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BUILDING SHARED UNDERSTANDING

DOUBLE-LOOP KNOWLEDGE MANAGEMENT

BY MARK W. McELROY

These are trying times for the field of knowledge management. Shunned by many as little more than yesterday's information technology trotted out in today's more fashionable clothes, KM has responded by evolving itself into two distinct, if not competing, schools of thought. Accordingly, many of us have begun to differentiate between the two as *first-* and *second-generation KM*. Second-generation KM approaches emphasize knowledge production without discounting the information codification and sharing emphasized by first-generation KM. This emergent focus on knowledge creation points to a much higher value proposition for KM than has been proffered to date: *the prospect of increasing an organization's rate of learning, and hence, its rate of innovation*.

The advent of second-generation KM, then, can be seen as a convergence in thinking between the organizational learning and knowledge management communities. In effect, second-generation KM has emerged as an implementation strategy for organizational learning—a practitioner's model for how to help organizations increase their capacity to learn, innovate, and adapt to change. Unlike its first-generation ancestry, second-generation thinking is more concerned with the evolution of knowledge, not just its mechanical application in practice.

Two Levels of Learning

In a breakthrough article entitled *Teaching Smart People How to Learn (Harvard Business Review,* May/June 1991), Harvard Business School professor Chris Argyris explained the difference between what he called *single-loop* and *double-loop* learning in the following way: "To give a simple analogy: a thermostat that automatically turns on the heat whenever the temperature in the room drops below 68 degrees is a good example of single-loop learning. A thermostat that could ask, 'Why am I set at 68 degrees?' and then explore whether or not some other temperature might more economically achieve the goal of heating the room would be engaging in double-loop learning."

During the course of normal experience, we invoke internally maintained rules to decide how to respond to events. When the traffic light turns green, we go; when it's red, we stop. In this context, the term *rules* means *knowledge*, in that all knowledge can be expressed in the form of if/then statements. Conditions that satisfy the *if* side of a rule trigger the *then* side (*if* the traffic light turns green, *then* release the brake, depress the accelerator, and proceed carefully ahead). Organizational knowledge is similarly configured. Rules inform workers of what to do in defined situations, such as *if* the customer wants x, *then* do y followed by a, b, and c.

By contrast, in double-loop learning, people not only reference these rules but constructively challenge such rote responses. In the human mind, this kind of double-loop thinking leads us to construct alternative scenarios in which we play out likely outcomes. We can then test promising new ideas and potentially choose to override or replace the prescribed response. Depending on how well the new rule fares in practice, we either reinstate the old one or replace it with the new, more successful "habit." Our *knowledge* (i.e., the rules that produce successful outcomes in practice) evolves accordingly.

The extent to which an organism engages in healthy rule-making and knowledge innovation will largely

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determine its success in life. An agent (e.g., person, animal, community, economy, etc.) that rarely tests its rules will tend to perform more poorly in practice than one that constantly challenges, upgrades, and refreshes its rules. The same is true for human organizations. A business that rarely revises its approach to the marketplace or its operating processes will tend to ossify and atrophy. On the other hand, companies that engage in healthy levels of rule-making and rule-revising are inherently more capable of adjusting to changes in their environment. Indeed, organizational agility depends, to a large extent, on just how well an organization's learning system works.

That is the principal aim of second-generation KM—to enhance an organization's ability to engage in constructive levels of double-loop learning. In a sense, what we're talking about is *double-loop KM,* an OL practitioner's framework for helping organizations, not just individuals, learn.

Double-Loop KM

Understanding Argyris's notion of single- versus double-loop learning is an important early step in appreciating the fundamental differences between first- and second-generation KM. Only first-generation KM assumes that current knowledge is valid. The goal of such approaches is to optimize the delivery of existing organizational rules to workers so that they can function successfully in their operating environments.

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This is why technology has played such a conspicuous role in knowledge management to date. After all, computers and telecommunications networks are unparalleled in their ability to deliver information to people, where and when it's needed. Thus, conventional knowledge management practice boils down to little more than getting the right information to the right people at the right time, using tools such as document management, imaging, data warehousing, data mining, and information-retrieval systems. While useful, this is all single-loop learning.

Other conventional KM practices, including some attempts to build communities of practice and corporate intranets, also focus on knowledge sharing and transfer. Once again, the target of this kind of intervention is single-loop learning: The purpose of sharing knowledge is merely to distribute existing organizational rule sets as widely as possible so that workers can employ "best practices" on the job front. But although knowledge sharing has some value to an organization, it completely side-steps the question of where organizational knowledge comes from to begin with—not to mention where knowledge resides within an organization and how it is expressed.

Knowledge Structures and Rules

One of the fundamentals of second-generation KM is the concept of *knowledge structures*—codified expressions of collective knowledge. For millennia, human civilizations have been embedding knowledge in myths, rituals, dance, and other cultural artifacts. In turn, these structures, along with our societies' institutions, reveal much about our cultural values, beliefs, and rules, and the ways in which they have evolved over time. The codification of collective knowledge facilitates knowledge transfer from one generation to the next without individuals' having to rely on the frailties of human memory. Cultural artifacts can thus be seen as a record of organizational knowledge. From this perspective, although we might have thought that knowledge management was new, as defined by second-generation practitioners, it is as old as the hills.

How does the concept of knowledge structures apply to the corporate world? Well, business processes, such as how to handle a mortgage application, are really nothing more than codified expressions of *procedural knowledge* (know-how). Business strategies, such as whether to be in the mortgage business in the first place, are codified expressions of *declarative knowledge* (know-what). All organizational knowledge, then, is expressed in the form of procedural and declarative rules that are recorded in various organizational knowledge structures. Some knowledge is expressed in literal structures such as business plans and policies-and-procedures manuals, while other knowledge is acted out in the processes or chain-of-command structures that we follow.

Although many modern-day knowledge structures take the form of information systems, documentation, videos, and other recorded representations, they are just as commonly found in corporate stories, repeated

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THE SYSTEMS THINKER™ explores both the theory and practice of the learning organization, with particular emphasis on systems thinking as the cornerstone of the five disciplines (as outlined by Peter Senge in *The Fifth Discipline*). Articles by leading thinkers and practitioners articulate the challenges and issues involved in creating learning organizations. We encourage dialogue about systemic issues and strive to provide a forum for debating such issues. Unsolicited articles, stories, and letters to the editor are welcome.

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patterns of behavior, and leadership styles. Regardless of where knowledge is held, the distinction between procedural and declarative knowledge is important for two reasons. First, in order to double-loop learn, an organization must *know what it knows,* as well as see and recognize its own knowledge as such. Understanding that knowledge is expressed in the form of rules that are contained in culture, business strategies, processes, and organizational schemes makes it easier for practitioners to discover and articulate what their organizations know.

Second, comprehending that declarative knowledge *drives* procedural knowledge can dramatically increase an organization's rate of learning and innovation. For example, IBM's declarative knowledge of *what* the market for e-commerce consists of will determine its approach for *how* to engage customers and competitors in the marketplace. Ultimately, every process that employees follow in practice can be traced to collectively held paradigms about the e-commerce market. The slightest error in any underlying declarative assumptions can render whole operating divisions obsolete or entire value chains irrelevant in the blink of an eye. Therefore, it is important to know that the leverage for making lasting, large-scale change is in altering declarative knowledge rather than in tinkering with procedural knowledge.

No discussion of knowledge management would be complete without addressing the persistent question of how knowledge differs from data, information, and wisdom. Based on the definitions of procedural and declarative knowledge given above, all instances of data, information, knowledge, and wisdom can be categorized as either knowledge of fact (declarative rules) or knowledge of practice (procedural rules). Even the most sterile summary of statistics taken from a laboratory experiment convey someone's knowledge of *what* happened, which is declarative knowledge.

Rather than differentiate among data, information, knowledge, and wisdom, it is more constructive to focus on gradations in the *value* of knowledge. Measuring the value of a given set of procedural and/or declarative rules boils down to evaluating how well they are serving the organization in meeting its goals. Using this criterion, what is considered low-grade "data" one day could easily become high-grade "wisdom" the next without any change in the actual content. If only we knew then what we know today about the space shuttle Challenger's flawed "o" rings, that sad chapter in the history of the U.S. space program could have been averted—and yet, the *wisdom* that speaks volumes to us now is identical to the *data* that NASA had at the time.

Having established second-generation KM's view of the form that knowledge takes and the containers in which it is stored, the next concept of fundamental importance is the process by which new rules come into existence.

The Knowledge Life Cycle

To address the shortcomings of the earlier phase of knowledge management, experts in the field have developed a three-phase model of the *knowledge life cycle:* Knowledge Production, Knowledge Validation, and Knowledge Integration (see "Organizational Knowledge Production"). It is here, in particular, that the influence of organizational learning theory has had its strongest effects on knowledge management. Until recently, KM's basic assumption has been that "knowledge exists"—we need only capture, codify, and share it. Learning, or knowledge creation, never really entered into the picture. By embracing the OL community's notion of collectively held knowledge and group learning, a more complete life-cycle view of the subject has emerged. From this perspective, knowledge exists only *after* it has been produced; at that point, we can capture, codify, and share it.

In this view of knowledge creation, during *Knowledge Production,* organizations generate new knowledge through mostly spontaneous interactions among individuals and groups. These interactions lead to the formation of new "knowledge claims," or procedural and/or declarative rules in their seminal stage. In the *Knowledge Validation* phase, the group measures the new or changed rules against the effectiveness of current knowledge to the organization. The satisfaction of validation criteria often leads to the formal adoption of this new knowledge in the form of procedural and declarative rules expressed in one or more knowledge structures.

The third phase, *Knowledge Integration,* involves operationalizing the new knowledge. A new business process, for

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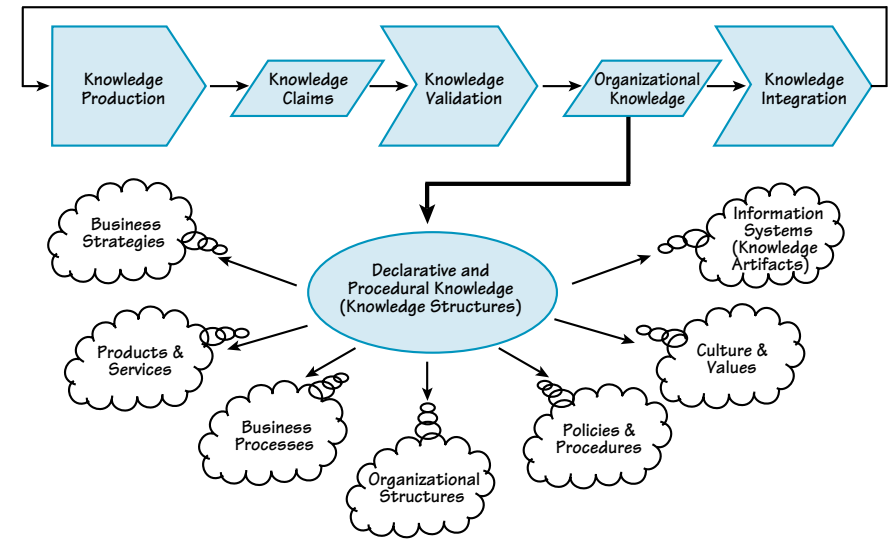
ORGANIZATIONAL KNOWLEDGE PRODUCTION



Organizational *learning* leads to the production of organizational *knowledge.* Collectively held knowledge is, in turn, expressed in the form of *Knowledge Structures.*

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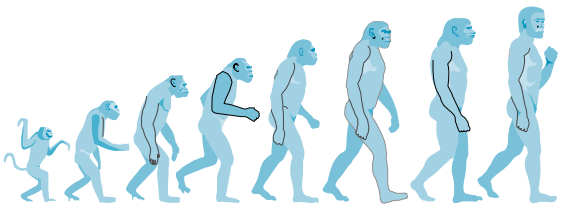
example, doesn't instantly supplant yesterday's standard operating procedures. Getting large numbers of workers to follow a newly conceived process calls for an act of willful transformation. Integrating this new procedural knowledge therefore entails the deliberate abandonment of one set of operating rules in favor of another.

To help illustrate how this cycle works, think of a well-defined business process in your own department or unit. It might be the mortgage application process in a bank, the order fulfillment process in a manufacturer, or some other workflow that you can clearly envision from start to finish. What you've conjured up in your mind is a chunk of procedural knowledge that is expressed in practice by the patterns of work that people conventionally follow. This knowledge may also be expressed in other knowledge structures, such as written procedures manuals and training programs.

Now, think back to how long this process has been practiced in its current form. Next, try to visualize the pattern of practice that preceded it. More important, see if you can reconstruct the circumstances by which the preceding knowledge was rejected and the new knowledge embraced. Where did the new workflow idea come from? How was it defined? What shape did it take as it moved toward the validation phase? Your answers to these questions will characterize your own organization's *Knowledge Production* phase and the people, processes, and technologies that made it work. Next, ask yourself, how was the new process evaluated? What criteria were used to measure it against then-current operating procedures? Who performed the evaluation? Was it a special-case effort, or are new knowledge claims systematically evaluated? Here again, your answers will characterize your organization's *Knowledge Validation* phase. And finally, trace the circumstances by which the new business process was formally operationalized. By doing so, you've just described the *Knowledge Integration* phase in your own company. You have now traced the genesis of current procedural knowledge across all three stages of its evolutionary cycle.

The value of this exercise is that it can not only assist you in understanding the three-phase life cycle, but can also help you make the crucial distinction between knowledge "content" management (first-generation KM) and knowledge "process" management (second-generation KM). By focusing on improving the



fundamental knowledge processes at work behind all of an organization's knowledge structures, second-generation KM helps make best practices in knowledge creation, not just codification and sharing, available to everyone in the organization.

With this life-cycle framework in mind, we can see the majority of first-generation KM as Knowledge Integration work, with little or no focus on Knowledge Production or Validation. But even the best Knowledge Integration work produces little meaningful organizational learning. Because the production of new knowledge lies at the heart of organizational learning, it's easy to understand why KM and OL have evolved on such separate paths over the years.

The secret of successful double-loop organizational learning can be found in the combination of Knowledge Production and Validation. Of particular importance are the processes by which new ideas are formed and subjected to group scrutiny for potential adoption. Ideas that survive the test and are then embraced by the organization can be seen as the progeny of organizational learning. Once born, these ideas then become systematically codified, expressed, and diffused throughout the organization in the form of new procedural and/or declarative rules. Training programs and new personnel policies are common examples of how new organizational knowledge is consciously embedded in one or more knowledge structures in the hope that it will spread effectively throughout the organization.

Implications for Practice

What are some of the tactical dimensions of this new approach to organizational learning? What specific steps can practitioners take—*on Monday morning*—to improve the learning performance of their collective constituents? Below are some examples of initiatives that practitioners can take to put double-loop knowledge management to work.

Taking Stock of Knowledge Structures. Creating an inventory of an organization's knowledge structures by documenting where procedural and declarative knowledge lies is among the first steps in the practice of double-loop knowledge management. Unlike first-generation KM, which selectively focuses on the *creation* of artificial knowledge structures (computer-based systems, prescribed communities of practice, etc.), second-generation practice seeks, first and foremost, to understand and enhance *existing* knowledge structures in all of their forms, both natural and artificial. The result is an end-to-end view of organizational knowledge and where it resides.

Profiling Knowledge Processes. Using the three-phase life cycle as a guide, practitioners can then survey existing knowledge processes as a baseline indicator of how well the organization is currently learning. For example, businesses that relegate most of their knowledge production and validation functions to senior management can be characterized as dysfunctional learners. This categorization might lead the company to recognize the need for bottom-up innovation programs, thereby increasing the rate of organizational learning and knowledge production. The organization could in turn take

remedial steps to establish critical knowledge processes in places where they might be missing or incomplete. In manufacturing, for example, the implementation of continuous improvement programs such as *Kaizen* has led to widespread advances in productivity at companies throughout the world. Unlike conventional top-down management programs, *Kaizen* initiatives tap directly into the workforce, are bottom-up in their orientation, and continuously produce innovations at a rate that exceeds that of even the most talented management teams.

Expressing Knowledge in Standard Form. Another fundamental tool in every practitioner's toolkit is a technique for converting organizational knowledge expressed in different ways into a standard form. For example, a business strategy is reducible to all of the underlying declarative knowledge that an organization regards as true and valid about itself and the marketplace. This might include how the market is structured, what trends are in play, and knowledge of how competitors are approaching the same opportunities. Why not make these rules explicit? More important, why not subject them to constant scrutiny by making them plainly visible and, therefore, candidates for improvement? This is precisely the kind of process organizations need to implement to receive the benefit of bottom-up innovation.

Tools and techniques for expressing both tacit and explicit organizational knowledge are now starting to appear in commercial form. One such tool, *Knowledge Harvester* (LearnerFirst, Inc. in Birmingham, Alabama), provides a technique and a "language" that practitioners can use to express organizational knowledge in a standardized way. LearnerFirst takes commonly expressed organizational knowledge and converts it into procedural and declarative statements. Over time, tools of this sort will be seen as fundamental to the practice of second-generation KM. As such, they will be used not only to catalogue existing organizational knowledge, but also to determine the extent to which an organization is actually learning. Dysfunctional learning organizations, for example, would exhibit relatively stagnant rule sets; highly adaptive firms, by contrast, would display regular turnover in rules and, hence, higher rates of innovation.

Measuring Return on KM Investment. As organizational knowledge changes or evolves, evidence of this learning can be seen in the form of new rules, retired rules, more rules, fewer rules, or different combinations of new and old rules. By tracking the evolution of rules held by an organization at different points in time, practitioners can quite literally measure rates of learning and innovation. Indeed, returns on investments made in KM will increasingly be measured by their effects on rule-making and rule-set refresh rates, in addition to their tangential effects on business performance.

Measuring return on investment from KM and OL initiatives, then, should occur in two ways: 1) by tracking the evolution of rules held in knowledge structures, and 2) by measuring related changes in the performance of the organization. Knowledge management investments that lead to improvements in business performance, such as increased productivity, lowered costs, or higher revenue, can be declared successful; those that do not should be judged accordingly.

Linking Learning and Knowledge

Second-generation knowledge management explicitly links organizational *learning* with the concept of organizational *knowledge* (See "Some Principles of Double-Loop Knowledge Management"). In particular, it offers fresh perspectives on how knowledge is created and diffused in organizations that are germane to both disciplines. Indeed, the new field of second-generation, double-loop knowledge management not only embraces organizational learning as a concept, but also offers practical tools and techniques for what to do about it on Monday morning.

The greatest challenge we face as practitioners of double-loop KM and organizational learning is to create the conditions in which new ideas can be freely expressed and thoughtfully considered at an organizational level. Doing so would seem to hinge on making knowledge processes explicit in our organizations, nurturing well-running knowledge processes behind all of our knowledge structures, and supporting bottom-up participation in all stages of the knowledge life cycle. Thus, from a 21st-century perspective, our historical practice of relegating knowledge creation to the hands of a few will be seen in retrospect as one of the profound follies of our time—a grand succession of missed opportunities of enormous proportions. Fortunately, we now have the tools and knowledge to rectify this error as we build the organizations of the future.

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SOME PRINCIPLES OF DOUBLE-LOOP KNOWLEDGE MANAGEMENT

- **Organizational knowledge (procedural and declarative rules) can be found in an organization's knowledge structures;** that is, institutionalized expressions of *what works best for us.* For an organization to maximize its adaptive capabilities, it must decipher and manage the rules embedded in these structures.
- **Organizational knowledge is the product of natural learning processes present in all human organizations.** Businesses should formalize and manage these processes to optimize knowledge creation and diffusion.
- **Know what you know and why you know it!** One of the most valuable steps an organization can take is institutionalizing knowledge validation criteria. Because these criteria are *rules about making rules,* changes to them can have a powerful impact on organizational learning.
- **Innovate, validate, and integrate.** This cycle of knowledge creation should continually support and renew all knowledge held and practiced by an organization.