Integrating complexity theory, knowledge management and organizational learning

Mark W. McElroy

The author

Mark W. McElroy is a Consultant with Macroinnovation Associates LLC, Windsor, Vermont, USA.

Keywords

Organizational learning, Knowledge management, Supply and demand

Abstract

Chronicles the unfolding convergence of thinking and practice behind knowledge management, organizational learning and complexity theory. Of particular interest are the roles that knowledge management and complexity theory play in this impending consilience of ideas. On the one hand, knowledge management is anxious to rid itself of its overly technology-centric reputation in favor of promoting the role it can play in furthering organizational learning. On the other, complexity theory, a confident solution in search of unorthodox problems, has discovered its own true place in the world, an explanation for the means by which living systems engage in adaptive learning – the seminal source of social cognition in living systems.

Electronic access

The current issue and full text archive of this journal is available at

http://www.emerald-library.com

Journal of Knowledge Management
Volume 4 · Number 3 · 2000 · pp. 195–203
 · ISSN 1367-3270

I. Introduction

In what is shaping up to be an unusual and fascinating case of strange bedfellows, three otherwise separate communities of management practice are about to converge. Without knowing it, all three share an intrinsically co-dependent view of the hot new field of knowledge management (KM), the latest rage in business.

Variously referred to as intellectual capital, intellectual property, knowledge assets, or business intelligence, corporate knowledge is now being viewed as the last and only sustainable untapped source of competitive advantage in business. Unlike other forms of capital – land, equipment, labor and money – knowledge is theoretically infinite. There is always a new idea waiting to be discovered – new ways of doing things, new products, new strategies, new markets. Getting to the next important discovery first, then, is the aim of KM.

The three communities involved in this meeting of the minds are:

(1) the burgeoning KM community itself;
(2) advocates of organizational learning (OL) and systems thinking; and
(3) supporters of complexity theory and its application to business.

What makes the imminent convergence of these three groups so interesting is that each has much to gain from it, but none of them seems to see it coming. With heads down and blinders attached, each has been wrestling with its own narrow scope of interest, rarely stopping to consider cross-disciplinary possibilities. But this is beginning to change.

In a recent interview in *Knowledge Management Magazine* (Karlenzig, 1999), Peter Senge, creator of the OL movement and author of the hugely influential book, *The Fifth Discipline* (Senge, 1990) was asked about the emerging connection between two of these three areas: KM and OL. Senge had previously viewed KM as little more than information indexing and retrieval, but now sees a new definition emerging. In its new form, Senge sees KM as attempting to address "some of the same critical issues [Society of Organizational Learning] members have been struggling with – the sustainable creation, transfer, and dissipation of organizational knowledge."

Journal of Knowledge Management
Volume 4 · Number 3 · 2000 · 195–203

When asked to comment on the challenges that lie ahead for both communities (KM and OL), Senge posed the following questions:

> What is the nature of organizational knowledge, how is it generated, how is it diffused, what does it mean to develop more knowledge-based strategies? What happens at the interface between acquiring information and generating knowledge? These are issues that are deep and hardly trivial by any stretch. These are issues that people are really going to be wrestling with.

Enter complexity theory.

In what has only recently become apparent, the issues Senge speaks of are precisely those that scholars and researchers of complexity theory have been dealing with for the past 15 years. Chief among these analysts have been John Holland, Keith Holyoak, Richard Nisbett and Paul Thagard, whose collaborative work, *Induction: Processes of Inference, Learning and Discovery* (Holland *et al.*, 1986) not only was a towering achievement in the study of complexity, but also contained explicit answers to the kinds of questions more recently posed by Senge.

Complex systems are, by any other definition, learning organizations. Complexity theory is, therefore, on the verge of making a huge contribution to both KM and OL. But what in particular makes the impending merger of these three communities so compelling? What could account for the apparent synergy between them? The answer to both questions is that each of the three groups has something that the other two desperately need. There is an idea at stake here that is bigger than any one of them can defend alone, or even two of them together. It takes all three to make it work. KM and OL each lack a theory of how cognition happens in human social systems – complexity theory offers this missing piece.

II. Like ships passing in the night

Complexifiers

The date is October 1998. Only a few short blocks from Boston Harbor, in the elegant digs of the Swissotel, members of the COMPLEX-M contingent of the New England Complex Systems Institute (NECSI) gather for the third time in less than a year to continue their intensive study of complexity theory. This eclectic, three-year-old group of business leaders, consultants, scientists and academics features an international cast of "complexifiers," people who share an abiding interest in the new science they simply call "complexity."

What distinguishes the COMPLEX-M group from the rest of NECSI is its singular focus on the application of complexity theory to the management of human social systems (the "M" stands for management). Seen as just another class of "complex systems," human organizations, they believe, display the same kinds of behaviors found in, say, weather patterns or animal populations in the natural world. Businesses are living systems, they argue, and should be managed accordingly (see Figure 1).

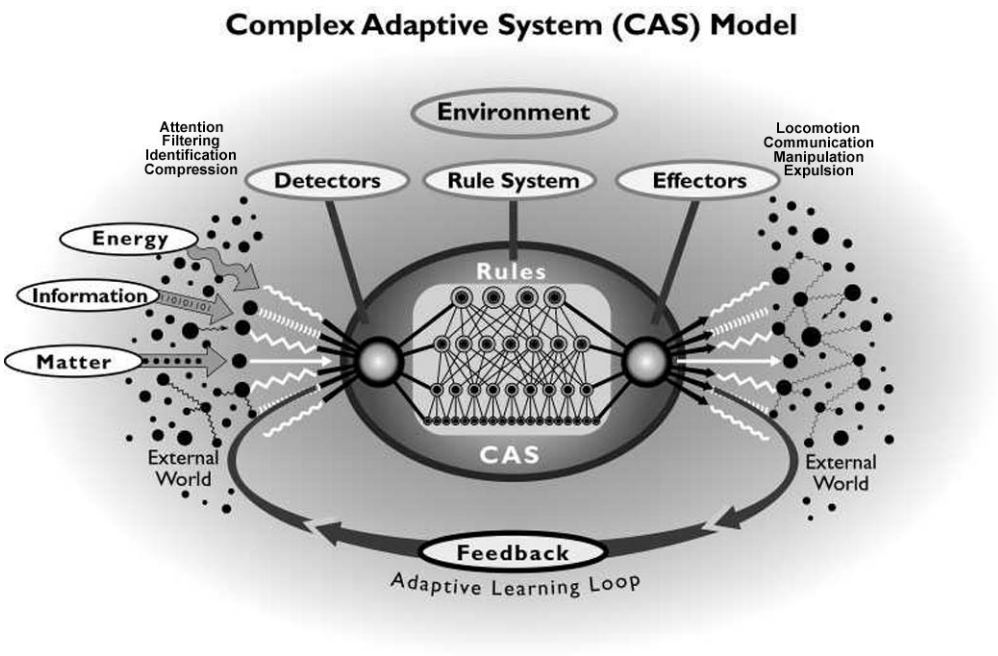
Complexity theory – or, to be more precise, the science of complexity – is the study of emergent order in what are otherwise very disorderly systems. Spirals in whirlpools, funnels in tornadoes, flocks of birds, schools of fish – these are all examples of orderly behavior in systems that are neither centrally planned nor centrally controlled. How and why such coherence emerges in complex systems is a mystery. Nevertheless, understanding its influence on the performance of human organizations could lead to major gains in the conduct of human affairs, especially business.

Complexity studies indicate that the most creative phase of a system, that is, the point at which emergent behaviors inexplicably arise, lies somewhere between order and chaos. Stuart Kauffman of the Santa Fe Institute points out that complex systems produce their most inventive displays in the region of behavior he calls "the edge of chaos." Systems operating in the vicinity of the edge exhibit wild bursts of creativity and produce new and novel behaviors at the level of the whole system. Whirlpools spring forth, birds flock in patterns, and whole populations of species ebb and flow accordingly.

In a sense, complex systems innovate by producing spontaneous, systemic bouts of novelty out of which new patterns of behavior emerge. Patterns which enhance a system's ability to adapt successfully to its environment are stabilized and repeated; those that do not are rejected in favor of radically new ones, almost as if a cosmic game of trial-and-error were being played. Complexity is, therefore, in part, the study of pervasive innovation in the universe.

Journal of Knowledge Management
Volume 4 · Number 3 · 2000 · 195–203

Figure 1 Complex adaptive system model[1]



KMers

On a completely different front – again, fall, 1998 – deep inside the cavernous halls of McCormick Place in Chicago, a business conference devoted to the exciting new field of KM unfolds. This event, KM Expo, has attracted hundreds of visitors who have all come to attend dozens of seminars and endless exhibits. The prospect of leveraging human knowledge for commercial gain is on everyone's mind. To be "knowledge-based" is now all the rage in business – make no mistake, interest in KM is rising fast.

Meanwhile, echoes away from the din of the show, a small group convenes in a remote part of the same building to continue the work of the KM consortium (KMC), a think-tank made up of KM practitioners. Unlike its peers just a few hundred yards away, the KMC holds an utterly unconventional view of the subject – one largely inspired by complexity theory. To the KMC, a business is just another class of complex system. Managing knowledge has nothing to do with building computer-based repositories of facts and figures, they argue. Rather, knowledge is the product of natural innovation schemes inherent to all living systems. Create the conditions in which innovation thrives, they believe, and the evolution of new knowledge will naturally follow (see Figure 2).

Launched in December 1997, the KMC has become one of the most influential think-tanks in the field. What the KMC set out to do is nothing less than crack the secret of innovation by creating techniques that will make it possible for businesses to out-learn, out-innovate, and out-perform their competitors in the marketplace, a way of accelerating the production of new knowledge – even a way to innovate at will!

Organolearners

The scene this time is San Francisco. The setting is the Systems Thinking in Action conference in September 1998, which by all accounts is industry's premier annual event in the field of OL. Popularized by Peter Senge (1990), OL has become one of the hottest new fields in business. According to Senge and his disciples, organizations, not just individuals, hold knowledge. We can therefore make the useful distinction, they argue, between personal learning and OL. Organizations, not just individuals, actually learn (see Figure 3).

Practitioners of OL, known as "organolearners," therefore, see a difference between what individuals know and knowledge held collectively by groups of individuals – individual learning leads to individual knowledge; OL leads to collective knowledge. With this in mind, they explain, conflict between the two in most organizations is bound to occur. But the tension between them is actually seen as a stimulant for innovation and creativity. Older

Figure 2 The knowledge life cycle[2]

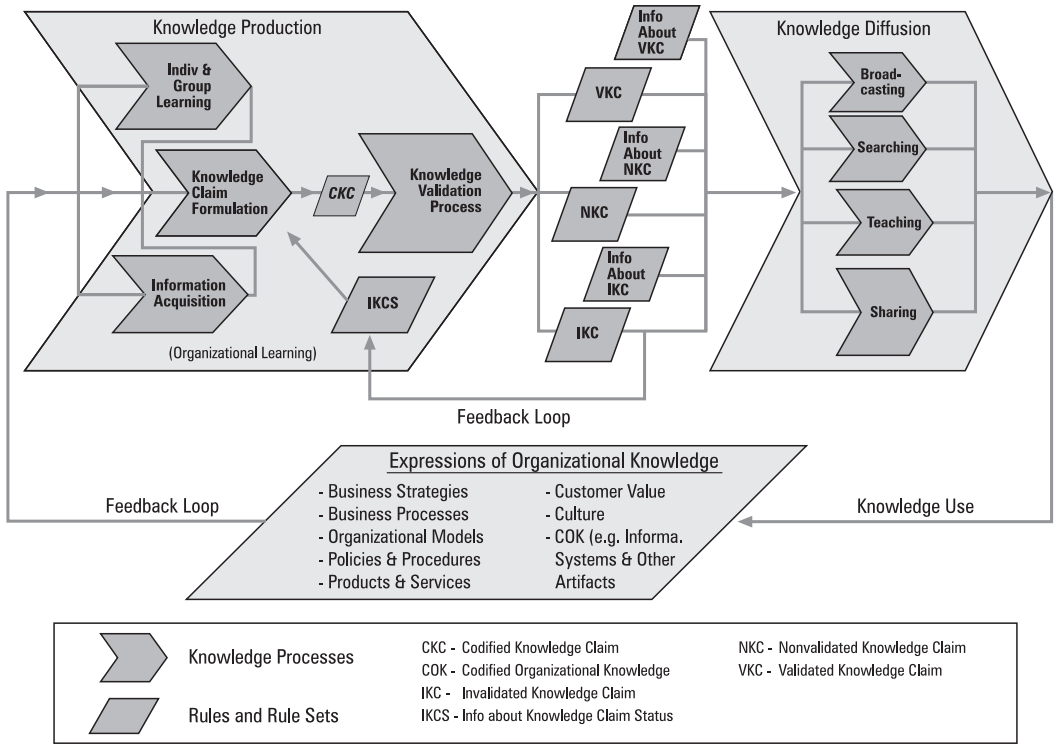
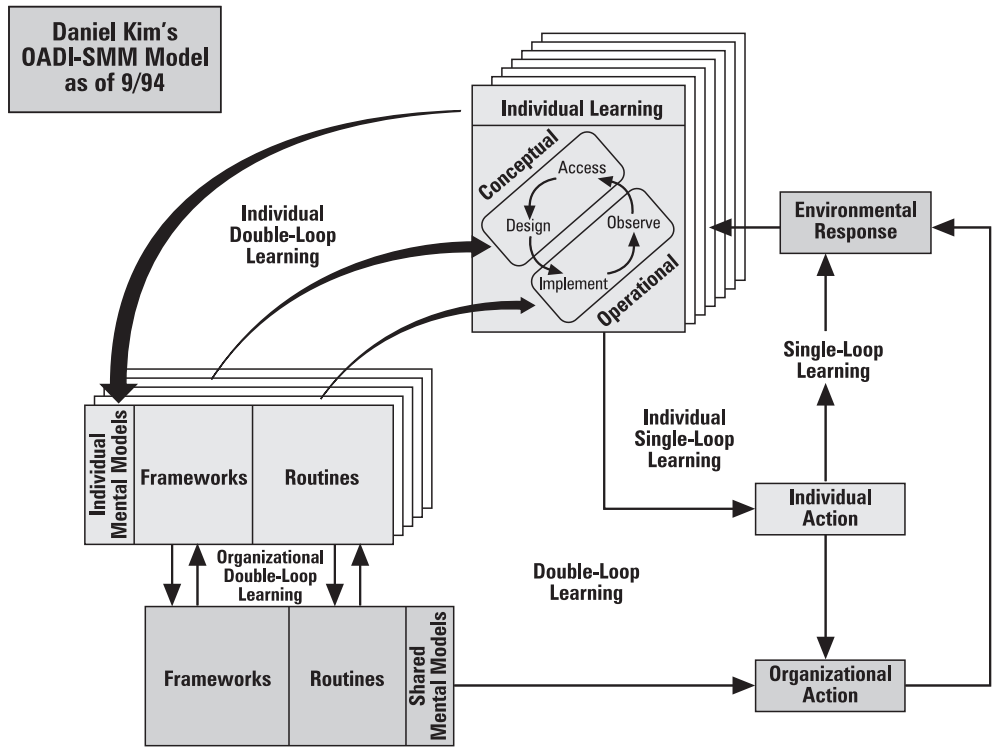


Figure 3 Organizational learning model[3]



established ideas give way to newer, more effective ones as people in business, for example, attempt to resolve their individual and group differences. Organolearners, therefore, see constructive non-conformity as a positive force in business. Creative tension, they argue, is a prerequisite for OL and innovation in human organizations.

The implications of OL for business are profound. Managing to out-learn one's

Journal of Knowledge Management
Volume 4 · Number 3 · 2000 · 195–203

competitors, for example, can easily lead to better performance in the marketplace as new ideas translate into lowered costs, higher productivity, or increased revenue. Early in the text of Senge's *Fifth Discipline* (Senge, 1990), Arie De Geus, former head of planning for Royal Dutch Shell, eloquently makes the same point: "The ability to learn faster than your competitors may be the only sustainable competitive advantage." Here, De Geus evokes a vision of knowledge as though it were a newly discovered natural resource, as indeed it is. Moreover, his words make it clear to a whole new breed of manager that knowledge and continuous learning are powerful prerequisites for business success.

III. Two's a crowd, three's company

Second-generation KM

The genesis of the integration between organizational management, OL and complexity theory can be traced to recent events within the KM community, alone. Of the three groups involved, only KM has experienced profound changes in how it defines itself, its outlook on the fundamental nature of knowledge, and the value of its prescriptions. In the chain of events leading up to the imminent confluence of the three, this metamorphosis has clearly been the seminal event. Understanding the make-up and significance of these changes, then, is an important first step in appreciating the logic of what is about to happen.

Among the changes now taking place in the practice of KM is a shift in thinking from strategies that stress dissemination and imitation to those that promote education and innovation. To date, the goal of KM has been to capture, codify and distribute organizational knowledge (usually in centrally managed computer systems) so that it can be shared by an organization's knowledge workers in the field. By contrast, the educate and innovate strategy, while placing no less importance on sharing and informed decision making, grants a higher value to learning and knowledge creation. The 3M Company, for example, has a policy called the "15 percent rule," according to which all 3M employees are expected to spend roughly 15 percent of their time dreaming up new products, or new ways of lowering costs or increasing productivity. The result? A remarkable one-fourth of 3M's annual revenue comes from products less than five years old. There is that much innovation going on there.

To satisfy this shift in thinking, many practitioners of KM are now turning to the OL community as a source of what it means for an organization, not just individuals, to learn. This is a fundamentally new brand of KM, one that has shed its former preoccupation with information technology as the stock response to all KM needs. KM now regards OL as its new best friend and, in light of its improved, more enlightened outlook, has given itself a new name: "second-generation KM" – not to be confused with its first-generation, technology-centric ancestry.

But while the logical combination of KM and OL is rapidly gaining favor in both camps, many people believe the new brand of KM has a tough row to hoe. KM efforts to date, they complain, have amounted to little more than a re-hash of yesterday's "information management" schemes. As such, they have had little to do, if anything, with knowledge, *per se*, by any conventional definition of the term. The fact that so many so-called KM solutions have amounted to nothing more than repackaged information retrieval systems has provoked a discernible backlash in the marketplace. The resulting damage that first-generation KM has done to its own credibility could very well slow market acceptance of even the new, second-generation, more enlightened style of practice.

In expressing his own misgivings with first-generation KM, Peter Senge explained that:

> . . .the first wave of KM hasn't been about knowledge at all. It's been about information – how to capture it, store it, retrieve it, access it and all that stuff. . .[little more than] a great excuse to sell a lot of information technology under the guise of managing knowledge (Karlenzig, 1999).

Indeed, much of current KM is merely yesterday's information technologies trotted out in today's more fashionable clothes: data warehousing, document management, imaging, and data mining. Even corporate intranets have been dragged into the fray, and are now being referred to by first-generation practitioners as "knowledge portals."

In practice, first-generation KM schemes have been solely devoted to enhancing the performance of day-to-day business processes by workers. They start by asking two very

Journal of Knowledge Management
Volume 4 · Number 3 · 2000 · 195–203

revealing questions: "What knowledge do people need to do their work? And how can we help them get it?" Both questions expose first-generation KM's narrow preoccupation with business operations and the role of knowledge in supporting them. First-generation KM, then, can be seen as a management discipline that focuses on knowledge operations, or knowledge use. And while this focus is in no way inappropriate or of little value to the organization, it completely side-steps the question of where organizational knowledge comes from to begin with – in other words, how is knowledge created?

If a first-generation KM practitioner were asked to characterize the role of KM in business, an example of the following sort might be used:

> A knowledge worker is sitting at her desk performing a task, then suddenly develops a need for information to complete her work. Where does she turn? Is the knowledge readily available? How long does it take to get it? Does she tap her relationships with other workers? Has technology been effectively placed at her disposal? Is her knowledge source current? Is it complete? Was the task successfully carried out? These are the kinds of questions we wrestle with in KM – it's all about getting the right information to the right people at the right time so they can do their jobs more effectively.

This is vintage first-generation KM thinking in action. It is all about delivering information to support a task. And it is all about individual performance in the field. The target of all investments in first-generation KM, then, is the individual worker and the extent to which he or she has access to, and can leverage, information needed to get the job done – where and when it occurs. Nowhere in this proposition is OL mentioned, and not once is there any discussion of knowledge creation or rule-making. Only with the arrival of second-generation thinking do we see an application of KM to these issues. What second-generation KM offers, then, is an implementation strategy for organizational knowledge creation and learning.

Second-generation doctrine discovers and accepts organizational knowledge as an important concept worthy of respect. Understanding how knowledge is created, how it is shared and diffused throughout an organization – and not just how to codify and record it in artificial form, or map it into business processes – lies at the very heart of the profound movement from first- to second-generation thinking. Second-generation theory subscribes to the existence of knowledge processes and knowledge life cycles in human organizations. First-generation thinking has no such foundation. Thus, second-generation practitioners have come to recognize and respect the concept of organizational knowledge.

This dramatically revamped brand of KM points to another important distinction between first- and second-generation thinking – supply-side versus demand-side interventions. While first-generation schemes have concentrated on the "supply" of existing knowledge (and information) throughout the organization, second-generation strategies focus, instead, on satisfying organizational "demand" for new knowledge. As explained above, it is an imitate versus innovate dichotomy. Supply-side schemes take the best organizational thinking (both practiced knowledge and supporting information), codify it in various forms, and then distribute it through databases, documents, training or other methods – all of this with intentional imitation in mind. Demand-side schemes focus, instead, on creating and maintaining the conditions required for optimum production of new knowledge (i.e. knowledge in practice). Increasingly, both sides are coming to see the importance of a balanced approach, in which the healthy production of new knowledge and its effective distribution and use throughout the organization are acknowledged as two parts of the same recursive cycle. Second-generation KM has been crafted accordingly.

Complexity's killer app

Despite his enormous contributions to the field of OL, Peter Senge (1990) has not addressed the fact that the key to creating learning organizations can be found in complexity theory. This is surprising, given his grounding in systems thinking (i.e. the "fifth discipline" that he speaks of). Complexity theory is nothing if not systems thinking in practice. Its insights into the nature of knowledge in living systems, in particular, are germane to the fields of KM and OL. Not surprisingly, then, tell-tale signs of complexity theory are beginning to appear in both disciplines.

For instance, thanks to the influence of complexity theory, practitioners of second-

Journal of Knowledge Management
Volume 4 · Number 3 · 2000 · 195–203

generation KM now believe that all organizational knowledge consists of formally held know-what knowledge and formally held know-how knowledge – held either in fact or in practice. An organization, for example, practices its know-what knowledge by basing all of its strategies – business, market, product, distribution, sales, and otherwise – on what it believes to be true and valid about itself and the markets in which it operates. Even an organization's structure is a reflection of its know-what knowledge about the best way to arrange itself. Know-what organizational knowledge, therefore, amounts to collectively held mental models on a broad range of subjects.

Similarly, business processes can be seen as nothing more than behavioral expressions of know-how knowledge (we do WHAT we do THE WAY we do it because of our BELIEF in its VALUE compared to other alternatives). But like all knowledge, procedural knowledge is ephemeral. Business processes are constantly being revised as new information about changing conditions in the marketplace continuously arrives. Whenever procedural knowledge is revised or refreshed, behavior and practice are modified in response.

In sum, organizations do not practice information, they practice knowledge. And knowledge is forever changing.

It is precisely at this point that the importance of the impending three-way convergence presents itself in final form. The KM and OL communities have discovered each other's value. As stated earlier, second-generation KM is emerging as a kind of implementation strategy for OL – a tool kit for how to get there from here if what you want to be is a learning organization. But for this new partnership to survive the test of time, both sides must have an epistemology that they can agree to – a theory of how learning "happens" in human organizations, not just a shared belief in the value of learning. This is where complexity theory comes into play. Complexity offers one of the most robust and widely subscribed-to theories on the nature and role of cognition in living systems, including the manner in which knowledge evolves in human organizations. This is just the kind of paradigm that second-generation KM and OL need – an executable model that both can hang their hats on.

Complexity theory is systems thinking applied to the behavior of natural systems. Within its perspective is a framework that defines how knowledge evolves in living systems, a conceptual model developed more than 15 years ago by Holland *et al.* (1986), and now closely studied at the highly acclaimed Santa Fe Institute. Complexity's theory of knowledge in living systems is specifically known as complex adaptive systems theory, or CAS theory (pronounced, "KASS"). In discussing the similarities of adaptive behavior between, say, a metropolis, mammalian central nervous systems, ecologies, businesses, economies and other CASes, Holland writes:

> Even though these complex systems differ in detail, the question of coherence under change is the central enigma for each. This common factor is so important that at the Santa Fe Institute we collect these systems under a common heading, referring to them as complex adaptive systems (CAS). This is more than terminology. It signals our intuition that general principles rule CAS behavior, principles that point to ways of solving the attendant problems (Holland, 1995).

Inside the workings of CAS theory is the key to understanding how knowledge naturally unfolds in living systems, be they human organizations or otherwise. Complexity's explication of this process, therefore, offers a solid foundation on which practitioners of second-generation KM can build tools and techniques for use in the real world. By embracing its perspective on how learning happens in living systems, methods employed by practitioners of both KM and OL can be measurably improved.

For example, the KMC's knowledge life cycle (see Figure 2), was largely inspired by the process-based view of rule-making as defined in CAS theory (Figure 1). The similarity between these two models is far from coincidental. Both rely heavily on the presence of feedback loops in the formation of new knowledge, and both interpret knowledge as consisting of rules and rule sets (shown as expressions of organizational knowledge in Figure 2). Practitioners of KM and OL have much to gain by incorporating these principles of complexity in their work. Learning to see knowledge as rules produced by natural knowledge processes is an important first step. Helping businesses to create these processes and to measure their downstream effects on OL (measured as

Journal of Knowledge Management
Volume 4 · Number 3 · 2000 · 195–203

changes in rule sets) is where CAS theory can really pay off in practice.

While CAS theory was originally developed in the early 1980s, it was not until the KMC came along in 1997 that the connections between complexity theory and KM formally gelled into the second-generation brand of KM that we now see before us. It was the KMC who first put John Holland's (1995) CAS theory and KM together, recognizing that human organizations are, in the Holland sense, complex adaptive systems – that is, groups of independent, autonomous agents, all of whom share certain goals and operate in accordance with individually and collectively held rules.

Rules held at both levels, however, are not necessarily in harmony with one another, and the tension between them over time gives rise to the emergence of new ideas to replace old ones. Every new idea (or rule) that replaces an old one can be thought of as an innovation. Innovations that lead to changes in knowledge and practice can be thought of as learning events. All told, then, CAS theory offers a very clear explanation of how learning and innovation happen in living systems; in terms that both the KM and OL communities can relate to.

Several years after his ideas on complex adaptive systems first appeared in print, John Holland published *Hidden Order: How Adaptation Builds Complexity* (1995). Written mainly for the lay reader, *Hidden Order* provided a clear and compelling explanation of how learning happens in terms that included consideration of human organizations. Holland described the complexion of CASes, how agents operate within them, and how knowledge, or rule sets, are created. He further categorized rules held by a CAS as being either declarative or procedural in form (i.e. know-what versus know-how knowledge as discussed above). And all knowledge, he explained, is employed by CASes in the pursuit of perpetually adaptive behavior: "Adaptation, in biological usage, is the process whereby an organism fits itself to its environment. Here," he continued, "we expand the term's range to include learning and related processes."

Bingo! The last shoe has been dropped.

Holland explicitly links complexity theory to KM and OL by pointing to "learning and related processes" in complex adaptive systems. Like KM and OL, complexity theory concerns itself with the nature and role of knowledge and learning in human organizations, which, Holland's work tells us, are CASes. Unlike KM and OL, however, complexity provides an explicit model for how learning occurs in living systems. To the discussion of KM and OL, then, complexity adds an understanding of the form that knowledge takes (i.e. rules) and the means by which it arises (knowledge processes). When combined with second-generation KM, a powerfully new executable model emerges that practitioners and users alike can take to the bank – a real prescription for what to do about it on Monday.

The life cycle of knowledge evolution in living systems is a natural process, and human organizations are by no means excluded from its reach. By incorporating Holland's ideas within the theory and practice of second-generation KM, KM could well turn out to be complexity's killer app – a breakthrough of major proportions, and a powerful new tool for helping businesses become the high-performance learning organizations they desperately want to be.

Notes

1 This model of complex adaptive systems (CAS) was taken from the Internet Web site of the New England Complex Systems Institute (www.necsi.org). Of particular interest in its representation of complex living systems is the role played by knowledge as portrayed by the "rule system" and the "rules" it produces. As the system encounters incoming stimuli from its environment (information, energy, or matter), it fashions its response by invoking pertinent knowledge contained in its rule sets. Actions then taken, if any, produce effects inside the system itself and/or externally, the results of which are fed back into the system for immediate and future reference. Rules, or knowledge, are refreshed in the process. Feedback and rules in the science of complexity, then, are strikingly similar to the roles played by "experiential feedback" and "organizational knowledge," as conceived in emerging KM models (see Figure 2). Indeed, the subject in both cases is identical: the ontology of cognition in living systems. This graphic was created by Marshall Clemens, a NECSI member and President of Idiagram in Lincoln, MA, an illustrator of concepts in complexity theory (www.idiagram.com).

2 This process-based depiction of the knowledge life cycle was created by the KM Modeling Standards Committee of the Knowledge Management Consortium, a KM think-tank in Washington, DC. Embedded within its boundaries are three

Journal of Knowledge Management
Volume 4 · Number 3 · 2000 · 195–203

fundamental stages in the evolution of new organizational knowledge: knowledge production, knowledge validation, and knowledge integration. Notice the similarities between the role of feedback in this model and the CAS model taken from complexity theory shown in Figure 1. Also common to both models is the interpretation of knowledge as consisting of rules and rule sets, shown here in the form of organizational knowledge, or "OK." A "knowledge claim," as shown above, is a new rule, or new knowledge, in its formative stages.

3 This model is composed of two separate, but related, learning cycles: individual learning and OL. Kim's model combines the two to convey the importance of interplay between them if learning at either level is to occur: individual learning is informed by organizational knowledge (mental models) and, conversely, organizational knowledge is produced, collectively, by individuals. This idea is similarly expressed in the KM community's view of organizational knowledge processes (Figure 2), which explicitly shows the influence of individual and group learning on knowledge claim formulation in knowledge production. When compared to the complex adaptive systems model (Figure 1), the components of Kim's OADI/SMM (Kim, 1994) model correspond roughly as follows:

OADI/SMM model
- Observe (concrete experience)
- Assess (reflect on observations)
- Design (form abstract concepts)
- Implement (test concepts)
- Environmental response (feedback)

CAS model (Figure 1)
- Detectors (sensory perception of feedback)
- Rule system and rules (sense-making)
- Rule system and rules (knowledge creation)
- Effectors (locomotion, communication, action)
- Experimental feedback (feedback)

While the mapping here is far from precise, the functional similarities between certain elements of Kim's (1994) OL model and the complex adaptive systems model shown in Figure 1 are striking.

References

Holland, J. (1995), *Hidden Order: How Adaptation Builds Complexity*, Perseus Books, Reading, MA.

Holland, J., Holyoak, K., Nisbett, R. and Thagard, P. (1986), *Induction: Processes of Inference, Learning, and Discovery*, MIT Press, Cambridge, MA.

Karlenzig, W. (1999), "Senge on knowledge", *Knowledge Management Magazine*, July, pp. 22-4.

Kim, D.H. (1994), "Do organizations learn?", *Chemtech Magazine*, September, pp. 14-21.

Senge, P. (1990), *The Fifth Discipline: The Art and Practice of The Learning Organization*, Currency Doubleday, New York, NY.