates in surfacing and testing each other’s mental models. Through this process, a shared understanding of the organization’s key assumptions and interrelationships emerges. The use of an interactive computer "flight simulator" offers the participants an opportunity to test their assumptions and to viscerally experience the consequences of their actions. Management flight simulators represent mental models that have been translated into a more formalized and explicit computer model.

The Ford product development team described above has been running a learning lab codeveloped with MIT’s Center for Organizational Learning. The learning lab is now spreading the Ford/MIT core learning team’s insights among the rest of the car program members. The learning lab participants worked in pairs with a computer simulator to manage a product development project to meet cost, timing, and quality objectives. Encouraged to make the reasoning behind their decisions explicit, they surfaced the mental models that drove their decision making. They discovered, for example, how their assumptions about the right pace of staffing and the coordination between product and process engineering led to missing all three targets.

At Hanover Insurance, a property and casualty insurance company, groups of claims managers went through a three-day learning lab on claims management. Through the use of the simulator, managers surfaced tacit assumptions about what constituted "right" performance numbers and learned how those mental models directly affected the strategies and decisions they made. In short, they began to see how their actions created their own reality.

Wide use and successive iterations of a learning lab are expected to affect the organization’s shared mental models through changes in its weltanschauung and SOPS. People leave a learning lab with tools they can use in their work settings; these advance operational learning. The principles embodied in such tools help advance conceptual learning as individuals use them. In terms of the OADI-SMM model, systems archetypes and computer simulators make mental models explicit, thus improving the transfer mechanism and reducing situational and fragmented learning.
Building Shared Meaning

I believe that the process of surfacing individual mental models and making them explicit can accelerate individual learning. As mental models are made explicit and actively shared, the base of shared meaning in an organization expands, and the organization’s capacity for effective coordinated action increases. Johnson & Johnson’s handling of the Tylenol poisoning incident is a vivid example of how a deeply shared belief (or *weltanschauung*) on the value of a human life can have a powerful effect on an organization’s ability to mount a coordinated response quickly.

On a less grand scale, systems archetypes provide a glimpse of the possibility of developing a similar capability for enhancing coordinated action. As more people understand the meaning behind the tragedy-of-the-commons archetype, for example, the use of the term itself will conjure up the whole story line behind it as well as its implications for action.

At this point, my discussion is more a set of assertions based on anecdotal evidence and preliminary research than a set of facts that has been supported by extensive longitudinal studies and rigorous research. Little empirical work has been done on the construct of organizational memory and shared mental models. Further work is needed for a better understanding of the role of mental models in individual and organizational learning, the types of mental models that are appropriate for representing dynamic complexity, the methods with which to capture the understanding of such complexity, and the means through which new learning can be transferred to the whole organization. I propose the model developed in this article as a guide for pursuing these goals.