3 KNOWLEDGE MANAGEMENT MODELS

Furious activity is no substitute for understanding.
H. H. Williams (1858–1940)

To succeed, a knowledge management initiative must have a robust theoretical foundation. The major KM activities described in the KM cycle in the previous chapter require a conceptual framework to operate within; otherwise the activities will not be coordinated and will not produce the expected KM benefits. Knowledge management models are presented from Choo (1998), Weick (2001), Nonaka and Takeuchi (1995), Wiig (1993), von Krogh and Roos (1995), Boisot (1998), Beer (1984), and Bennet and Bennet (2004). All the models present different perspectives on the key conceptual elements that form the infrastructure of knowledge management. This chapter describes, compares, and contrasts each model in order to provide a sound understanding of the discipline of KM.

LEARNING OBJECTIVES

1. Understand the key tenets of the major knowledge management theoretical models in use today.
2. Link the KM frameworks to key KM concepts and the major phases of the KM cycle.
3. Explain the complex adaptive system model of KM and how it addresses the subjective and dynamic nature of content to be managed.

INTRODUCTION

In an economy where the only certainty is uncertainty,
the one sure source of lasting competitive advantage is knowledge.
I. Nonaka (1995)

Although few would argue that knowledge is not important, the overriding problem is that few managers and information professionals understand how to manage knowledge in knowledge-creating organizations. The tendency is to focus on "hard" or quantifiable knowledge, and KM is often seen as some sort of information processing machine. The advent of knowledge management was initially met with a fair degree of criticism, with many people feeling this was yet another buzzword that would quickly pass into history. Instead, KM established itself credibly as both an academic discipline of study and a professional field of practice, and one reason it was so successful was the work done on theoretical or conceptual models of knowledge management. Early in the development of KM, more pragmatic considerations about its processes were soon complemented by the need to understand what was happening in organizational knowing, reasoning, and learning.

A more holistic approach to KM has become necessary as the complex subjective and dynamic nature of knowledge has become a more pressing issue. Cultural and contextual influences further increased the complexity involved in KM, and these factors also had to be taken into account in a model or framework that could situate and explain the key KM concepts and processes. Finally, measurements were needed in order to be able to monitor progress toward and attainment of expected KM benefits.

This holistic approach encompasses all the different types of content to be managed, ranging from data to information to knowledge, but also from tacit to explicit and back to tacit-knowledge-type conversions. All the KM models presented in this chapter attempt to address knowledge management from a holistic and comprehensive perspective.

Davenport and Prusak (1998, p. 2) provide the following distinctions between data, information, and knowledge, which also serve to recap the examples presented in Chapter 1:

Data:	A set of discrete, objective facts about events.
Information:	A message, usually in the form of a document or an audible or visible communication.
Knowledge:	A fluid mix of framed experiences, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information. It originates and is applied in the minds of knowers. In organizations, it often becomes embedded not only in documents or repositories but also in organizational routines, processes, practices, and norms.

Davenport and Prusak (1998) refer to this distinction between data, information, and knowledge as an operational one, and they argue that we can transform information into knowledge by means of comparison, consequences,

connections, and conversation. They stress that knowledge-creating activities take place between and within humans and that we have to consider knowledge among the most important corporate assets.

Yet there is no need to choose one over the other or to create mutually exclusive categories. A great deal of overlap and a great deal of value are evident in the many different types of content. In this respect, *content management* is perhaps a better, more general term than knowledge management.

Nonaka and Takeuchi (1995) provide a more philosophical distinction, starting from the traditional definition of knowledge as "justified true belief." They define knowledge as "a dynamic human process of justifying personal belief toward the "truth" (p. 58). They contend that in order to produce innovation, it is necessary to create knowledge. For them, organizational knowledge creation is "the capability of a company as a whole to create new knowledge, disseminate it throughout the organization and embody it in products, services, and systems" (p. 58).

The concept of tacit knowledge, as we saw in Chapter 1, has been clarified by Polanyi (1966), who stresses the importance of the "personal" way of knowledge construction, affected by emotions and acquired at the end of the process involving every individual's active creation and organization of the experiences. When a person tacitly knows, he or she acts, decides, uses the body, and experiences great difficulty in explaining this process in words, rules, and algorithms. The act of tacitly knowing is without distance from things and performances, and the knowing interaction between persons is one of an unaware observation and social, "communitarian" closeness.

Polanyi posits that all knowledge is either tacit or rooted in tacit knowledge. On one hand, tacit knowledge is not easily expressed in formalized ways, and is context-specific, personal, and difficult to communicate. On the other hand, explicit knowledge is the codified one, expressed in formal and linguistic ways, easily transmittable and storable, and expressible in words and algorithms, but it represents only the tip of the iceberg of the entire body of knowledge. This definition of the tacit/explicit concepts emphasizes the importance of considering adequately the tacit dimension.

The 80/20 rule appears to apply here; that is, roughly 80% of our knowledge is in tacit form as individuals, as groups, and as an organization. Only 15 to 20% of valuable knowledge has typically been captured, codified, or rendered tangible and concrete in some fashion. This is usually in the form of books, databases, audio or video recordings, graphs or other images, and so forth. The tacit/explicit mobilization (in the epistemological dimension) and the individual/group/organizational sharing and diffusion (in the ontological dimension) have to take place in order to create knowledge and produce innovation. Each of the KM models presented in the next section addresses this point in different but complementary ways.

MAJOR THEORETICAL KM MODELS

The following models were selected because they possess the following critical characteristics:

1. They represent a holistic approach to knowledge management (i.e., they are comprehensive and take into consideration people, process, organization, and technology dimensions).
2. They have been reviewed, critiqued, and discussed extensively in the KM literature, by practitioners, academics, and researchers alike.
3. The models have been implemented and field tested with respect to reliability and validity.

This list is not meant either to be exhaustive or a definitive short list, but the models have been selected with a view to providing the widest possible perspective on KM as a whole, combined with a deeper, more robust theoretical foundation for explaining, describing, and better predicting the best way to manage knowledge.

The von Krogh and Roos Model of Organizational Epistemology

The von Krogh and Roos KM model (1995) distinguishes between individual knowledge and social knowledge, and they take an epistemological approach to managing organizational knowledge: the organizational epistemology KM model. Whereas the definition of *organization* has been problematic and the term is often used interchangeably with information, a number of issues must be addressed:

- How and why individuals within an organization come to know.
- How and why organizations, as social entities, come to know.
- What counts for knowledge of the individual and the organization.
- What are the impediments in organizational KM.

The cognitivist perspective (e.g., Varela, 1992) proposes that a cognitive system, whether it is a human brain or a computer, creates representations (i.e., models) of reality and that learning occurs when these representations are manipulated. A cognitive organizational epistemology views organizational knowledge as a self-organizing system in which humans are transparent to the information from the outside (i.e., we take in information through our senses, and we use this information to build our mental models). The brain is a machine based on logic and deduction that does not allow any contradictory propositions. The organization thus picks up information from its environment and processes it in a logical way. Alternative courses of action are generated through information search, and the cognitive competence of an organization depends on the mobilization of individual cognitive resources—a "linear" summation of individuals to form the organizational whole.

The connectionist approach, on the other hand, is more holistic than reductionist. The brain is not assumed to sequentially process symbols but to perceive "wholeness," global properties, patterns, synergies, and gestalts. Learning rules govern how the various components of these whole networks are connected. Information is not only taken in from the environment but also generated internally. Familiarity and practice lead to learning. Individuals form

nodes in a loosely connected organizational system, and knowledge is an emergent phenomenon that stems from the social interactions of these individuals. In this perspective, knowledge resides not only in the minds of individuals but also in the connections among these individuals. A collective mind is formed as the representation of this network, and it is this that lies at the core of organizational knowledge management.

Von Krogh and Roos adopt the connectionist approach. In their organizational epistemology KM model, knowledge resides both in the individuals of an organization and, at the social level, in the relations between the individuals. Knowledge is said to be "embodied"; that is, "everything known is known by somebody" (von Krogh and Roos, 1995, p. 50). Unlike cognitivism, which views knowledge as an abstract entity, connectionism maintains that there can be no knowledge without a knower. This notion fits nicely with the concept of tacit knowledge, which is very difficult to abstract out of someone and is made more concrete. It also reinforces the strong need to maintain links between knowledge objects and those who are knowledgeable about them—authors, subject matter experts, and experienced users who have applied the knowledge both successfully and unsuccessfully.

In 1998, von Krogh, Roos, and Kleine examined the fragile nature of KM in organizations in terms of the mind-set of the individuals, communication in the organization, the organizational structure, the relationship between the members, and the management of human resources. These five factors could impede the successful management of organizational knowledge for innovation, competitive advantage, and other organizational goals. For example, if the individuals do not perceive knowledge to be a crucial competence of the firm, then the organization will have trouble developing knowledge-based competencies. If there is no legitimate language to express new knowledge in the individual, contributions will fail. If the organizational structure does not facilitate innovation, KM will fail. If individual members are not eager to share their experiences with their colleagues on the basis of mutual trust and respect, there will be no generation of social, collective knowledge within that organization. Finally, if those contributing knowledge are not highly evaluated and acknowledged by top management, they will lose their motivation to innovate and develop new knowledge for the firm.

Organizations need to put knowledge enablers in place that will stimulate the development of individual knowledge, group sharing of knowledge, and organizational retention of valuable knowledge-based content. This approach was further refined (von Krogh, Ichijo, and Nonaka, 2000) to propose a model of knowledge enabling rather than knowledge management. Knowledge enabling refers to the "overall set of organizational activities that positively affect knowledge creation" (p. 4). This typically involves facilitating relationships and conversations as well as sharing local knowledge across an organization and across geographical and cultural borders.

The connectionist approach appears to be the more appropriate one for underpinning a theoretical model of knowledge management, especially owing to the fact that the linkage between knowledge and those who "absorb" and make use of the knowledge is viewed as an unbreakable bond. The connectionist approach provides a solid theoretical cornerstone for a model of

knowledge management and is a component of the models discussed in this chapter.

The Nonaka and Takeuchi Knowledge Spiral Model

Nonaka and Takeuchi (1995) studied the success of Japanese companies in achieving creativity and innovation. They quickly found that it was far from a mechanistic processing of objective knowledge. Instead, they discovered that organizational innovation often stemmed from highly subjective insights that can best be described in the form of metaphors, slogans, or symbols. The Nonaka and Takeuchi model of KM has its roots in a holistic model of knowledge creation and the management of "serendipity." The tacit/explicit spectrum of knowledge forms (the epistemological dimension) and the individual/group/organizational or three-tier model of knowledge sharing and diffusion (the ontological dimension) are both needed in order to create knowledge and produce innovation.

Nonaka and Takeuchi argue that a key factor behind the Japanese enterprises' successful track record in innovation stems from the more tacit-driven approach to knowledge management. They maintain that Western culture considers knower and known as separate entities (harkening back to the cognitivist approach, which places greater importance on communicating and storing explicit knowledge). In contrast, the Japanese, through the structural characteristics of their language and through influences such as Zen Buddhism, believe in the oneness of humanity and nature, body and mind, self and other (Nonaka and Takeuchi, 1995). Accordingly, it may be easier for Japanese managers to engage in the process of "indwelling," a term used by Polanyi (1966) to define the individual's involvement with objects through self-involvement and commitment, in order to create knowledge. In such a cultural environment, knowledge is principally "group knowledge," easily converted and mobilized (from tacit to explicit, along the epistemological dimension) and easily transferred and shared (along the individual to the group to the organization, in the ontological dimension).

Nonaka and Takeuchi underline the necessity of integrating the two approaches, from the cultural, epistemological, and organizational points of view, in order to acquire new cultural and operational tools for better knowledge-creating organizations. Their construct of the *hypertext organization* formalizes the need for integrating the traditionally opposed concepts of Western and Japanese schools of thought.

The Knowledge Creation Process

Knowledge creation always begins with the individual. A brilliant researcher, for example, has an insight that ultimately leads to a patent. Or a middle manager has an intuition about market trends that becomes the catalyst for an important new product concept. Similarly, a shop floor worker draws upon years of experience to come up with a process innovation that saves the company millions of dollars. In each of these scenarios, an individual's personal, private knowledge (predominately tacit in nature) is translated into valu-

able, public organizational knowledge. Making personal knowledge available to others in the company is at the core of this KM model. This type of knowledge creation process takes place continuously and occurs at all levels of the organization. In many cases, the creation of knowledge happens in an unexpected or unplanned way.

According to Nonaka and Takeuchi, there are four modes of knowledge conversion that

> constitute the "engine" of the entire knowledge-creation process. These modes are what the individual experiences. They are also the mechanisms by which individual knowledge gets articulated and "amplified" into and throughout the organization (p. 57). Organizational knowledge creation, therefore, should be understood as a process that organizationally amplifies the knowledge created by individuals and crystallizes it as a part of the knowledge network of the organization. (p. 59)
>
> Knowledge creation consists of a social process between individuals in which knowledge transformation is not simply a unidirectional process but it is interactive and spiral. (pp. 62–63)

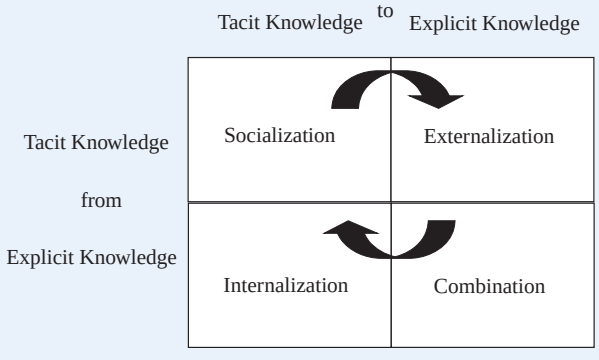
Knowledge Conversion

There are four modes of knowledge conversion, as illustrated in Figure 3-1:

1. From tacit knowledge to tacit knowledge: the process of *socialization*.
2. From tacit knowledge to explicit knowledge: the process of *externalization*.
3. From explicit knowledge to explicit knowledge: the process of *combination*.
4. From explicit knowledge to tacit knowledge: the process of *internalization*.

FIGURE 3-1

THE NONAKA AND TAKEUCHI MODEL OF KNOWLEDGE CONVERSION



Source: Nonaka and Takeuchi, 1995, p. 62.

Socialization (tacit-to-tacit) consists of sharing knowledge in face-to-face, natural, and typically social interactions. It involves arriving at a mutual understanding through the sharing of mental models, brainstorming to come up with new ideas, apprenticeship or mentoring interactions, and so on. Socialization is among the easiest forms of exchanging knowledge because it is what we do instinctively when we gather at the coffee machine or engage in impromptu corridor meetings. The greatest advantage of socialization is also its greatest drawback: because knowledge remains tacit, it is rarely captured, noted, or written down anywhere. It remains in the minds of the original participants. Although socialization is a very effective means of knowledge creation and sharing, it is one of the more limited means. It is also very difficult and time-consuming to disseminate all knowledge using only this mode.

Davenport and Prusak (1998) point out that:

> Tacit, complex knowledge, developed and internalized by the knower over a long period of time, is almost impossible to reproduce in a document or a database. Such knowledge incorporates so much accrued and embedded learning that its rules may be impossible to separate from how an individual acts. (p. 70)

This means that the process of acquiring tacit knowledge is not strictly tied to the use of language but rather to experience and to the ability to transmit and to share it. This idea must not be confused with that of a simple transfer of information because knowledge creation does not take place if we abstract the transfer of information and of experiences from associated emotions and specific contexts in which they are embedded. Socialization consists of sharing experiences through observation, imitation, and practice.

For example, Honda organizes "brainstorming camps" during which detailed discussions take place to solve difficult problems in development projects. These informal meetings are usually held outside the workplace, off-site, where everybody is encouraged to contribute to the discussion and nobody is allowed to refer to the status and qualification of employees involved. The only behavior not admitted during these discussions is simple criticism that is not followed by constructive suggestions. Honda uses brainstorming meetings not only to develop new products but also to improve its managerial systems and its commercial strategies. Brainstorming represents not only occasions for creative dialogue but also a moment when people share experience and, then, tacit knowledge. In this way, they create harmony among themselves, they feel they are a part of the organization, and they feel linked to one another by sharing the same goals. Many other organizations hold similar "Knowledge Days" or "Knowledge Cafés" to encourage this type of tacit-to-tacit knowledge sharing.

The process of *externalization* (tacit-to-explicit) gives a visible form to tacit knowledge and converts it to explicit knowledge. It can be defined as "a quintessential knowledge creation process in that tacit knowledge becomes explicit, taking the shapes of metaphors, analogies, concepts, hypotheses, or models" (Nonaka and Takeuchi, 1995, p. 4). In this mode, individuals are able to articulate the knowledge and know-how and, in some cases, the know-why and

the care-why. Previously tacit knowledge can be written down, taped, drawn, or made tangible or concrete in some manner. An intermediary is often needed at this stage; it is always more difficult when we transform one type of knowledge into another. A knowledge journalist is someone who can interview knowledgeable individuals in order to extract, model, and synthesize in a different way (format, length, level of detail, etc.) and thereby increase its scope (a wider audience can understand and apply this content now).

Once externalized, knowledge is tangible and permanent. It can be shared more easily with others and leveraged throughout the organization. Good principles of content management will need to be brought into play in order to make future decisions about archiving, updating, and retiring externalized knowledge content. It is particularly important not to lose attribution and authorship information when tacit knowledge is made explicit. This involves codifying metadata or information about the content along with the actual content.

For example, Canon decided to design and produce a mini-copier that can be used occasionally for personal use. This new product was very different from expensive industrial copiers, which also engendered high maintenance costs. Canon had to design something that was relatively inexpensive with reasonable maintenance costs. The Canon mini-copier project members, aware that the drum was the most frequent problem, designed a type of drum that would last through a fair amount of usage. They then had to be creative and design a drum that did not cost more than the mini-copier! How did they come up with this innovation? After long discussions, one day the leader of the unit that had to solve this problem brought along some cans of beer, and as the team was brainstorming, someone noted that beer cans had low costs and used the same type of aluminum as copier drums did. The rest, as they say, is history.

The next stage of knowledge conversion in the Nonaka and Takeuchi model is *combination* (explicit-to-explicit), the process of recombining discrete pieces of explicit knowledge into a new form. Some examples would be a synthesis in the form of a review report, a trend analysis, a brief executive summary, or a new database to organize content. No new knowledge is created per se; it is a new combination or representation of existing or already explicit knowledge. In other words, combination occurs when concepts are sorted and systematized in a knowledge system. Some examples would be populating a database when we teach, when we categorize and combine concepts, or when we convert explicit knowledge into a new medium such as a computer-based tutorial. For example, in developing a training course or curriculum for a university course, existing, explicit knowledge would be recombined into a form that better lends itself to teaching and to transferring this content.

Another example is that of Kraft General Foods when it planned and developed a new point-of-sale (POS) system, one that would track not only items sold but also information about the buyers. Its intent was to use this information to plan new models to sell, new combinations of products, of products and services, of services, and so on. The POS system collects and analyzes information and then helps marketing people to plan information-intensive marketing programs called micro-merchandising.

The last conversion process, *internalization* (explicit-to-tacit), occurs through diffusing and embedding newly acquired behavior and newly understood or revised mental models. Internalization is strongly linked to "learning by doing."

Internalization converts or integrates shared and/or individual experiences and knowledge into individual mental models. Once internalized, new knowledge is then used by employees who broaden it, extend it, and reframe it within their own existing tacit knowledge bases. They understand, learn, and buy into the new knowledge, and this is manifested as an observable change; that is, they now do their jobs and tasks differently.

For example, General Electric has developed a system of documenting all customer complaints and inquiries in a database that can be accessed by all its employees. This system allows the employees to find answers to new customers' questions much more quickly because it facilitates the sharing of employees' experiences in problem solving. This system also helps the workers to internalize others' experiences in answering questions and solving problems.

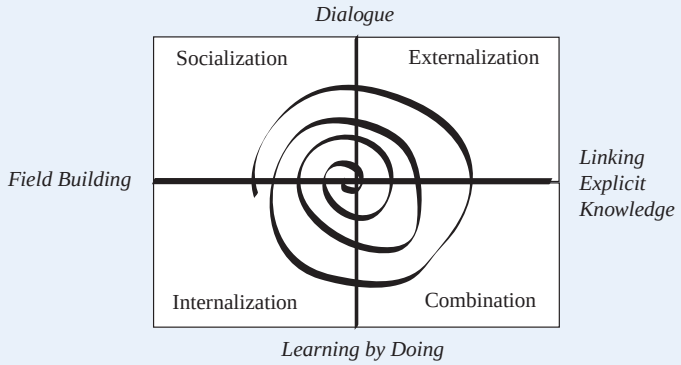
Knowledge, experiences, best practices, lessons learned, and so on go through the conversion processes of socialization, externalization, and combination, but they cannot halt at any one of these stages. Only when knowledge is internalized into individuals' tacit knowledge bases in the form of shared mental models or technical know-how does this knowledge become a valuable asset to the individual, to their community of practice, and to the organization. In order for organizational knowledge creation to take place, however, the entire conversion process has to begin all over again: the tacit knowledge accumulated at the individual level needs to be socialized with other organizational members, thereby starting a new spiral of knowledge creation (Nonaka and Takeuchi, 1995, p. 69). When experiences and information are transferred through observation, imitation, and practice, then we are back in the socialization quadrant. This knowledge is then formalized and converted into explicit knowledge, through use of analogy, metaphor, and model, in the externalization quadrant. This explicit knowledge is then systematized and recombined in the combination quadrant, whereupon it once again becomes part of individuals' experiences. In the internalization quadrant, knowledge has once again become tacit knowledge.

Knowledge Spiral

Knowledge creation is not a sequential process. Rather, it depends on a continuous and dynamic interaction between tacit and explicit knowledge throughout the four quadrants. The knowledge spiral (see Figure 3-2) shows how organizatins articulate, organize and systematize individual tacit knowledge. Organizations produce and develop tools, structures, and models to accumulate and share knowledge. The knowledge spiral is a continuous activity of knowledge flow, sharing, and conversion by individuals, communities, and the organization itself.

The two steps in the knowledge spiral that are the most difficult are those involving a change in the type of knowledge, namely, *externalization*, which converts tacit into explicit knowledge, and *internalization*, which converts

FIGURE 3-2
THE NONAKA AND TAKEUCHI KNOWLEDGE SPIRAL



Source: Nonaka and Takeuchi, 1995, p. 71.

explicit into tacit knowledge. These two steps require a high degree of personal commitment, and they will typically involve mental models, personal beliefs and values, and a process of reinventing yourself, your group, and the organization as a whole. A metaphor is a good way of expressing this "inexpressible" content. For example, a slogan, a story, an analogy, or a symbol of some type can encapsulate complex contextual meanings. A metaphor is often used to convey two ideas in a single phrase and may be defined as "accomplishes in a word or phrase what could otherwise be expressed only in many words, if at all" (Sommer and Weiss, 1995, p. vii). All of these vehicles are good models for representing a consistent, systematic, and logical understanding of content without any contradictions. The better and the more coherent the model, and the better the model fits with existing mental models, the higher the likelihood of successful implementation of a knowledge spiral.

It is possible to structure metaphors, models, and analogies in an organizational KM design. The first principle is to have built-in redundancy to make sure information overlaps. Redundancy will make it easier to articulate content, to share content, and to make use of it. An example is to set up several competing groups, to build in a rotational strategy so that workers do a variety of jobs, and to provide easy access to company information via a single integrated knowledge base.

Knowledge sharing and use occurs through the "knowledge spiral," which, "starting at the individual level and moving up through expanding communities of interaction, . . . crosses sectional, departmental, divisional and organizational boundaries" (Nonaka and Takeuchi, 1995, p. 72). Nonaka and Takeuchi argue that an organization has to promote a facilitating context in which the organizational knowledge-creation process and the individual one can easily take place, acting as a spiral. They describe the following "Enabling Conditions for Organizational Knowledge Creation":

1. *Intention*: an organization's aspiration to its goals (strategy formulation in a business setting).
2. *Autonomy*: condition whereby individuals act autonomously, according to the "minimum critical specification" principle, and are involved in cross-functional self-organized teams.
3. *Fluctuation and Creative Chaos*: condition that stimulates the interaction between the organization and the external environment and/or creates fluctuations and breakdowns by means of creative chaos or strategic equivocality.
4. *Redundancy*: existence of information that goes beyond the immediate operational requirements of organizational members; competing multiple teams on the same issue; and strategic rotation of personnel.
5. *Requisite Variety*: internal diversity to match the variety and complexity of the environment, and to provide everyone in the organization with the fastest access to the broadest variety of necessary information; flat and flexible organizational structure interlinked with effective information networks.

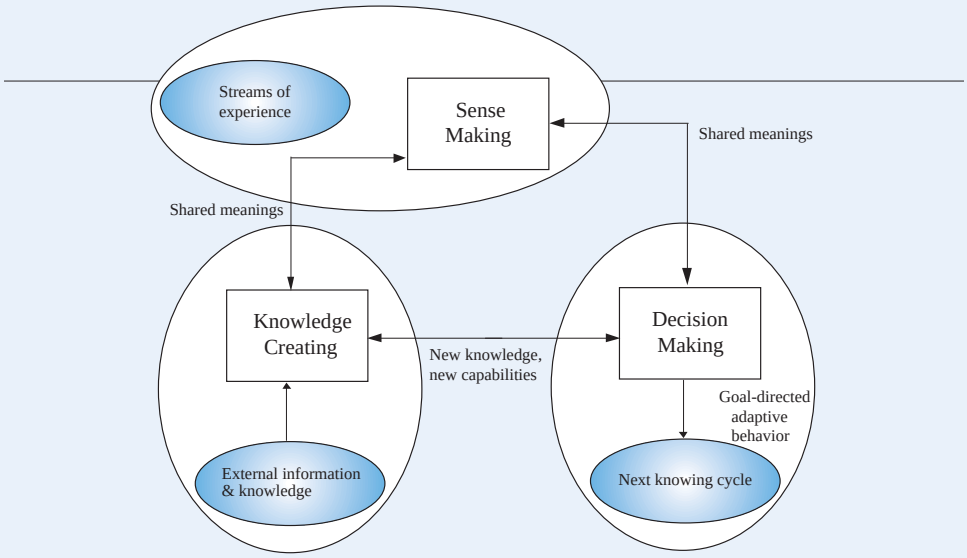
The Nonaka and Takeuchi model has proven to be one of the more robust ones in the field of KM, and it continues to be applied in a variety of settings. One of its greatest strengths is its simplicity—both in terms of understanding the basic tenets of the model and in terms of being able to quickly internalize and apply the KM model. One of its major shortcomings is that, through valid, it does not appear to be sufficient to explain all of the stages involved in managing knowledge. The Nonaka and Takeuchi model focuses on the knowledge transformations between tacit and explicit knowledge, but the model does not address larger issues of how decision making takes place by leveraging both forms of knowledge.

The Choo Sense-making KM Model

Choo (1998) has described a model of knowledge management that stresses sense making (largely based on Weick, 2001), knowledge creation (based on Nonaka and Takeuchi, 1995) and decision making (based on, among other concepts, bounded rationality; see Simon, 1957). The Choo KM model focuses on how information elements are selected and subsequently fed into organizational actions. Organizational action results from the concentration and absorption of information from the external environment into each successive cycle, as illustrated in Figure 3-3. Each phase, sense making, knowledge creation, and decision making, has an outside stimulus or trigger.

In the sense-making stage, one attempts to make sense of the information streaming in from the external environment. Priorities are identified and used to filter the information. Individuals construct common interpretations from the exchange and negotiate information fragments combined with their previous experiences. Weick (2001) proposed a theory of sense making to describe how chaos is transformed into sensible and orderly processes in an organization through the shared interpretation of individuals. *Loosely coupled system* is a term used to describe systems that can be taken apart or revised without

FIGURE 3-3
OVERVIEW OF CHOO'S (1998) KNOWLEDGE MANAGEMENT MODEL



damaging the entire system. A human being is "tightly coupled," whereas the human genome is "loosely coupled." Loose coupling permits adaptation, evolution, and extension. Sense making can be thought of as a loosely coupled system whereby individuals construct their own representation of reality by comparing current with past events.

Weick (2001) proposes that sense making in organizations consists of four integrated processes: (1) ecological change, (2) enactment, (3) selection, and (4) retention.

Ecological change is a change in the environment that is external to the organization—one that disturbs the flow of information to participants—and triggers an ecological change in the organization. Organizational actors enact their environment by attempting to closely examine elements of the environment.

In the *enactment* phase, people try to construct, rearrange, single out, or demolish specific elements of content. Many of the objective features of their environment are made less random and more orderly through the creation of their own constraints or rules. Enactment clarifies the content and issues to be used for the subsequent selection process.

Selection and *retention* are the phases in which individuals attempt to interpret the rationale for the observed and enacted changes by making selections. The retention process in turn furnishes the organization with an organizational memory of successful sense-making experiences. This memory can be reused in the future to interpret new changes and to stabilize individual interpretations into a coherent organizational view of events and actions. These phases

also serve to reduce any uncertainty and ambiguity associated with unclear, poorly defined information.

Knowledge creating may be viewed as the transformation of personal knowledge between individuals through dialogue, discourse, sharing, and storytelling. This phase is directed by a knowledge vision of "as is" (current situation) and "to be" (future, desired state). Knowledge creation widens the spectrum of potential choices in decision making by providing new knowledge and new competencies. The result feeds the decision-making process with innovative strategies that extend the organization's capability to make informed, rational decisions. Choo (1998) draws upon the Nonaka and Takeuchi (1995) model for a theoretical basis of knowledge creation.

Decision making is situated in rational decision-making models that are used to identify and evaluate alternatives by processing the information and knowledge collected to date. There are a wide range of decision-making theories such as the theory of games and economic behavior (e.g., Dixit and Nalebuff, 1991; Bierman and Fernandez, 1993), chaos theory, emergent theory, and complexity theory (e.g., Gleick, 1987; Fisher, 1984; Simon, 1969; Stewart, 1989; Stacey, 1992). There is even a garbage can theory of decision making (e.g., Daft, 1982; Daft and Weick, 1984; Padgett, 1980).

The Garbage Can model (GCM) of organizational decision making was developed in reference to "ambiguous behaviors," that is, explanations or interpretations of behaviors that at least appear to contradict classical theory. The GCM was greatly influenced by the realization that extreme cases of aggregate uncertainty in decision environments would trigger behavioral responses, which, at least from a distance, appear to be "irrational" or at least not in compliance with the total/global rationality of "economic man" (e.g., "act first, think later"). The GCM was originally formulated in the context of the operation of universities and their many interdepartmental communications problems.

The Garbage Can model attempted to expand organizational decision theory into the then uncharted field of organizational anarchy, which is characterized by "problematic preferences," "unclear technology," and "fluid participation." "The theoretical breakthrough of the garbage can model is that it disconnects problems, solutions, and decision makers from each other, unlike traditional decision theory. Specific decisions do not follow an orderly process from problem to solution, but are outcomes of several relatively independent streams of events within the organization" (Daft, 1982, p. 139).

Simon (1957) identified the principle of bounded rationality as a constraint for organizational decision making: "The capacity of the human mind for formulating and for solving complex problems is very small compared with the size of the problems whose solution is required for objectively rational behavior in the real world—or even for a reasonable approximation to such objective rationality" (p. 198).

Simon suggested that persons faced with ambiguous goals and unclear means of linking actions to those goals seek to fulfill short-term subgoals. Subgoals are objectives that the individual believes can be achieved by allocating resources under his or her control. These subgoals are generally not derived from broad policy goals, but rather from experiences, education, the

community, and personal needs. Simon (1976) first proposed bounded rationality theory as a limited or constrained rationality to explain human decision-making behavior. When confronted with a highly complex world, the mind constructs a simple mental model of reality and tries to work within that model. The model may have weaknesses, but the individual will try to behave rationally within the constraints or boundaries of that model.

Individuals can be bound in a decisional process by a number of factors such as:

- Limits in knowledge, skills, habits, and responsiveness.
- Availability of personal information and knowledge.
- Values and norms held by the individual, which may differ from those of the organization.

This theory has long been accepted in organizational and management sciences. Bounded rationality is characterized by individual use of limited information analysis, evaluation and processing, shortcuts and rules of thumb (sometimes called *heuristics*), and "satisficing" behavior, which means it may not be fully optimized but it is good enough. The 80/20 rule (e.g., Clemson, 1984) is a good example of the application of satisficing behavior—for example, in a brainstorming session, when you feel that you may not have fully exhausted all the possibilities but have managed to capture roughly 80% of them. Continuing would result in the law of diminishing returns, so much more effort would be required to incorporate the remaining 20% that generally participants would agree that what they have so far is "good enough" for them to proceed.

One strength of the Choo KM model is the holistic treatment of key KM cycle processes extending to organizational decision making, which is often lacking in other theoretical KM approaches. This makes the Choo model one of the more "realistic" or feasible models of KM, for the model represents organizational actions with "high fidelity." The Choo KM model is particularly well suited to simulations and hypothesis- or scenario-testing applications.

The Wiig Model for Building and Using Knowledge

Wiig (1993) approached his KM model with the following principle: in order for knowledge to be useful and valuable, it must be organized. Knowledge should be organized differently depending on what use will be made of the knowledge. For example, in our own mental models, we tend to store our knowledge and know-how in the form of semantic networks. We can then choose the appropriate perspective based on the cognitive task at hand.

Knowledge organized within a semantic network can be accessed and retrieved using multiple-entry paths that map onto different knowledge tasks to be completed. Some useful dimensions to consider in Wiig's KM model include: (1) completeness, (2) connectedness, (3) congruency, and (4) perspective and purpose.

Completeness addresses the question of how much relevant knowledge is available from a given source. Sources may be human minds or knowledge

bases (i.e., tacit or explicit knowledge). We first need to know that the knowledge is out there. The knowledge may be complete in the sense that all that is available about the subject is there, but if no one knows of its existence and/or availability, they cannot make use of this knowledge.

Connectedness refers to the well-understood and defined relations between the different knowledge objects. Very few knowledge objects are totally disconnected from the others. The more connected a knowledge base is (i.e., the greater the number of interconnections in the semantic network), then the more coherent the content and the greater its value.

A knowledge base is said to possess *congruence* when all the facts, concepts, perspectives, values, judgments, and associative and relational links between the knowledge objects are consistent. There should be no logical inconsistencies, no internal conflicts, and no misunderstandings. Most knowledge content will not meet such ideals where congruency is concerned. However, concept definitions should be consistent, and the knowledge base as a whole needs to be constantly "fine-tuned" to maintain congruency.

Perspective and purpose refer to the phenomenon through which we "know something" but often from a particular point of view or for a specific purpose. We organize much of our knowledge using the dual dimensions of perspective and purpose (e.g., just-in-time knowledge retrieval or just enough—"on-demand" knowledge).

Semantic networks are useful ways of representing different perspectives on the same knowledge content. Figures 3-4 through 3-8 present examples of different perspectives on the same knowledge object ("car") using semantic networks.

FIGURE 3-4

EXAMPLE OF A SEMANTIC NETWORK

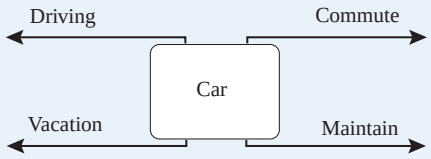


FIGURE 3-5

EXAMPLE OF A SEMANTIC NETWORK—"COMMUTE" VIEW

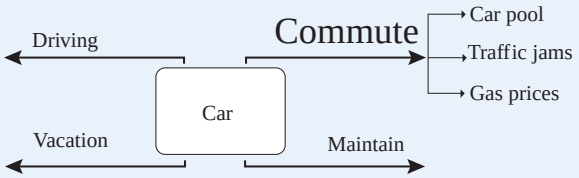


FIGURE 3-6

EXAMPLE OF A SEMANTIC NETWORK—"MAINTAIN" VIEW

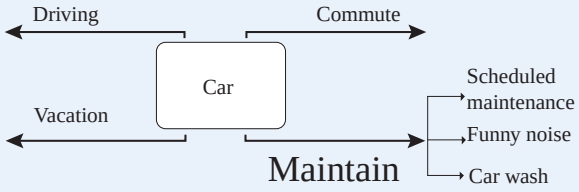


FIGURE 3-7

EXAMPLE OF A SEMANTIC NETWORK—"VACATION" VIEW

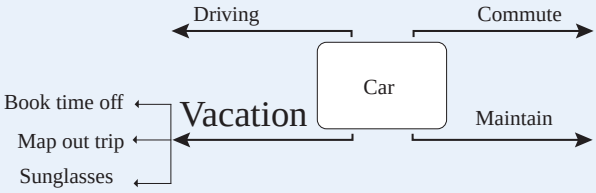
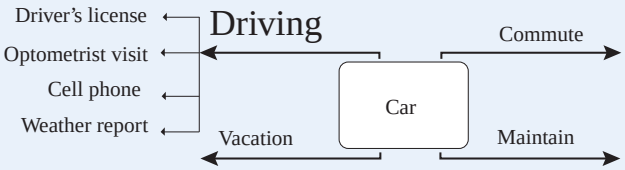


FIGURE 3-8

EXAMPLE OF A SEMANTIC NETWORK—"DRIVING" VIEW



Wiig's KM model goes on to define different levels of internalization of knowledge. Wiig's approach can be seen as a further refinement of Nonaka and Takeuchi's fourth quadrant, internalization. Table 3-1 briefly defines each of these levels. In general, there is a continuum of internalization, starting with the lowest level, the novice, who "does not know he does not know"—who does not have even an awareness that the knowledge exists—and extending to the mastery level where there is a deep understanding not just of the know-what, but the know-how, the know-why, and the care-why (i.e., values, judgments, and motivations for using the knowledge).

Wiig (1993) also defines three forms of knowledge: public knowledge, shared expertise, and personal knowledge. *Public knowledge* is explicit, taught, and routinely shared knowledge that is generally available in the public domain. An example would be a published book or information on a public website.

TABLE 3-1
WIIG KM MODEL—DEGREES OF INTERNALIZATION

Level	Type	Description
1	Novice	Barely aware or not aware of the knowledge and how it can be used.
2	Beginner	Knows that the knowledge exists and where to get it but cannot reason with it.
3	Competent	Knows about the knowledge, can use and reason with the knowledge given external knowledge bases such as documents and people to help.
4	Expert	Knows the knowledge, holds the knowledge in memory, understands where it applies, reasons with it without any outside help.
5	Master	Internalizes the knowledge fully, has a deep understanding with full integration into values, judgments, and consequences of using that knowledge.

Shared expertise is proprietary knowledge assets that are exclusively held by knowledge workers and shared in their work or embedded in technology. This form of knowledge is usually communicated via specialized languages and representations. Although he does not use the term, this knowledge form would be common in communities of practice and among informal networks of like-minded professionals who typically interact and share knowledge in order to improve the practice of their profession. Finally, *personal knowledge* is the least accessible but most complete form of knowledge. It is typically more tacit than explicit and is used nonconsciously in work, play, and daily life.

In addition to the three major *forms* of knowledge (personal, public, and shared), Wiig (1993) defines four *types* of knowledge: factual, conceptual, expectational, and methodological. *Factual knowledge* deals with data and causal chains, measurements, and readings—typically, directly observable and verifiable content. *Conceptual knowledge* involves systems, concepts, and perspectives (e.g., concept of a track record, a bullish market). *Expectational knowledge* concerns judgments, hypotheses, and expectations held by knowers. Examples are intuition, hunches, preferences, and heuristics that we make use of in our decision making. Finally, *methodological knowledge* deals with reasoning, strategies, decision-making methods, and other techniques. Examples would be learning from past mistakes or forecasting based on analyses of trends.

Together, the three forms of knowledge and the four types of knowledge combine to yield a KM matrix that forms the basis of the Wiig KM model. Table 3-2 outlines the Wiig KM model.

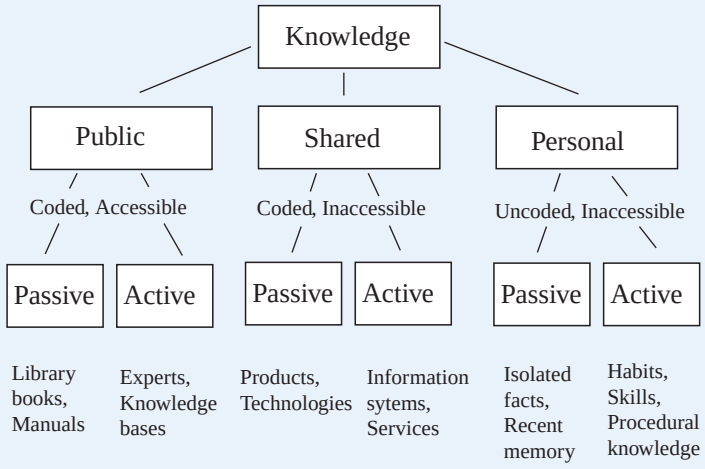
To summarize, Wiig (1993) proposes a hierarchy of knowledge that consists of public, shared, and personal knowledge forms. His hierarchy of knowledge forms is shown in Figure 3-9.

The major strength of the Wiig model is that, despite having been formulated in 1993, the organized approach to categorizing the type of knowledge

TABLE 3-2
THE WIIG KM MATRIX

Form of Knowledge	Type of Knowledge			
	Factual	Conceptual	Expectational	Methodological
Public	Measurement, reading	Stability, balance	When supply exceeds demand, price drops	Look for temperatures outside the norm
Shared	Forecast analysis	"Market is hot"	A little water in the mix is okay	Check for past failures
Personal	The "right" color, texture	Company has a good track record	Hunch that the analyst has it wrong	What is the recent trend?

FIGURE 3-9
WIIG HIERARCHY OF KNOWLEDGE FORMS



to be managed remains a powerful theoretical model of KM. The Wiig KM model is perhaps the most pragmatic of the models in existence today and can easily be integrated into any of the other approaches. This model enables practitioners to adopt a more detailed or refined approach to managing knowledge based on the type of knowledge but goes beyond the simple tacit/explicit dichotomy. Its major shortcoming is the paucity of research and/or practical experience involving the implementation of this model.

The Boisot I-Space KM Model

The Boisot KM model is based on the key concept of an "information good" that differs from a physical asset. Boisot distinguishes information from data by emphasizing that information is what an observer will extract from data as a function of his or her expectations or *prior knowledge*. The effective movement of information goods is largely dependent on senders and receivers sharing the same coding scheme or language. A knowledge good is one that also possesses a context within which it can be interpreted. Effective knowledge sharing requires that senders and receivers share the context as well as the coding scheme.

Boisot (1998) proposes the following two key points:

1. The more easily data can be structured and converted into information, the more diffusible it becomes.
2. The less data that has been so structured requires a shared context for its diffusion, the more diffusible it becomes.

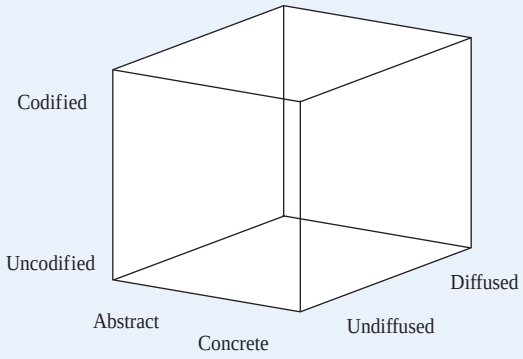
Together, they underpin a simple conceptual framework, the Information Space or I-Space KM model. Data is structured and understood through the processes of codification and abstraction. Codification refers to the creation of content categories—the fewer the number of categories, the more abstract the codification scheme. It is assumed that the well-codified abstract content is much easier to understand and apply than the highly contextual content. Boisot's KM model addresses the tacit form of knowledge by noting that in many situations, the loss of context due to codification may result in the loss of valuable content. This content needs a shared context for its interpretation and implies face-to-face interaction and spatial proximity—which is analogous to socialization in the Nonaka and Takeuchi model (1995).

The I-Space model can be visualized as a three-dimensional cube with the following dimensions (see Figure 3-10): (1) codified—uncodified; (2) abstract—concrete; and (3) diffused—undiffused.

The activities of codification, abstraction, diffusion, absorption, impacting, and scanning all contribute to learning. Where they take place in sequence—and to some extent they must—together they make up the six phases of a social learning cycle (SLC). These activities are described in Table 3-3.

The Boisot model incorporates a theoretical foundation of social learning and serves to link together content, information, and knowledge management in a very effective way. In an approximate sense, the codification dimension is linked to categorization and classification; the abstraction dimension is linked to knowledge creation through analysis and understanding; and the third diffusion dimension is linked to information access and transfer. There is a strong potential to make use of the Boisot I-Space KM model as to map and manage an organization's knowledge assets as the social learning cycle—something that the other KM models do not directly address. However, the Boisot model appears to be somewhat less well known and less accessible, and as a result has not had widespread implementation. More extensive field-testing of this

FIGURE 3-10
THE BOISOT I-SPACE KM MODEL



model would provide feedback regarding its applicability as well as more guidelines on the best way to implement the I-Space approach.

Complex Adaptive System Models of KM

The Intelligent Complex Adaptive Systems (ICAS) KM theory views the organization as an intelligent complex adaptive system—the ICAS model of KM (e.g., Beer, 1981; Bennet and Bennet, 2004). Beer (1981) was a pioneer in the treatment of the organization as a living entity. In his Viable System model (VSM), a set of functions is distinguished, which ensures the viability of any living system and organizations in particular. The VSM is based on the principles of cybernetics or systems science, which make use of communication and control mechanisms to understand, describe, and predict what an autonomous or viable organization will do.

Complex adaptive systems consist of many independent agents that interact with one another locally. Together, their combined behavior gives rise to complex adaptive phenomena. Complex adaptive systems are said to "self-organize" through this form of emergent phenomena. There is no overall authority that is directing how each one of these independent agents should be acting. An overall pattern of complex behavior emerges as a result of all their interactions.

The Viable System model has been applied to a wide range of complex situations, including the modeling of an entire nation (implemented by President Salvador Allende in Chile in 1972). The model enables managers and their consultants to elaborate policies and to develop organizational structures in the clear understanding of the recursions in which they are supposed to operate, and to design regulatory systems within those recursions that obey certain fundamental laws of cybernetics (e.g., Ashby's Law of Requisite Variety). As such, the usefulness of the VSM as a theoretical grounding for KM becomes quite clear.

TABLE 3-3
THE SOCIAL LEARNING CYCLE IN BOISOT'S I-SPACE KM MODEL

Phase	Name	Description
1	Scanning	■ Identifying threats and opportunities in generally available but often fuzzy content. ■ Scanning patterns such as unique or idiosyncratic insights that then become the possession of individuals or small groups. ■ Scanning may be very rapid when the data is well codified and abstract and very slow and random when the data is uncodified and context-specific.
2	Problem solving	■ The process of giving structure and coherence to such insights—that is, codifying them. ■ In this phase they are given a definite shape, and much of the uncertainty initially associated with them is eliminated. ■ Problem solving initiated in the uncodified region of the I-space is often both risky and conflict-laden.
3	Abstraction	■ Generalizing the application of newly codified insights to a wider range of situations. ■ Involves reducing them to their most essential features—that is, conceptualizing them. ■ Problem solving and abstraction often work in tandem.
4	Diffusion	■ Sharing the newly created insights with a target population. ■ The diffusion of well-codified and abstract content to a large population will be technically less problematic than that of content that is uncodified and context-specific. ■ Only a sharing of context by sender and receiver can speed up the diffusion of uncodified data. ■ The probability of a shared context is inversely proportional to population size.
5	Absorption	■ Applying the new codified insights to different situations in a "learning by doing" or a "learning by using" fashion. ■ Over time, such codified insights come to acquire a penumbra of uncodified knowledge that helps to guide their application in particular circumstances.
6	Impacting	■ The embedding of abstract knowledge in concrete practices. ■ The embedding can take place in artifacts, technical or organizational rules, or behavioral practices. ■ Absorption and impact often work in tandem.

Source: Adapted from Boisot, 1998.

A number of researchers have made use of complex adaptive system theories in deriving a theoretical basis for KM. David Snowden (2000), the director of Cynefin, a research group at IBM, describes his approach as follows: "Complex adaptive systems theory is used to create a sense-making model that utilizes self-organizing capabilities of the informal communities and identifies a natural flow model of knowledge creation, disruption and utilization" (p. 1).

Cynefin is a Welsh word with no direct equivalent in English but as a noun can be translated as *habitat* or, as an adjective, as *acquainted* or *familiar*. The Cynefin research center focuses on action research in organizational complexity and is open to individuals and to organizations. One of Snowden's (2000) major points is that the focus on tacit–explicit knowledge conversion (e.g., the Nonaka and Takeuchi model, 1995) that has dominated knowledge management practice since 1995 provides a limited, but useful, set of models and tools. The Cynefin model instead proposes the following key types of knowledge: known, knowable, complex, and chaotic. Snowden's Cynefin model is less concerned about tacit–explicit conversions because of its focus on descriptive self-awareness than on prescriptive organization models.

Bennet and Bennet (2004) also describe a complex adaptive system approach to KM, but the conceptual roots are somewhat different from the Beer VSM. Bennet and Bennet believe strongly that the traditional bureaucracies or popular matrix and flat organizations are not sufficient to provide the cohesiveness, complexity, and selective pressures that ensure the survival of an organization. A different model is proposed, one in which the organization is viewed as a system that is in symbiotic relationship with its environment, that is, "turning the living system metaphor into reality" (p. 25). The Intelligent Complex Adaptive System (ICAS) model is composed of living subsystems that combine, interact, and coevolve to provide the capabilities of an advanced, intelligent technological and sociological adaptive enterprise. Complex adaptive systems are organizations that are composed of a large number of self-organizing components, each of which seeks to maximize its own specific goals but which also operates according to the rules and context of relationships with the other components and the external world.

In an ICAS, the intelligent components consist of people who are empowered to self-organize but who remain part of the overall corporate hierarchy. The challenge is to take advantage of the strengths of people while getting them to cooperate and collaborate to leverage knowledge and to maintain a sense of unity of purpose. Organizations take from the environment, transform those inputs into higher-value outputs, and provide them to customers and stakeholders. Organizational intelligence becomes a form of competitive intelligence that helps facilitate innovation, learning, adaptation, and quick responses to new unanticipated situations. Organizations solve problems by creating options, and they use internal and external resources to add value above and beyond the value of the initial inputs. They must also do this in an effective and efficient manner. Knowledge becomes the most valuable of these resources because it is critical in taking effective action in a variety of uncertain situations. This is often used to distinguish information management (predictable reactions to known and anticipated situations) and knowledge

management (use of existing or new reactions to unanticipated situations). Knowledge will typically consist of experience, judgment, insight, context, and the "right" information. Understanding and meaning become prerequisites to taking effective action, and they create value by ensuring the survival and growth of the organization.

The key processes in the ICAS KM model can be summarized as:

1. Understanding.
2. Creating new ideas.
3. Solving problems.
4. Making decisions.
5. Taking actions to achieve desired results.

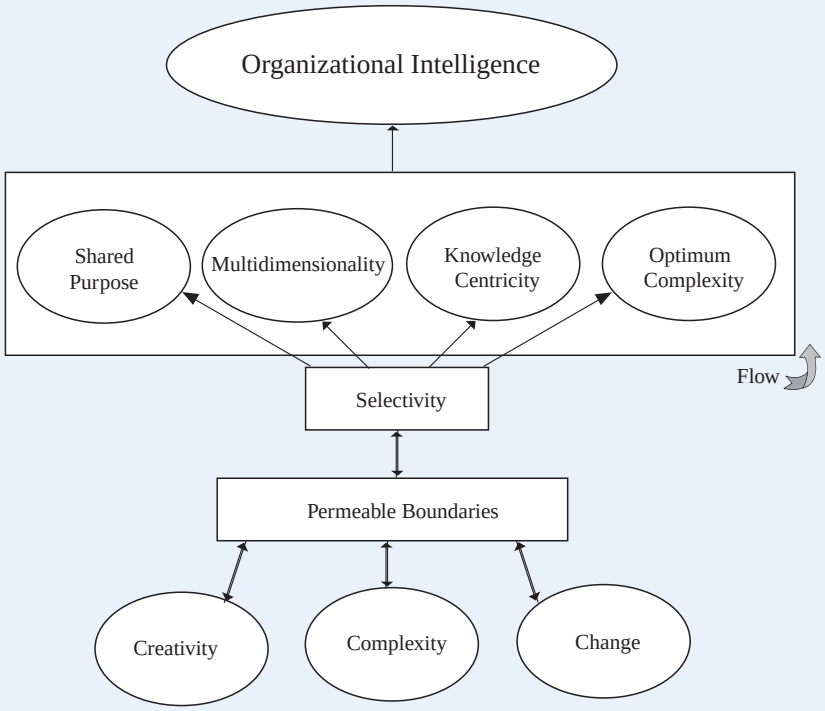
Since only people can make decisions and take actions, this model emphasizes the individual knowledge worker and his or her competency, capacity, learning, and so on. These knowledge assets are leveraged through multiple networks (communities of practice, for example) to make available the knowledge, experience, and insights of others. This type of tacit knowledge is leveraged through dynamic networks and makes a broader "highway" available to connect data, information, and people through virtual communities and knowledge repositories.

To survive and successfully compete, an organization also requires eight emergent characteristics, according to this model: (1) organizational intelligence, (2) shared purpose, (3) selectivity, (4) optimum complexity, (5) permeable boundaries, (6) knowledge centricity, (7) flow, and (8) multidimensionality.

An emergent characteristic is the result of nonlinear interactions, synergistic interactions, and self-organizing systems. The ICAS KM model follows along the lines of the other approaches in that it is connectionist and holistic in nature. The emergent ICAS characteristics are outlined in Figure 3-11. These emergent properties serve to endow the organization with the internal capability to deal with the future unanticipated environments yet to be encountered.

Organizational intelligence refers to the capacity of the firm to innovate, acquire knowledge, and apply that knowledge to relevant situations. In the ICAS model, this property refers to the organization's ability to perceive, interpret, and respond to its environment in such a way as to meet its goals and satisfy its stakeholders. This is very similar to the approach taken in the Choo sense-making model. Unity and a shared purpose represent the organization's ability to integrate and mobilize its resources through a continuous, two-way communication with its large number of relatively independent subsystems, much like the VSM. Optimum complexity represents the right balance between internal complexity (i.e., number of different relevant organizational states) to deal with the external environment without losing sight of the overall goal and the notion of a firm that despite its size does not lose its common identity. The major difference here with VSM is the notion of relevant states—not all possible states. This selectivity is in keeping with the notion of evaluating content in KM as opposed to a more exhaustive warehousing approach.

FIGURE 3-11
OVERVIEW OF THE ICAS MODEL



The process of selectivity consists of filtering incoming information from the outside world. Good filtering requires broad knowledge of the organization, specific knowledge of the customer, and a strong understanding of the firm's strategic goals. Knowledge centricity refers to the aggregation of relevant information from self-organization, collaboration, and strategic alignment. Flow enables knowledge centricity and facilitates the connections and continuity needed to maintain unity and give coherence to organizational intelligence. Permeable boundaries are essential if ideas are to be exchanged and built upon. Finally, multidimensionality represents organizational flexibility that ensures that knowledge workers have the competencies, perspectives, and cognitive ability to address issues and solve problems. This is sometimes seen as being analogous to developing human instinct.

Each of these characteristics must emerge from the nature of the organization. They cannot be designed by managerial decree; they can only be nurtured, guided, and helped along. In summary, there are four major ways in which the ICAS model describes organizational knowledge management: (1) creativity, (2) problem solving, (3) decision making, and (4) implementation.

Creativity is the generation of new ideas, perspectives, understanding, concepts, and methods to help solve problems, build products, offer services, and so on. Individuals, teams, networks, or virtual communities are useful in

problem solving, and they take the outputs of the creative processes as their inputs. *Decision making* is the selection of one or more alternatives generated during the problem-solving process, and *implementation* is the carrying out of the selected alternative(s) in order to obtain the desired results.

Complex KM models based on adaptive system theory show both an evolution and a return to systems thinking roots in the KM world. All of the models presented in this chapter are relevant, and each offers valuable theoretical foundations in understanding knowledge management in today's organizations. What they all share is a connectionist and holistic approach to better understand the nature of knowledge as a complex adaptive system that includes knowers, the organizational environment, and the "bloodstream" of organizations—the knowledge-sharing networks.

STRATEGIC IMPLICATIONS OF KM MODELS

Models help us to put the disparate pieces of a puzzle together in a way that leads to a deeper understanding of both the pieces and the ensemble they make up. Models supplement the concept analysis approach outlined in the first chapter in order to take our understanding to a deeper level. KM models are still fairly new to the practice or business of knowledge management, and yet they represent the way ahead. A coherent model of knowledge-driven processes is crucial to the KM initiatives' ability to address strategic business goals, even if only partially. This is not to say that KM is a silver bullet or that it will solve all organizational problems. Those areas of knowledge-intensive work and intellectual capital development that are amenable to KM processes, on the other hand, require a solid foundation of understanding of what KM is, what the key KM cycle processes are, and how these fit in to a model that enables us to interpret, to establish cause and effect, and to successfully implement knowledge management solutions.

PRACTICAL IMPLICATIONS OF KM MODELS

For many years now, KM practitioners have been practicing "KM on the fly." Many valuable empirical lessons and best practices have been garnered through experience with many diverse organizations. However, KM needs to be grounded in more robust, sound theoretical foundations—something more than "it worked well last time so . . . ." The KM models' key role is to ensure a certain level of completeness or depth in the practice of KM: a means of ensuring that all critical factors have been addressed. The second practical benefit of a model-driven KM approach is that models not only enable a better description of what is happening but also help provide a better prescription for meeting organizational goals. KM models help to explain what is happening now, and they provide us with a valid blueprint or road map for getting organizations where they want to be with their knowledge management efforts.