The New Knowledge Management

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Introduction

Quick, what's the definition of knowledge management? Don't know? Join the crowd. Welcome to the most "successful" fuzzy idea in the history of management. KM has been successful in the sense that everybody seems to be doing it, and fuzzy in the sense that nobody seems to agree on what it is. Definitions of knowledge management generally range from, say, data warehousing or data mining, on the one hand, to vague notions of communities of practice as comprising the salvation of business and humankind, on the other. Would the real knowledge management please stand up!

Despite all the confusion in the marketplace, there has, in general, been agreement on one common theme in the fray. Knowledge management is all about *getting the right information to the right people at the right time*. Practicing knowledge management has therefore been mostly about *information* indexing, storage and retrieval. Which means it should come as no surprise to anyone that the conventional practice of KM has been utterly technology-centric. If KM is all about delivering information to people on a timely basis, what better way to do so than to arm them with technology and the data du jour of their choosing? *Have it your way*, as it were.

These delivery-oriented approaches to knowledge management amount to what I like to think of as "supply-side" KM schemes. [1] The practice of supply-side KM begins with the assumption that valuable organizational knowledge exists, and that the primary task of the knowledge manager is to find it, codify it, and deliver it to the working masses. The unspoken model, here, is significant. Someone – an authority structure of some kind – is doing the finding, codifying and delivering. The recipients of this largesse, on the other hand, are on the receiving end, only. Knowledge is handed down from heaven, as if from God to the people – hence, the supply-side metaphor.

The opposite of supply-side KM is demand-side KM. Unlike supply-side schemes which tend to begin with the assumption that knowledge exists and must only be found, codified and delivered, demand-side practitioners make no such starting assumption. Instead, they first ponder the question of where valuable organizational knowledge comes from in the first place. Sure, sharing valuable organizational knowledge is important, they argue, but shouldn't we also be focusing on the production of new valuable knowledge, and not just on the management of the old? How can we increase the capacity of an organization's

ability to satisfy its demand for *new* knowledge relevant to competitive advantage and improved enterprise performance? This is the central question posed by practitioners of demand-side KM.

Knowledge Babies

The general failure of the knowledge management profession to focus, in earnest, on the question of knowledge production, can be seen as a kind mass hysteria, or denial. An unspoken, unacknowledged, but universally shared aversion to "going there: a kind of modern-day myth of the stork as the explanation for where knowledge babies come from. Indeed, knowledge management has opted for the convenience of not having to worry about how we make knowledge. That's too scary a problem to tackle: too fuzzy; too controversial; too theoretical. Or as the King of Austria once said to Mozart, it has "too many notes."

Here is a quiz. Two knowledge managers are working for two identical companies. One decides to practice supply-side knowledge management and focuses only on the capture, codification and distribution of existing organizational knowledge. The other decides to practice both demand-side and supply-side KM as well, and sets about the task of enhancing her firm's ability to generate new knowledge as well as to manage the old. Assuming both are equally successful at their jobs, which company is better off in the end?

Answer: the second company is better off in the end, of course, because not only is it managing the diffusion and use of existing knowledge as effectively as the first, but unlike the first, it is also *accelerating its rate of organizational learning and innovation*. As a result, it is out-learning its rival by discovering and/or creating new knowledge on a regular basis. Knowledge babies don't come from storks, you see; organizations actually make them.

Two or more people collaborate to solve a problem. They engage in a kind of dialectical foreplay, and together they hatch new knowledge babies. What's more, this process (presented in more detail in the next subsection below) is understandable to us. We know how it works, or at least how it's supposed to work. The implications of this knowledge cannot be overstated.

We now know not only how knowledge production works, but also how to recognize cases in which knowledge production is *not* working, as well as what to do about it. Most of these insights can be traced to the influence of Complex Adaptive Systems theory (CAS theory), which provides a powerful view of how knowledge is produced in living systems. According to CAS theory, knowledge evolves in the minds of individual learners who sometimes go on to co-attract one another on the basis of their mutual interests. [2][3] Communities of interest then form, through which groups of many individuals collaborate in the production

of new knowledge of a mutually-held kind. Some of this knowledge may later escalate into adoption by an entire organization, after which an innovation, or an episode of organizational learning, can be said to have occurred.

Familiarity with the pattern of knowledge-making set forth in CAS theory is key to determining whether or not 'natural' knowledge production is happening in an organization. Social patterns of behavior which conform to the characteristic dynamics of complex adaptive systems signal health in learning and knowledge production, while social patterns to the contrary suggest otherwise. Still, the practice of knowledge management has largely ignored these insights, and has chosen instead to hide behind the myth of the stork because *the new knowledge management* has too many notes; is too scary; and is too theoretical. Enough.

For short-hand purposes, let us refer to the old practice of supply-side KM as "first-generation KM," and the practice of balance between supply- and demand-side KM as "second-generation KM." It is the practice of second-generation KM, then, that I am referring to when I say "The New KM."

In the new KM, the myth of the stork is dead. Organizations create new knowledge, we argue, and they do so by following certain regular and predictable patterns of knowledge-making behavior. We believe that by focusing our investments and management efforts on supporting and strengthening these behaviors, we can enhance the production of organizational knowledge – even accelerate the rate of organizational learning and innovation. In the new KM, knowledge management, organizational learning and business innovation converge into one body of practice.

A Life Cycle View

Over the past two years, a small band of devoted "*New KM thinkers*," myself included, have been working on a body of second-generation practice under the auspices of the Knowledge Management Consortium International (KMCI) [4]. Out of that effort has come a theoretical model which attempts to portray the process by which organizations produce, diffuse and apply new knowledge. My own revised version of this knowledge life cycle model (KLC) can be summarized as follows (see Figure 1):

1. All knowledge begins in the minds of individuals. "Organizations learn only through individuals who learn." [5, P. 139] An important early step in the production of new, shared knowledge, then, is the individual learning experience.

2. As individuals learn, they begin to sense continuities and discontinuities with their experience. In other words, their experience either agrees with what they think they know, or it doesn't. In cases where it doesn't, tension arises

which must be resolved. This might be in the minds of individuals who see their employers heading in directions that they firmly believe are mistaken. These people then turn to each other for relief, as it were. They seek each other out; they co-attract one another; and they engage in a process of commiseration and constructive dialogue. They create their own knowledge, or contrarian rules. "Some of those rules come to be shared in small groups, or even across the whole system: in other words, group and organizational cultures develop that are not part of the officially sanctioned culture or ideology." [3, P. 139] It is in this way that communities of knowledge, interest or practice spring forth.

3. These communities, or groups, then engage in an ongoing process of knowledge making and negotiation.   Each member brings his or her "knowledge claims" to the table, and together they are scrutinized, discussed, modified and refined. New knowledge is shaped this way, and out of this process comes community-made knowledge-claims of a highly refined and validated form. In cases where these community-validated knowledge claims are at odds with the prevailing wisdom or practice of the day, tension builds again, but this time not at the level of the individual, but at the level of the organization.

4. Community-made knowledge claims, in cases where they conflict with the status quo knowledge-in-practice, often escalate to the level of organizations' authority structures, or *senior management*, if you like. Here again, the same community knowledge-making process unfolds, and in the end, new knowledge may or may not emerge at the level of the authority structure. An authority structure is, after all, just another community; one which differs from the rest, however, given the weight of formal authority that lies behind it.
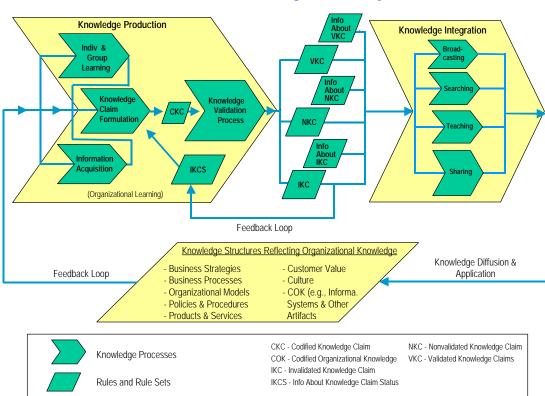
In cases where authority-structure communities embrace and/or create new knowledge, attempts to diffuse such knowledge into practice, or to integrate it organizationally, generally follow. This is the knowledge integration phase of the knowledge life cycle. In the first stage of this phase, new knowledge propagates across the organization either serendipitously or by directly managed attempts to do so. On the managed side, we call this "training." On the serendipity side, we call it the "grapevine" or sharing.

As new knowledge is broadly diffused across the organization, its embodiment in practice becomes more apparent – or not, perhaps. If so, this marks the second stage of the knowledge integration phase. Knowledge that does infuse practice on a wide scale can be said to have accompanied an instance of organizational learning. "The output of organizational inquiry may take the form of a change in thinking and acting that yields a change in the design of organizational practices." [6, P. 12]   Each occurrence of organizational learning can, in turn, be regarded as an episode of innovation.

The means by which new knowledge is produced, diffused and embraced into widespread organizational practice is what we mean by the term "innovation." Innovation and organizational learning are largely synonymous terms.

5. Once new knowledge has progressed to the point of its infusion in widespread dominant practice, its application by individuals in business processes begins to produce experience. The effects of practicing new knowledge generate feedback to its practitioners, who in turn learn from these effects and form judgments and opinions on the *value* of the new knowledge, accordingly. Not only do these value assessments lead to alterations in practice, but they also serve to stimulate the production of new ideas and new problems in the minds of individuals, who then go on to imagine the next generation of the same idea. In other words, feedback from knowledge in practice engenders new problems, new learning, and inventive tendencies in the minds of individuals, which takes us back to the beginning of the cycle as illustrated in step 1 above; and so the whole process then repeats itself, continuously and recursively.

The Knowledge Life Cycle

The knowledge life cycle, as described above, was created using a blend of complexity theory, organizational learning, epistemology, and system dynamics.

As such, it has an unmistakable *systems thinking* spin to it, thanks mainly to the influence of the science of complexity. What many people may find surprising then, is that most of the ideas expressed in this paper are firmly rooted in complexity theory. Now seen as a valuable source of insight in understanding how living systems function—including human organizations—the science of complexity also has a great deal to say about the nature and role of cognition in the conduct of human affairs. [7]

Indeed, as noted earlier, second-generation KM owes much of its thinking to Complex Adaptive Systems theory, or CAS theory, which holds that living systems (i.e., organizations made up of living, independent agents, such as people) self-organize and continuously fit themselves, individually and collectively, to ever-changing conditions in their environment. They do this, the theory says, by modifying their knowledge *of fact* and *of practice* (i.e., their *know-what* and their *know-how*) as a consequence of their interaction with their environment and the effects of their own, and others', actions. [8]

Knowledge, according to CAS theory, can be represented by rules that agents follow in their perpetual quest to successfully adapt themselves to their environment. According to this view, living systems are nothing if not learning organizations. Understanding how knowledge forms at the level of individual agents, and rises to the level of *the collective* to become shared organizational knowledge, is a lesson in process taken directly from complexity theory.

The application of complexity theory to a broad range of business and organizational development issues is widening in practice. Examples include the *New England Complex Systems Institute*, [9] and the *Institute For The Study of Coherence and Emergence*, [10] both in Cambridge, MA, whose respective members have been actively studying the application of complexity and CAS theory to the management of human affairs for years now.

Major corporations have also risen to the occasion by investing in dedicated resources, such as Citibank's *Complexity and Organizational Behavior Project*, [11] to explore and embrace ways of applying complexity's lessons to the management of their own affairs. Even the *Wall Street Journal*, thanks to the pioneering efforts of journalist Tom Petzinger, has been closely following the trajectory of complexity theory as practiced by business since the mid-'90s. [12]

But it wasn't until 1997, when the *Knowledge Management Consortium International (KMCI)* was formed — a think-tank in Washington, D.C. — that the profound connection between complexity theory and knowledge management was formally embraced. [13] By simply recognizing human organizations as living systems — consistent with CAS theory's definition of *complex adaptive systems* — all of the theory's insights on how knowledge *happens* in such systems were suddenly seen as applicable to business and industry. This insight, coupled with

the influence of organizational learning on KM, accounts for the strikingly new and different brand of *second-generation knowledge management* that we now see before us – a practitioner's framework firmly rooted in the study of living systems.

Too Theoretical?

Unfortunately, new ideas all too often provoke the kinds of complaints mentioned above as being "too vague," "too scary," or "too theoretical" to be of any use on a purely practical basis. Detractors of the new knowledge management might already be saying to themselves, "Come on, who's kidding who? This business of '*a practitioner's framework firmly rooted in the study of living systems*' may sound good in the classroom, but it's dead-on-arrival in the boardroom. We need executable models that we can deploy '*on Monday morning*' that come with clearly definable value propositions and measurable benefits – *economic* benefits, that is. Nothing less will do."

Fair enough. Let's take a crack at it.

First, let's tighten the scope of our opening hypothesis a bit. That is, that businesses, which are human social systems, are subject to the implications of complex adaptive systems theory (CAS theory), because human social systems are living systems, and comprise "exactly the kind of system that the science of complexity deals with." [3, P. 24] This is decidedly different from conventional thinking, which has tended to think of businesses as collections of objects that in this instance we call *people.* When it comes to conventional thinking on matters related to knowledge production, sharing and human performance, the dominant first principle might read like this: *People in organizations can be manipulated to form social systems which create new ideas and new products.* Rarely are business plans expressed in these terms, but this intention is inevitably embedded in them.

The new knowledge management begins with a different first principle: *Knowledge production in organizations is an emergent social process.* Human social systems, by their intrinsic nature, give rise to collective knowledge-making by their members as a byproduct of their individual learning and interpersonal interactions. What invariably bubbles up from all of this is new knowledge. In other words, no manipulation or management is required to get people to innovate in organizations; the constitution of human social systems already includes their predisposition to do so. [14]

Let me put it in more business friendly terms. Organizations innovate by their very nature (see knowledge life cycle discussion above). *You don't manage innovation, you either get out of its way or you engage it on its own terms, not*

yours. Better yet, you acknowledge its primacy in human social systems and you support, strengthen and reinforce its expression.

Now, here's where the hard-core *take it to work and put it to use on Monday* inspiration comes in. If organizations are already fundamentally predisposed to create new knowledge – and that's what they do and always have done; and if we think we have some inkling of how they do this, which can only be described as attributable to self-organization; then rather than think in terms of trying to manage or manipulate organizations towards some desired outcome (e.g., better knowledge making, diffusion and use), why don't we begin by declaring victory at the outset and celebrate the fact that what we want is already there?

Wait! You say it's *not* there? Or it's not there to the desired *extent*? You mean, of course, that people learn without being told to do so. And of course people affiliate with one another in communities of interest without being told to do so; and of course people engage in co-invention and all of the things described above in the knowledge life cycle without being told to do so to some degree. Is that it? What you want, then, is for them to do it more often. Or more intensively? Or more effectively? Or more collaboratively? Or more prolifically? Is that what you want? Is that what you mean?

Or do you still cling to the notion that you can manage or manipulate people into following certain other knowledge-making, -sharing and -using regimes that are the creations of managers? This issue requires resolution of the central question implied above, which is *do you agree with 'first principle number one' or 'first principle number two'?* Because you can't have it both ways. And if you are a *first principle number one* believer, I challenge you to explain how throughout all of human history men and women have been making shared knowledge at the planetary level without once being subjected to knowledge-making management schemes of an administered kind. I'm talking about knowledge-making at the level of whole social systems such as science, religion, philosophy, politics, medicine and education.

These are all knowledge-making social systems (self-organized communities) operating on a planetary scale that have never been subjected to any form of centralized planning, control, or management and yet they have all somehow managed to create mutually-held new knowledge throughout time. Philosopher of science, Thomas Kuhn, observed that evolutions in science, in particular, have been anything but managed. "Competition between segments of the scientific community is the only historical process that ever actually results in the rejection of one previously accepted theory or in the adoption of another." [15, P. 8] CAS theory applies to all levels of scale, whether all of humanity at one extreme or Acme Widgets, Inc. at the other.

That all being said, surely it is possible to create artificial knowledge-making regimes that can produce new knowledge by following *prescribed* patterns of behavior, rather than relying on patterns which *emerge* through the life cycle described above. After all, we do this all the time in the form of R&D departments, market research functions, product planning and development, steering committees, task forces, etc. [16] Even our predominant form of management in most businesses is arguably artificial and patently oligarchical (management by the privileged few). But are these approaches to knowledge-making sufficient and, ultimately, sustainable? Probably not.

Oligarchical businesses systematically fail to take the full creative power of their human agents into account, and they regularly make knowledge that has a long history of leading to unsustainable behaviors over the long term. If you have any doubt of that, then I'm sure you wouldn't mind volunteering your basement at home to serve as a repository for the millions of tons of spent nuclear fuel produced by the energy industry in the U.S., for which there are no suitable places of long-term storage on Earth. Or perhaps the asbestos industry's attempts to go on pushing their products despite their knowledge of the attendant risks to human health will convince you. Or the tobacco industry's equally reprehensible behavior. Or the chemical industry's unbridled release of synthetic products into the atmosphere every day. Or the life sciences industry's reckless experiments in genetic engineering. Or Firestone/Bridgestone's cover-up of its faulty tire products. Does anyone really think that left to their employees' devices, as opposed to only their management teams, any one of these companies or industries would have made the same mistakes? I doubt it.

After a few hundred years of progressively making and practicing unsustainable business, one starts to get the impression that it may not be so much a case of bad decisions being made by bad decision makers. Rather, the problem may lie with the nature of the knowledge-making system that accounts for the decisions being made. Oligarchies are sub-optimal when it comes to knowledge making for the masses. Top-down knowledge making always is. Bottom-up knowledge-making, however – of the self-organized sort described in the life cycle narrative above – always does a much better job over the long-term, and is therefore inherently more sustainable and more prolific. Humanity, itself, has never had any form of centralized control or management on a global level, and yet we're here, aren't we?

Human social systems – businesses included – are endowed with certain knowledge-related behaviors that can best be described as *the tendency to self-organize around the production, diffusion and use of new knowledge*. [17][18] Practicing the new knowledge management therefore begins with this insight and is predicated on the perspective that these behaviors should be acknowledged, embraced, supported and reinforced. Anything less than that is patently

unsustainable. The new knowledge management is about *sustainable innovation*!

An Executable Process Model for Creating Sustainable Innovation

Metaphorically, here, courtesy of the new knowledge management perspective, is a "seven-day" creation process for a knowledge life cycle that will sustain innovation. Central to the approach advocated below is CAS theory's perspective on how knowledge production and integration happen in human social systems. In addition, I invoke concepts taken from the literature in organizational learning to repair CAS theory's failure to adequately address the origin and role of self-organized communities in collective knowledge-making. [6]

While CAS theory does a superior job of describing the role of genetic algorithms in the unfolding of individual learning, with few exceptions [3] it leaves much to be desired on matters related to community formation and group learning. Here, organizational learning theory steps conveniently into the breach. By combining the two fields of thought, we arrive at a place in which both individual and organizational learning are accounted for using principles that both camps seem eager to embrace, especially the principles of self-organization and emergence in complex systems.

A third pillar in our theoretical platform stands in the form of the theory of autopoiesis as developed in the late 'seventies by Maturana and Varela. [17] Autopoiesis, which roughly means *self-making,* is a specific account of the principle of self-organization so commonly evoked in complexity theory, and therefore offers more than we find in CAS theory, alone, in terms of understanding how self-organization happens in living systems.

By appealing to various aspects of these three mutually-enriching bodies of thought in the discussion below, I argue that practitioners of second-generation knowledge management can improve both the rate and quality of organizational innovation by strengthening and reinforcing related social processes. Above all, however, I stress that these processes are naturally emergent as opposed to engineered. It would therefore make no sense at all to attempt to build, much less engineer, related processes. Human social systems are already endowed with all of the processes needed to engage in knowledge production and integration. Instead I argue for the implementation of policies which are aligned, or synchronized, with organizational tendencies to self-organize around the production, diffusion and application of shared knowledge.

To achieve my ends, I advocate the management of knowledge-related policies. But while in most instances policies are used as management tools for guiding behavior, I promote the reverse. Instead of behavior following from policy, I argue that in the case of business innovation, policy should follow from behavior. Knowledge-related behaviors in human social systems are antecedent to

interventions of any kind. Policies, therefore, should be crafted in such a way that they do not conflict with such behaviors; rather, they should support them. Knowledge managers should take their cue from behaviors already embedded in human social systems and plan their strategies, accordingly. In this regard, mine is an utterly deferential approach to managing innovation, not a prescriptive one.

Monday Morning

On Monday morning, the organization practicing the new knowledge management will do the following things. First, it will organize an effort to discover and document its current practices in four knowledge-related areas of interest.

▪ *Embryology (of knowledge):* The embryology of knowledge refers to the extent to which individuals in an organization are free to pursue their own learning agendas, and the degree to which they are further free to self-organize into knowledge-making groups, or communities of knowledge, interest, or practice.

Self-managed, self-inspired learning by individuals is a hallmark of complex adaptive systems. Indeed, most of what CAS theory deals with is self-motivated individual learning as the mainspring of adaptive behavior in living systems. According to Holland, "A major part of the modeling effort for any CAS, then, goes into selecting and representing stimuli and responses, because the behaviors and strategies of the component agents are determined thereby." [2, P. 8] Indeed, not only are organizations self-organized in their *collective* learning regimes, but so, too, are *individuals*, upon whom organizations rely heavily for their inspiration and leadership. To attempt to manage such important sources of innovation through prescribed learning agendas is to quell the very source of insight that leads to adaptive behavior in human social systems.

Individuals whose passions and interests cause them to engage in creative thinking and innovation tend to seek dialogue and assurance from others who share their views. This is especially true in cases where the views and opinions involved are contrary to those held by the status quo in an organization. The anxiety that follows serves as a profound source of innovation, both in the minds of individuals and in the collectivities of groups. In discussing the role of groups in rule-making and innovation, Ralph Stacey says, "This means we cannot view creativity purely as an attribute of an individual. An individual is creative only if he or she is a member of groups that are capable of assisting in the containment of anxiety, although the degree to which individuals rely on groups for this purpose varies enormously." "Ultimately, creativity, and thus innovation, lie in interaction within a group. [3, P. 139]

Current practices in this area are commonly found in terms of where companies invest in their employees' learning, and how much of these investments are made in the form of formal training programs versus employee-managed informal learning. Self-organized communities, on the other hand, can be measured, in a sense, through the use of social network analyses, as well as gauging the extent to which self-organized communities are formally supported by management in the form of time, infrastructure, and other corporate resources.

▪ *Politics (of knowledge):* The politics of knowledge-making, diffusion and use in an organization can have a dramatic impact on the overall rate of business innovation and the quality of ideas produced. Most organizations tend be organized oligarchically around these functions. Management teams and their administrative designates, including R&D functions, Product Planning and so forth, tend to monopolize innovation while the rest of the organization is relegated to knowledge-following and a regimen of obedience.

In a complex adaptive system, politics are no less important, or prevalent, in the development of shared knowledge and as a determinant of group behavior. Moreover, the principle of self-organization in such systems tends to result in pure anarchies, or in the case of human social systems, democracies and parliamentary systems. In Erich Jantsch's words, "The natural dynamics of simple dissipative structures [of which CASes are included] teaches the optimistic principle of which we tend to despair in the human world: The more freedom in self-organization, the more order!" [18, P. 40]

Of course, oligarchies, dictatorships and all sorts of other repressive regimes can be found in the realm of human affairs, but these systems tend to die out sooner and are rarely sustained. According to the present method, this is attributable to the degree of misalignment between the natural thrust of human social systems and the policies imposed on them by authoritarian leaders.

Discovering current practices in this area is best accomplished by starting with the identification of significant organizational knowledge currently in practice (business strategies, organizational models, business processes, products and services, etc.), and then tracing their evolution to the formal processes by which they were created. Next, determining how these legacy processes have been – and are now – populated with people will reveal the core complexion of who gets to make new knowledge in the organization today, and under what type of political "constitution" their power to do so is enforced.

- *Intellectual Diversity:* The degree to which a business supports a plurality of ideas, even dissident ones, will, too, have a material impact on its overall performance in innovation. Firms, which seek diversified intellectual ethnographies tend to be more innovative than those that don't. Here, it is useful to begin the search for practices related to intellectual diversity by looking at the HR recruiting and hiring process. The extent to which intellectual diversity is considered at all can be very revealing.

On the importance of diversity among agents in a system, intellectual diversity and otherwise, CAS theory is unequivocal. Among the commonalities held by CASes, according to Holland, is their dependence upon the "aggregation of diverse elements." [2, P. 4] Similarly, another scholar of complexity theory, Ralph Stacey, puts it this way: "Complex adaptive systems are driven by three control parameters: the rate of information flow through the system, the richness of connectivity between agents in the system, and the level of diversity within and between the schemas [i.e., knowledge bases] of the agents." [3, P. 99] It is my contention that Stacey's third parameter, diversity of knowledge held by agents, is entirely manageable, if only in the form of how organizations may take very deliberate steps to recruit members who bring divergent views, experiences, and interests to the table. Too often, however, organizations do precisely the opposite.

One firm which I regard as particularly enlightened on this subject recently put it to me this way: "Here, we are more interested in becoming *a well-rounded organization of individuals*, than we are in becoming an organization of *well rounded individuals*." [19] This credo routinely leads to the admission of very different people into the organization when compared to one another, thereby leading to a highly diverse enterprise with an arguably impressive and equally diverse pool of knowledge potentialities. This diverse pool of potentialities may be seen as an adaptive toolbox providing an organization with the capacity to fit itself to its environment. The more diverse the hining, the more diverse the resulting knowledge potentialities in the toolbox, the more likely it is that the organization will survive and prosper.

- *Connectivity:* The density of communications networks or connectivity is also important to business innovation. The degree to which a culture values effective communications and connectivity between individuals and groups will materially affect the rate and quality of its innovation.

Turning back to Ralph Stacey, we see that two of his three fundamental "control parameters" for complex adaptive systems consist of: "the rate of information flow through the system," and "the richness of connectivity between agents in the system." [3, P. 99] In other words, what Stacey is referring to is the rate and quality of communications in a CAS as enabled by its connectivity scheme. Holland, echoing a similar theme, stresses the

importance of "extensive interactions" between agents in a CAS as a primary factor in determining the coherence and persistence of the system. [2, P. 4]

Mapping current technology infrastructures and the connectivity they provide is certainly important here. But it is also important to characterize the density and make-up of social networks, as well. In some firms, it is taboo for employees to speak with their supervisors' peers without first "going through" their supervisor to do so. Even more taboo would be "going around" their supervisor to speak with their boss's boss. The presence of communications networks, technological or social ones, and the protocols according to which they function play pivotal roles in the knowledge-making affairs of businesses and should be surveyed, accordingly.

These four areas of organizational life are the most important variables in human social systems when it comes to how well an organization learns and produces new knowledge. Together, they reflect certain principles that form the foundation of practice in the new KM.

Tuesday Morning

Having documented current practices in each of the four areas discussed above, the organization practicing the new knowledge management will now set about the task of inferring from these practices (or by further direct discovery) what their precipitating and underlying rules and polices are. Here, I invoke the following model:

Principles ➔ Policies ➔ Rules ➔ Practices

Stated in the form of an assertion: An organization's principles, or values, give rise to its policies, which in turn give rise to its rules, which account for its practices.

An authority structure can certainly reach agreement on what its principles or values happen to be, but it can hardly manage the application of its principles in the form of detailed practices to such an extent that every worker's experiences and transactions in the field are directly guided, or determined, by management. Short of that, polices are developed which are inspired by principles and which loosely guide behavior. Actual behavior, however, is far more granular, is only guided by policies indirectly, but is not directly determined, per se. That requires policy-driven rules, usually formulated at a local level, often by individuals, themselves.

According to this framework, an "Embryology (of Knowledge)" policy might be adopted by management which says, *"All employees shall be encouraged to engage in significant levels of self-directed learning with the organization's*

support and encouragement." The fulfillment of this policy, however, could be wildly different from one part of the organization to another.

In one case, employees might be granted 5 percent of their company time to engage in related learning, while in others the percentage might be considerably higher. Budgets allocated for such learning might also vary. Their relative size vis-a-vis dollars spent on mandatory training might vary as well. There are many different ways to implement even the simplest policy, and yet all of them might arguably comply with the same governing policy, nonetheless. Rules developed at a local level would vary, accordingly. In any case, practices follow from rules, which spring forth from policies. This is why we begin the effort with an understanding of practices and then work our way backwards to our goal.

Just as rules reflect underlying policies, so does the same framework suggest that policies reflect underlying principles, or values. These too, then, should be determined either by inference or by direct discovery. Knowing what ultimately drives an organization's policies, rules and practices in the four areas of interest will be of tremendous value when it comes to exploring opportunities for change and improvement. If the policies change, but the underlying principles behind them don't, it should come as no surprise to anyone later on that attempts to practice the new policies will ultimately run afoul of the organization's value system. This absolutely applies to knowledge-related policies and practices as well as to any other dimension of organizational life.

Before moving on to Wednesday's work, there is one more task to complete. The organization must baseline its current rate and quality of innovation. There is no one way to do this and so how it is done is up to the organization. But whichever way it chooses, it must be one that will satisfy it and that can be reused later on to determine the effects of KM interventions in the latter stages of the effort.

I will offer two thoughts on how to baseline innovation in the current context, but will leave the question open for organizations to research and pursue later on. In choosing the organizational scope of this process, it will be necessary to narrow the baselining effort to a smaller group, or at least to one that is open and receptive to what the organization is about to do. In addition, it would be helpful if the group of choice has records of knowledge production of some sort going backwards in time – say, two to five years or so. This can be done by focusing not on all forms of organizational knowledge, but on a few representative ones only.

For example, in an R&D environment, records on research reports, or even patents, are often held for long periods of time, offering tangible evidence of the authors' rate and quality of innovation. In an HR function, it might be personnel programs; in marketing it might be new ad campaigns; in sales it might be new

contract offerings; in manufacturing, it might be new production processes; in finance, it might be new cash flow and/or investment management schemes. These are all expressions of organizational knowledge that are subject to continuous improvement and/or outright displacement by new or better ideas. Every such innovation or improvement constitutes an innovation, or an organizational learning event, and can be counted, accordingly. Rates of innovation are measured using such recorded events.

Measuring the quality of an innovation can be accomplished in at least two ways. One would be to correlate the value of the incremental revenue gained, or the cost saved, through the implementation of specific innovations. Again, this can be established through retrospective analysis.

The other technique would be to trace the evolution of new knowledge, in retrospect, to the process which created it, and to grant a higher value, or quality, to innovations that were subjected to, and which survived, thoughtful validation. According to this principle, knowledge created through community deliberations will almost always have a higher value in practice than knowledge imposed by oligarchs, if only because of the fact that knowledge co-created by members of a community has been subjected to more stringent validation. Knowledge produced by communities on a bottom-up basis also tends to be more acceptable in practice than knowledge imposed through top-down measures due to the investments people have made in its creation, validation and adoption.

Wednesday Morning

Now that the firm's current knowledge-related environment, in terms of the four policy areas of interest, is mapped (I call it the organization's *Knowledge Operating System*, or KOS [20]), the organization is in a position, for the very first time, to contemplate meaningful change and improvement to its rate and/or quality of learning, innovation and performance. In our practice of second-generation KM, we have come this far without once turning to the 'capture and codify' obsession of supply-side thinking, much less its characteristic knee-jerk resort to technology.

Now, today, Wednesday, the new knowledge management organization will engage in the single most powerful kind of intervention available to practitioners of knowledge management – new or old. It will apply a new skill that I will refer to here as the Policy Synchronization Method, or PSM. I've discussed the PSM using another name in an earlier paper of mine. [21]

Let's start off with an analogy. In the 1960s and '70s, and to some extent still today, many people in the teaching profession experimented with, and advocated, the twin principles of *intrinsic learning* and *intrinsic motivation* as the basis of their methods. [22][23][24][25] The theory behind it is that individual

students tend to learn better when they're learning what *they* want to know rather than what *you* want them to know.

In other words, when they are motivated intrinsically by their *own* interests, as opposed to extrinsically by some third party's, they invariably learn more, learn faster, and retain their knowledge over longer periods of time than when the process is reversed. So, these intrepid teachers argued, stop trying to get them to learn better and more effectively, and recognize that they already do so under the right conditions. Create and maintain those conditions, they suggested, and high performance learning will flourish.

Now, let's briefly analyze what happened with intrinsic learning and why it worked. First, the theorists at the time began by observing the predispositional learning behavior of individual students (children, in this case). Next, they characterized these behaviors and made them explicit. They were then in a position not only to know what these predispositional behaviors were, but to evaluate the effectiveness of their current and past teaching habits against them. In other words, if the learner learns well by doing "X" and we systematically make him do "Y" as a matter of practice, instead, then what we have before us is a poorly synchronized policy-to-behavior condition which is inherently unsustainable. By synchronizing the policies with the target environment's intrinsic pattern of behavior in the behavioral domain of interest, we can not only support the desired behaviors, but we can strengthen and reinforce them as well.

In other words, rather than fighting the system to obtain certain desired results, one could embrace the same system's desirable native practices in the behavioral domain of interest and obtain even better results by strengthening and reinforcing them. With prior knowledge of *how learners learn*, then, one could conceivably craft policies that reciprocate and strengthen such learning behaviors and reinforce them in the exchange. Or, one could ignore these insights and cram kids in classrooms whether they like it or not, and force-feed them what *we* want them to know for twelve-plus years.

Among the fascinating results from early studies in intrinsic learning were the following:

- Intrinsic motivation "is based on people's need to be competent and self-determining." [26, P. 9]

- There appear to be two primary factors that foster intrinsic motivation to learn [26, Pp. 9-10]:

    1. The first is choice. Not surprisingly, people tend to focus more intently on activities of their own choosing and interests.

2. The second is "positive competence feedback." "When subjects get feedback indicating that they are quite competent, they seem more interested in the activity and they persist at it longer" than those who do not get the feedback. [26, P. 10] Perhaps this is one of the reasons why groups form and persist: they serve as sources of positive feedback for individuals engaged in creativity and innovation.

▪ "Whenever people's behavior becomes controlled by some extrinsic factor, they seem to be left with less intrinsic motivation." "Apparently, the fact of the rewards or controls undermines their sense of self-determination, for they begin to see their behavior as being determined by the reward contingencies rather than by their own interest in the activity." [26, P. 9]

As I asked earlier, is it bad decisions being made by bad decision-makers causing bad learning results, or is it the knowledge-making system itself in which decision-makers are operating which cause bad learning results? I think it's the latter, and I think the present system is unsustainable precisely because of the false mental models underlying the educational system we have today, *despite* the brilliance of the insights gained from intrinsic learning studies forty years ago contradicting these false models.

I choose to embrace the knowledge from the intrinsic learning studies. They imply that organizations, like individuals, exhibit certain self-organized learning-related tendencies that are ultimately immutable. With these tendencies in mind, the Policy Synchronization Method offers one simple imperative: *embrace them.*

On Wednesday, then, the new knowledge managed organization will begin the process of systematically assessing the degree of alignment or disparity between the current knowledge-related policies held by the firm and a target set of ideal policies as inspired by an understanding of how learning happens in complex adaptive systems.

Wednesday's work will therefore have amounted to a carefully executed gap analysis of a traditional kind as applied to a rather new domain: the organization's *knowledge operating system*, or KOS. At the end of the day, the deliverable will consist of a fully developed study of gaps and opportunities to bring the organization's KOS more closely into alignment with the target model. This, in turn, might point to many different areas in which gaps exist, the resolution of which might take the form of just as many, or more, potential interventions. Proposing which of these opportunities to, in fact, focus on and how to do so will be the organization's next step.

Thursday Morning

Thus far, the organization has studied and profiled its current practices, rules and policies in the four areas germane to knowledge production, diffusion, integration and use. In addition, its knowledge managers have established a baseline of how well the organization has performed over time under its present system, expressed in terms of its historical rate and quality of innovation. And finally, the organization has just completed a gap analysis that determined the degree of disparity between current and target knowledge-related policies in the four areas of interest. Thursday, then, will amount to a planning day. It's time for the knowledge managers to plan and prioritize their interventions.

In the Policy Synchronization Method (PSM), not all of the four policy domains are equal when it comes to their influence. Some policies are more important than others, at least in terms of how and when they should be deployed. In the early stages of a PSM intervention, it is the politics of knowledge policies that should come first.

In complex adaptive systems, all knowledge-making is bottom-up in origin, in that it involves individual and group learning. There are no chief knowledge makers, dictators, commanders, or autocrats. There are leaders in such systems, but they derive their authority from the fact that they are the attractor basins of knowledge processing self-organization. In other words, they can act on behalf of other agents whose interactions place them at the nexus of the self-organized process, but only so long as they remain at the center of such interactions. As soon as their knowledge claims no longer represent the emergent result of knowledge processing interactions, their authority disappears.

All knowledge made under such systems is no-less bottom-up in its construction. This includes knowledge of knowledge-related policies, themselves. More to the point, it is the political system that either makes it possible, or not, for the dynamics of self-organized knowledge production, diffusion and use in a social system, to unfold. Getting the correct political system in place, then, is the first order of business in any PSM project, because all organizational knowledge, including the remaining knowledge-related policies, are produced by such systems and cannot be prescribed independent of them.

For these reasons, the new knowledge management organization will prioritize plans for the implementation of a new knowledge making political system that will make it possible for all stakeholders in the organization to participate in not only the knowledge system itself, but also in the process that produces the rules that will govern the system, as well. What this means is that no longer will all organizational knowledge be created by oligarchies (aka, senior management). Knowledge production will become less oligarchical and more democratic.

At Deere and Company in Moline, IL, knowledge managers are already experimenting with a knowledge-related political system that will make it possible for knowledge claims produced by self-organized communities of interest to have a voice in the formal planning and decision-making processes of the firm – a seat at the table, as it were. In effect, communities of interest are being recognized as a valuable source of organizational knowledge and they are being formally embraced into the politics of knowledge-making at Deere. [27]

What's so interesting about this experiment is that it in no way threatens or erodes the authority of senior management at Deere, nor does it oblige management to agree with community input. Rather, it simply opens up the knowledge-making process in a very formal way to the entire population of the firm, with a particular emphasis on the role that self-organized communities of interest play in the production of new knowledge. Deere's planning-related business processes are being redefined, accordingly.

Next in the priority of planned interventions comes intervention in Embryology policy. In order for the new political system to have its greatest and most beneficial effects, people should be learning on a self-directed basis as much as possible, and communities of interest should be forming and flourishing at a healthy, natural pace. Organizational policies should make it possible for the organization to evolve into a healthy *community of communities*. Policies related to how people can be free to learn, on their own terms, and how communities can freely form, should be defined, implemented and funded. Planning the initiatives to do so is the organization's second priority.

Third, in the list of planning priorities should be a combination of steps required to revamp policies in the Diversity (of knowledge) and Connectivity areas. In the Diversity area, targets will most likely be in the human resources recruiting and hiring arena. Adopting policies that compel the organization to move towards becoming a well-rounded organization of individuals, as opposed to an organization of well-rounded individuals, should be the intended outcome. Similarly, policies that improve the internal flow of information and which make external information more readily available can only work to the organization's advantage if they are supported by policies that encourage innovation and the application of new knowledge. Policy interventions in these two remaining areas, then, should be the last planning priority and should be defined, accordingly.

Now, by the end of the day on Thursday, the organization should have prepared a comprehensive action plan that is expressed in terms of prioritized policy intervention and transformation efforts. But there's a twist to the actual implementation that will commence on Friday. Thursday's plan is merely a straw man, a proposed set of new policies that cannot simply roll out on the basis of the thinking of a single planner. There are no czars in complex adaptive systems. Rolling out the plan without subjecting it, first, to the very knowledge-

making regime that it seeks to create would be an act of authoritarian management. Friday's work must therefore be carried out with this caveat in mind.

Friday Morning

According to the plan created on Thursday, the first order of business is deploying the new knowledge-related political system. A comprehensive set of new policies must be created according to which stakeholders from all precincts in the organization can play a role in the production of new knowledge. Policy recommendations must be crafted accordingly, and the new political model is then deployed.

The organization now has a working, more democratic knowledge-making system up and running, all of which unfolds in keeping with a target model, a vision of how it should work, who should participate in its operations, and how it should interface with individuals, communities and with senior management. All of that is its strength, but also its weakness.

What has been done is to successfully launch a planner's or team's vision of what the optimal knowledge-making political system should consist of, as determined or influenced by the planner's policy prescriptions. An externally-designed model has therefore been imposed on a complex adaptive system under the assumption that it will work well and that its composition is inherently suitable for its intended target of use: the organization.

But nowhere in the planning process were the stakeholders of the target system themselves involved. How could they have been? They still occupied a system that was anything but democratic. They had no say in the process. Only the planner, operating under the authority of the well-intended oligarchy was in a position to make plans to change the system. And now the planners have deployed its first critical piece, a political system that should have been of its own making, but was not.

Resolving the quandary is a surprisingly simple task. Rather than view the initial fruits of the planner's labor as a permanent solution, distance the organization from it and declare it to be merely a prototype, a straw man; nothing more than a political system that has been bootstrapped by knowledge managers, but which is now in the organization's own hands. The bootstrapped system should then take its own constitution into its own hands, and redefine itself more to its own liking. Assuming a culture is in place that abhors illegitimate power grabs, what comes out of this process is a fully initialized political system that is ready to take on the remainder of the week's work.

Having recast itself in accordance with its members' own wishes, the new political system spends the rest of the day taking all of the knowledge manager's other policy-related intervention plans under consideration. It systematically reviews and either accepts, rejects or modifies the proposed policy interventions in the other three areas (Embryology, Diversity and Connectivity) and then recasts the plan so that it becomes more to its own liking. The knowledge manager's job is to attend and support this process. By the end of the day on Friday, a self-validated, self-determined political system will exist, and a full slate of validated policy transformation efforts will be ready for Saturday.

Saturday Morning

Saturday's work is simple. It's execution time. The revised and validated policy transformation efforts prepared the day before are systematically carried out from dusk to dawn. Individual learning and community formation policies are deployed (Embryology); Diversity policies are deployed; and the new Connectivity policies are rolled out as well. By the end of the day, an entirely new *knowledge operating system* (KOS) has been initialized and is up and running, albeit in its early, seminal stages.

Sunday Morning

Suffice it to say that the "first week" in the implementation of a PSM project offers no rest for the weary. There's one last – actually, ongoing – step in the process: perpetual monitoring and adjustment. Even if you, the knowledge manager, believe you can launch a KOS that perfectly meets the needs of the organization, it will only meet the needs of the organization today (Sunday). Tomorrow is another day, as will every other day be from now on. The world is a moving target. Markets change; customers change; your own internal circumstances change. And so it's imperative that the performance of the new KOS be continually measured to determine how well the new operating system is performing.

This is where the baselining methods used earlier on Tuesday come back into play. After a reasonable period of time operating under the influence of the new KOS, you should return to the scene to revisit its current rate and quality of innovation using the same tools and techniques you used earlier to baseline its historical performance in the same areas. Better yet, you should encourage the new political system to devise a set of practices that will make it easier to track organizational innovation as a natural byproduct of its operations. This need not be confined to simply counting widgets or new ideas. Of far greater value would be methods that make it possible for organizations to measure the economic impact of its innovations on a systematic basis. Tools and techniques of this sort are just now beginning to emerge (a subject for another paper).

Because the process of monitoring and adjusting the KOS will be an ongoing part of your work, Sunday's work, in a sense, will never be done. This aspect of the PSM comprises a good portion of what practitioners of second-generation knowledge management do: they monitor, modify and administer knowledge-related policies and associated rules and practices. Knowledge managers are *knowledge policy and process* managers. They don't manage knowledge, per se. According to the new knowledge management, they merely manage the organizational capacity to produce it.

References

[1] Mark McElroy, "The Second Generation of KM," Knowledge Management (October, 1999), Pp. 86-88, also available at www.macroinnovation.com/papers.htm.

[2] John H. Holland, Hidden Order (Reading, MA: Perseus Books, 1995).

[3] Ralph D. Stacey, Complexity and Creativity in Organizations (San Francisco, CA: Berrett-Koehler, 1996).

[4] Steve Cavaleri, Joseph M. Firestone, Mark W. McElroy, Edward Swanstrom, and Douglas Weidner, "The Age of the Metaprise," Knowledge Management Consortium International, Gaithersburg, MD, 1999, available at www.km.org/metaprise/MetapriseGrp.htm.

[5] Peter Senge, The Fifth Discipline (New York, NY: Doubleday/Currency, 1990).

[6] Chris Argyris and Donald A. Schon, Organizational Learning II, (Reading, MA: Addison-Wesley Publishing Company, 1996).

[7] Mark W. McElroy, "Integrating Complexity Theory, Knowledge Management and Organizational Learning," available at www.macroinnovation.com/papers2.htm.

[8] John H. Holland, Adaptation in Natural and Artificial Systems (Cambridge, MA: MIT Press, 1992).

[9] New England Complex Systems Institute, www.necsi.org.

[10] Institute for the Study of Coherence and Emergence, www.emergence.org.

[11] Susanne Kelly and Mary Ann Allison, The Complexity Advantage, (New York: BusinessWeek Books/McGraw-Hill, 1999).

[12] Thomas Petzinger, Jr., "Complexity—More Than a Fad?", Managing Complexity in Organizations, A View in Many Directions, Edited by Michael R. Lissack and Hugh P. Gunz, (Westport, CT: Quorum Books, 1999).

[13] Knowledge Management Consortium International, www.kmci.org.

[14] Mark W. McElroy, "Using Knowledge Management To Sustain Innovation," Knowledge Management Review, Vol. 3, No. 4, (2000), 34-37.

[15] Thomas S. Kuhn, The Structure of Scientific Revolutions, (Chicago, IL: University of Chicago Press, 1970 edition).

[16] William L. Miller and Langdon Morris, Fourth Generation R&D, (New York, NY: John Wiley & Sons, Inc, 1999).

[17] Humberto R. Maturana and Francisco J. Varela, Autopoiesis and Cognition, (Dordrecht, Holland: D. Reidel Publishing Company, 1980).

[18] Erich Jantsch, The Self-Organizing Universe, (Oxford, England: Pergamon Press, 1980).

[19] Stated by a college admissions officer from Dartmouth College during a high school presentation at Kimball Union Academy in New Hampshire in 1999.

[20] The phrase, Knowledge Operating System, was coined by Mark W. McElroy and is trademarked by Macroinnovation Associates, LLC. A discussion of its meaning can be found at www.macroinnovation.com/concept.htm.

[21] Mark W. McElroy, "Using Knowledge Management To Sustain Innovation," Knowledge Management Review, Vol. 3, No. 4, (2000), 34-37.

[22] Edward L. Deci and Richard M. Ryan, "Curiosity and Self-directed Learning: The Role of Motivation in Education," Current Topics in early Childhood Education, Vol. 4, (Norwood, NJ: Ablex Publishing Company, 1982).

[23] Laurel Diane Kamada, "Intrinsic and Extrinsic Motivation Learning Processes: Why Japanese Can't' Speak English," A paper presented at the Japan Association of Language Teachers' International Conference on Language Teaching and Learning, November 22-24, 1986.

[24] Ruth A. Zbrzezny, "Effects of Extrinsic Rewards on Intrinsic Motivation: Improving Learning in the Elementary Classroom," A dissertation submitted by the author in partial fulfillment of the requirements of a course (E591) at Indiana University of South Bend, April 10, 1989.

[25] Abraham Maslow, "Self-Actualization and Beyond," From Proceedings of the Conference on the Training of Counselors of Adults, sponsored by the New England Board of Higher Education, and the Center For The Study of Liberal Education For Adults, held May 22-28, 1965.

[26] Edward L. Deci and Richard M. Ryan, "Curiosity and Self-directed Learning: The Role of Motivation in Education," Current Topics in early Childhood Education, Vol. 4, (Norwood, NJ: Ablex Publishing Company, 1982).

[27]   From first-hand observations made by the author during visits to Deere and Company in Moline, IL.

Biography

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