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KM: A Self-Regulating Social System

Useful knowledge is not a "thing" that can be managed like other assets, as a self-contained entity. Nor does it just float free in cyberspace. . . . Only when information is used by people does it become knowledge.
(Wenger, McDermott, and Snyder 2002)

Businesses and government departments and agencies spend billions of dollars each year for purchases of information and communications technology and knowledge management (KM) equipment, materials, and consulting. One information and technology services executive estimated in 2005 that for the public and private sectors combined, IT and KM purchases together made up an annual U.S. market in excess of $12 billion. Much of this money is spent on the technology parts and pieces that together produce *knowledge management systems* (KMS). But technical mechanisms are only part of the story; KM is more than technology. It is a social system in which the needs and dictates of the people for whom KM is designed remain paramount.

The phrase *social system* is used in this chapter to collectively refer to a complex set of interacting parts and pieces that together make a knowledge management system. Some authors have referred to these same components as *conditions for success,* as *the fundamental components of KM,* and by other labels. Alluding to the pieces as integral components in a system helps prospective users of KM understand that it is not just another monolithic management theory, but is instead a set of tools, procedures, and activities, held together by a unifying philosophy. That philosophy is *sharing knowledge for public sector innovation.* Also, the KM systems that are employed in government departments and agencies are not composed of a predetermined set of static rules and regulations. Rather, they represent a dynamic evolving transformation process, one that has still to achieve its full potential.

Chapter Objectives

This chapter serves as an overview of the next six chapters in the book. The underlying principle is a model of the social system I refer to as the *total knowledge management system.* The salient objectives for this chapter include the following:

- To initiate the process of looking at knowledge management not as an unrelated collection of unrelated technologies and organizational policies and procedures, but as an integrated system composed of five essential subsystems.
- To introduce readers to the proposition that knowledge management systems have the power to transform government agencies into learning organizations.
- To help readers visualize the information technology component of KM as being more a key subsystem of tools and process for data transformation, and less an end in itself.
- To help readers see how the well-known set of steps in the knowledge creation/combination process relate to and interact with the remaining components of the total KM system.
- To review for those not familiar with the tools and processes of KM the several key activities that contribute to and result from changing attitudes of workers from knowledge hoarding to knowledge sharing.
- To reinforce in readers' memories the importance of developing a supportive and collaborative culture for successful implementation of KM.
- To introduce readers to the concepts of organizational learning and to show how the technical and social processes of KM contribute to achieving the goal of transformation from a bureaucracy to a learning organization.
- To introduce readers to the proposition that successful implementation of a knowledge management system may generate a significant contribution to the use of generative learning along with the more commonly encountered adaptive learning.

Organizations Are Not Machines

It is important to note that the use of the terms *mechanisms* and *systems* in this discussion is in no way intended to imply that organizations are like machines, regardless of how well-oiled and smoothly functioning they might be. Such a conclusion runs counter to the basic tenets of knowledge management. Rather, organizations such as government agencies are living *social organisms*—entities that grow, evolve, and eventually die. The science of

complexity theory extends this concept to suggest that organizations such as government agencies and departments are actually self-regulating and self-organizing organisms. As such, they are similar to ecosystems in which the living components—in this case, human beings—learn and evolve from contact with forces present in their internal and external environments. A primary objective of knowledge management is to create an organizational environment in which the collection and transfer of knowledge insure that, as much as is possible, organizations change in ways that better meet the needs and expectations of their relevant stakeholders.

As it is used in this discussion, the term *mechanism* is defined as *a collection of moving parts that work together to perform a complete function or purpose.* Such a collection of working parts is typically referred to as a *system.* A system has been defined as being composed of a set of interrelated components such that neither the properties of the component nor those of the system itself can be altered without fundamentally changing the system (National Defense University 2005). Systems can be any of several different types, from simple mechanical systems with predetermined motions of levers and pulleys such as an automobile engine, to complex social organizations, such as government agencies, that are established to accomplish specific objectives. Research on the *systems concept* focuses on the interactive processes between system components and subsystems, and the interactions of the system, its components, and its subsystems with its environment.

The term *mechanism* also refers to the structure or arrangement of the parts of a system *or mechanical device.* In this sense, the word is used as a metaphor for the architecture of the social system (that is, the enterprise architecture). The architecture of the social system defines the way people, technology, and knowledge resources are organized to form a knowledge management system. Government departments and agencies use KM systems, either as a whole or in their various parts, as components in the larger system of management practices employed to achieve agency goals and objectives.

The Knowledge Management Systems Model

This chapter proceeds upon the premise that KM is a dynamic, evolving set of interacting existing and new tools, practices, and procedures that employ technology and social interactions in the delivery of public services. The model of the knowledge management systems displayed in Figure 2.1 illustrates how the combined concepts, mechanisms, and processes of a KM system interact to shape an organizational culture that values knowledge creation and knowledge sharing. Together, these mechanisms, process, and subsystems may be considered a total knowledge management system.

Figure 2.1 **Fundamental Mechanisms, Processes, and Payoffs in a Public-Sector Knowledge Management System**

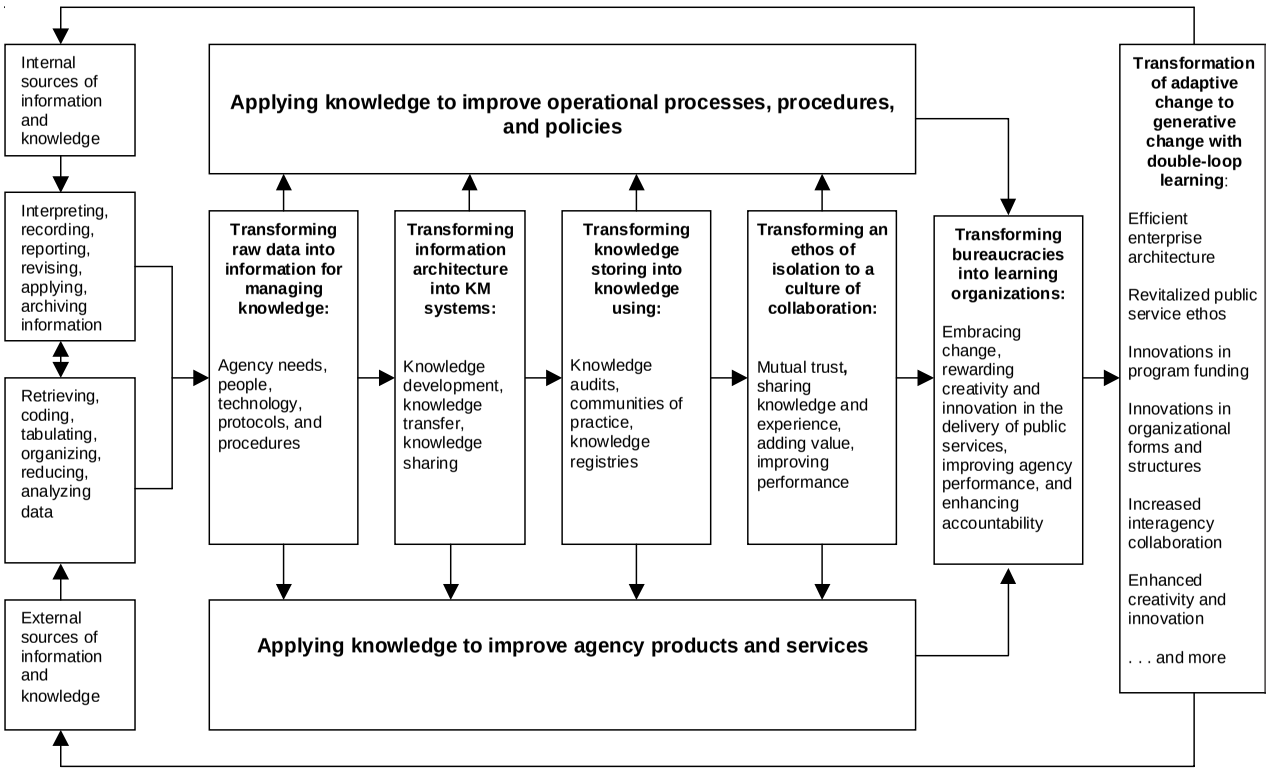
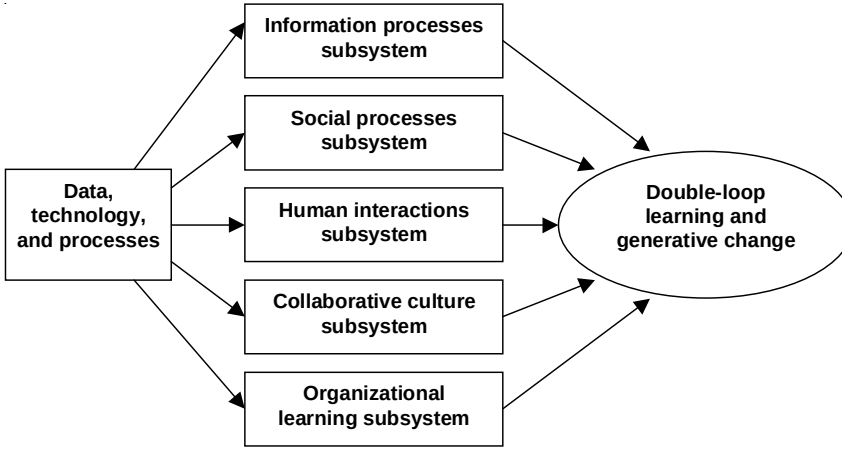


Figure 2.2 **How KM Subsystems Interact to Produce Learning and Generative Change**



This model of the KM system should be viewed as a living, dynamic system in which new, innovative tools, goals, approaches, and other elements are being added almost daily. Parts of what was new in KM one year are likely to be supplanted or replaced in the next. As KM concepts continue to evolve and change their focus, they are eventually replaced by improved ideas and processes as our knowledge about knowledge also grows. KM is, indeed, an evolving discipline.

1. Many authors researching and writing in the KM field of inquiry seem to have their particular favorite lists of basic elements for knowledge management. However, exposure to a wide variety of government KM applications and a broad reading in the KM literature suggest that five chief subsystems—each with a varying set of parts or components—come together to make up the fundamental building blocks of KM. Moreover, there seems to be significant agreement that a chief outcome of successful implementation of a KM system is the type of agency transformation mandated by recent presidential initiatives. These five subsystems and the transformation outcome incorporated into this model represent a realistic consensus of views on what should be included in the still-evolving KM discipline. Figure 2.2 illustrates the way in which the five KM subsystems collectively contribute to the payoffs occurring from transforming adaptive change to change that is generative.

2. An information technology–based *information processes subsystem* of hardware and software tools facilitates the transformation of data to infor-

mation, and of information to knowledge. This subsystem also supports the ultimate goal of knowledge eventually enabling individual and organizational learning. The processes in this subsystem revolve around designing and investing in the agency-wide enterprise technology architecture needed for supporting an agency-wide knowledge management system. Together, these are the fundamental building blocks of all KM systems: information needs of the agency, its people, its technology, its processes, and its culture.

3. In a *social processes subsystem*, knowledge sharing and distribution are enabled and promoted. This subsystem is a product of the agency's investment in the technology. However, its more important elements include the social components of its operations. These ultimately result in formation of the informal, self-regulating communities of practice that form the heart of the next subsystem. The chief components of this subsystem reflect earlier thinking on the cycle of learning. The four social processes include socialization, internalization, combining, and externalizing (or sharing).

4. A *human interactions subsystem* makes it possible to support and value knowledge creating, collecting, and sharing. With information and communications technology serving as the underlying support platform, three key actions illustrate the types of mechanisms and processes that take place at this stage of the system: knowledge audits, communities of practice, and knowledge registries; many others could be included.

5. A *collaborative culture subsystem* includes all the KM applications designed to improve the products and services provided by an agency. It also includes knowledge applications designed to improve the agency's internal processes, procedures, and policies, as well as its service delivery mechanisms. The product and delivery applications are shaped by the agency's enterprise architecture, people, mission, and culture. The product of this subsystem is the sought-after *culture of collaboration* that nurtures employee willingness to share their knowledge for the good of the organization. This, in turn, facilitates the creation of new knowledge that, in application, adds even greater value to the agency's delivered services. This subsystem has as one of its fundamental goals the transformation of the often-encountered ethos of self-before-others into a culture of collaboration and unselfish service before self. It is, then, the essence of the culture change that is needed for successful implementation of KM into a public organization.

6. An *organizational learning subsystem* makes it possible for a government agency or department to transform itself from the traditional hierarchical, bureaucratic structure thought for decades to be the public service ideal, to become an organization that learns from its mistakes and successes. Learning organizations can exist only when experience and knowledge are consistently and extensively shared, valued, and promoted. Thus, they are products

of an organizational culture in which hierarchical, bureaucratic structures are transformed into flat, team-driven, collaborative organizations of empowered individuals. A consistent problem with stopping the system at this point is that the change processes that agencies adopt are reactive rather than proactive. Reactive change is adaptive change, whereas proactive change is generative change.

7. This is the apex of the total knowledge management system idea: an organizational culture in which adaptive change is transformed into generative change. In the generative organization, creativity and innovation are not only tolerated, they are celebrated. They are the products of the interchange that occurs as a result of the interaction among these salient KMS subsystems. This culture change is the benefit received when agency leaders support and reward innovation and creativity, regardless of the outcome of that innovation. Adaptive change happens when organizations evolve to the point where managers and staff search out ways to react to changes in their environment. However, generative change is the organizational characteristic that makes it possible for agencies to make changes to their operational systems before problems occur; it produces and promotes the continuous improvement process, and enables the management transformation process that results in innovative solutions to agency problems.

The Information Processes Subsystem

The need to manage large amounts of data, to transform that data into the type and amount of information needed by decision makers, is one of the earliest drivers of the knowledge management discipline. One thing that government does well and does often is to collect data. This data ranges from the Census of Population, which takes place every ten years, to the Census of Industry, which occurs every five years, to the annual collection of agricultural production, trade statistics, and tax receipts—and much more in between. All this raw data is meaningless until it is coded, transformed, shaped into graphic communications forms, evaluated and interpreted, recorded and published, and eventually filed for future reference—only then does it become information. This information is one kind of input needed by a knowledge management system. It remains processed data until it is put to some use by people somewhere. Then it becomes knowledge, the kind known as *explicit knowledge.* Explicit knowledge is what is found in reports and manuals, films, radio scripts, charts and graphs, and speeches and books.

The second type of knowledge is fundamentally different from explicit knowledge. Called *tacit knowledge*, it often skips the information stage because it is knowledge that exists in the minds of human beings. It is knowl-

edge gained from experience, from doing and acting. It is difficult if not impossible to convert tacit knowledge to explicit knowledge. A written report of an event is not the same thing as being there or experiencing the activity by taking part in its production or delivery.

Two of the key questions underlying the "hard" or technology-driven side of KM are, How do you convert raw data into information? And, once that the data are information, how is that information converted into usable knowledge? These are questions that revolve around the concepts of knowledge creation and conversion. Knowledge creation occurs when people use what they know or have learned to perform what for them is a creative or innovative task. For example, electricians learn to handle electricity from what happens when they try to handle a live or "hot" line. The shock they receive is the lesson; they then know that to avoid a shock, one must turn off a breaker or switch so that the line is no longer "hot." Once learned, such knowledge is seldom forgotten. Clearly, knowledge is created by human experience, which can be from doing; or, it can be learned by reading about a phenomenon, by watching a film or video, or from listening to a narrative—someone telling a story about their experience.

The Social Processes Subsystem

In the social processes subsystem, knowledge collection, distribution, and sharing are enabled and promoted. This subsystem is a product of the agency's investment in the technology, of course. However, the more important elements are the social processes that put technology to work.

The four social processes are *socialization*, *internalization*, *combining*, and *externalizing* (Nonaka and Takeuchi 1995). These ultimately result in formation of the informal, self-regulating *communities of practice* that form the heart of the human interactions subsystem. These components have evolved from earlier thinking on learning theory and the learning or knowledge cycle, including the work of Kurt Lewin, John Dewey, and Jean Piaget (Blessing and Wallace 2000).

Converting Information into Knowledge

Information does not become knowledge until it is used by someone. The conversion of information into knowledge entails a vastly different process than converting data into information. Although IT tools may be used in the process, they are secondary to the rule of human interaction. Nonaka and Takeuchi (1995) explained this as a process of converting tacit knowledge into explicit knowledge, and vice versa. They identified four modes

of knowledge conversion. Each of the conversion processes has been given a label. For example, converting tacit knowledge into more explicit knowledge occurs through a process of *socialization.* Converting tacit knowledge to explicit knowledge occurs in a process of *internalization*—the process that transforms explicit knowledge into tacit knowledge. When new explicit knowledge is combined with existing explicit knowledge, a process of *combination* is involved.

Tacit vs. Explicit Knowledge

The distinctions between the two types of knowledge found in organizations—explicit and tacit—have been thoroughly critiqued by the authors of many papers and books that touch upon KM, beginning with the authors some consider to be KM's intellectual pioneers—Michael Polanyi in 1958, Ikujiro Nonaka and Hirotaka Takeuchi in 1995, and Karl-Erik Svieby in 1997, for example (Saint-Onge and Wallace 2003, Ash and Cohendet, 2004). Therefore, that distinction is only briefly reviewed here. The foundation stones of the discipline were set when the distinction was made between knowledge that is tacit (implicit) and knowledge that is explicit (Polanyi 1958). Table 2.1 compares the two forms of knowledge on several key characteristics.

Tacit knowledge exists in the minds of the holders, who for our purposes are the men and women in government with the skills and understanding that can come only with education and years of experience in public service. Tacit knowledge is difficult to express in its full form; the type of knowledge learned on the job cannot be written in books or learned at the computer.

Some people believe that tacit knowledge is inexpressible (Tiwana 2001). Explicit knowledge, on the other hand, represents knowledge that can be stored in books, pamphlets, manuals, drawings, and databases and on hard drives or computer discs. Because of this characteristic, explicit knowledge is considered as knowledge that can be codified—that is, knowledge that can be written in books and/or recorded in other media.

A list of the tools used in knowledge management systems includes the mechanisms and technology of collecting, storing, retrieving, organizing, transforming, and distributing knowledge. It is generally understood that these tools are what make it possible to process explicit knowledge, but that they are less appropriate for managing implicit knowledge.

Data conversion or transformation is both a mechanical and a mental process. Modern desktop and laptop computers and software programs are capable of quietly processing and organizing reams of data in a very short period. Of course, they have to be told what to do, how to go about the organizing, and in what form to present the results of their processing. That is a technical task relatively easily

Table 2.1

A Comparison of Tacit and Explicit Knowledge

Characteristic	Tacit knowledge	Explicit knowledge
Nature	Personal, context specific	May be codified, written
Formality	Hard to formalize, codify, record, code, or express	Is formalized through the process of explanation or interpretation of tacit knowledge
Location	In the minds of workers	Manuals, reports, drawings, databases, e-communications, charts, films, etc.
Conversion process	Conversion to explicit knowledge occurs in social processes, including externalization in stories, etc.	Converted back to tacit knowledge through personal understanding, absorption, or remembering
IT influence	Difficult for IT to play a role in tacit knowledge; sharing is personal and takes place in social situations	Fully supportable by IT and ICT
Medium	Needs a rich communications environment, a culture of sharing and trust	Can be transferred through normal communications media

Source: Tiwana 2001, 39.

learned by humans. Thus, the transformation of raw data into information occurs when humans impose a structure on the data according to an organizing structure that has meaning for those persons who will use the data.

The Human Interactions Subsystem

One way to approach the task of understanding the basic components of knowledge is to begin by reviewing some of the key activities or beliefs that are encapsulated in most if not all KM systems. Each of the activities helps facilitate the development of an organizational culture in which knowledge is collected, valued, and transferred. Among the more important activities are knowledge audits, communities of practice, and knowledge registries.

Beginning with a Knowledge Audit

The information audit is one of the first steps to be taken when establishing a knowledge management system. Knowledge audits have been recognized

since the early 1990s as a way of identifying and cataloging an organization's information needs and knowledge assets, and determining how closely these needs and assets are aligned (Griffiths 2005). Government organizations at all levels need to conduct information audits regularly so that they know what they know. In addition, agencies need to have an understanding of the knowledge existing in the organization and of the context in which that knowledge and experience must be applied in the conduct of the agency's business. Closing the gaps between knowledge needs and information available helps the organization accomplish its program objectives.

Peter Griffiths (2005), head of the information services unit at the UK Home Office, has suggested that the audit also be used in the creation and publication of such new information items as:

- Descriptive documents spelling out how information is currently managed in an agency.
- Formal statements of information requirements by an organization or its component units.
- Statements of the availability of information resources within the agency—as well as any restrictions on use, security, licensing, etc.
- Analyses of the differences between needs and availability statements.
- Recommendations for provision of additional resources or changes in information-management practices, technology use, or information sources.
- Case data for supporting recommended changes.

The information audit achieves these tasks by first looking at the organization's information needs, then conducting an inventory of the information assets of the organization. The capstone process involves determining—only by working hand in glove with the organization's leadership—how closely the two elements of the knowledge management system align.

The skills and resources required for conducting a meaningful information audit are dauntingly large for many government agencies. The audit team must ensure that the audit focuses explicitly on the needs of the sponsoring organization and have the full support of senior-level management to smooth over operating-level objections that are likely to arise over the time and effort required to complete an audit. The team must possess the skills and knowledge to be able to make such meaningful tasks and interpretations as:

- Establishing how the present and future roles of information and knowledge are needed for adding value to the organization, agency, or department.

- Determining how knowledge supports the organization's present and future objectives, either directly or by helping workers who support operations designed to achieve those objectives.
- Assessing the scope and identifying the location and source of the information required by the organization, while at the same time relating that information to the knowledge that already exists in the organization, or that which is in other ways generated internally.

Growing a Community of Practice

Communities of practice have become one of the principle mechanisms driving the transformation of data into information and information into knowledge. Communities are also what make a culture of knowledge sharing the characteristic that helps define learning organizations. Communities of practice are groups of people with like interests, knowledge, concerns, skills, and training who come together in some social situation, such as an informal meeting or conference, to share what they know and what they do not know. The purpose of such sessions is to learn from each other. The sharing of knowledge helps all members of the community to learn, including the individual doing the sharing. Learning by sharing is similar to learning by doing; it may not result in the tacit knowledge of a skill that is forged through years or decades on a job, but it does help avoid repeating the learning failures that may have occurred in the past (Ash and Cohendet 2004).

A community of practice may be defined as a tightly knit group of members of an organization who are engaged in a shared practice (Wasko and Faraj 2005). The members know each other and work together. They usually meet face to face, and are continually engaged in negotiating, communicating, and coordinating with each other directly. Interacting in this way, communities of practice are able to perform the following functions for organizations (Snyder and Briggs 2003):

- They husband and develop the knowledge assets of organizations.
- They operate as "social learning systems," where practitioners connect to solve problems, share ideas, set standards, and develop informal relationships with peers and stakeholders.
- They complement the information-transmitting activities of formal units in organizations that have the primary purpose of delivering a product or service.
- They bridge formal organizational boundaries, thus increasing the collective store of knowledge, skills, and professional trust and reciprocity.

In some agencies *communities of interest* may be used as a synonym for communities of practice. However, although their fundamental goals are similar, their functions and organizational benefits are structurally and operationally quite different. A community of interest is typically a formal grouping, such as a work team or a department or unit, with a vested interest in the delivery of the service, while a community of practice is more commonly an informal group of persons, often widely dispersed geographically, who share a passionate interest in the topic, product, or service.

Although the procedures and processes involved in moving a community of interest to a community of practice (CoP) are discussed in detail in a later chapter, before continuing it is important to have an understanding of how the CoP can build on and utilize the information technology tools deployed in conducting an information audit and building a knowledge registry. This can be achieved by examining a case history of an early CoP formed in the Federal Highway Administration.

Mike Burk is a knowledge management professional at the U.S. Department of Transportation's Highway Administration (FHWA). As the administration's senior knowledge officer, he directed creation of one of the earliest and most often cited "best practices" models of a community of practice in the federal government (Snyder and Briggs 2003).

The FHWA recognized that an informal community of practice was forming with federal, state, and local highway and safety personnel using the Internet to share knowledge on the use of highway "rumble strips." Rumble strips are the serrated bands installed along the outer edge of highway paving that produce a loud rumble noise when driven over. They are designed to let drivers know they are about to drive off the highway, and are particularly useful for alerting drowsy drivers before they have an accident. The knowledge-sharing activities of this CoP are supported by the Web site http://safety.fhwa.dot.gov/roadway_dept/rumble/index. The site was created and maintained in a collaborative effort by the knowledge manager for the FHWA's New York division, a FHWA marketing specialist, several highway safety engineers, and an outside consultant. Anyone with an interest in highway construction and safety can access the site for reports from states that have installed the devices, descriptions of the various types available, word on some of their drawbacks, and a short video on the various types of strips and how they are installed.

Forming and Maintaining a Knowledge Registry

Although it is commonly recognized that knowledge resides in the minds of individuals, knowledge sharing takes place in the context of two or more indi-

viduals in social settings. These can be as small as two people chatting over a cup of coffee, or as large as a community of professionals with hundreds and even thousands of members. More than one community can exist in an agency or subunit. When personal contact is impossible, or when a knowledge seeker does not know where in the organization knowledge is stored or who holds the needed knowledge, a place where it is possible to quickly look up the source is needed. In practice, these locations are referred to as "virtual yellow pages," or by their more formal name, knowledge registries.

The process-based mission assurance (PBMA) knowledge management system was formed in 1998 by NASA's Office of Safety and Mission Assurance to enable senior managers, program executives, and program and project managers to find critical managerial, scientific, engineering, and technical skills to support NASA's mission. One of the ways that the PBMA knowledge management system makes this possible is through development and regular maintenance of its knowledge registry. The registry serves as a knowledge locator, identifying where in the agency to find expertise on safety and mission assurance and technology. Other tools are also used in the application of knowledge management, as are tools and processes not necessarily considered to be KM components. More will be discussed later.

The PBMA unit of NASA reported in 2005 that it served more than 340 separate communities of practice; those communities, in turn, served the unit's more than 7,200 staff members and their outside stakeholders.

A Collaborative Culture Subsystem

Every organization has its own organizational culture and climate (Schein 1992, McNabb and Sepic 1995). The role of the culture of an organization has also achieved key importance in the literature of knowledge management. Knowledge accumulation and transfer occurs best at the point of contact where an organization's communities of practice interact with—and strive to interpret—the work environment. Contact in this instance does not have to be face-to-face. Rather, it can and does occur more often today as informal messaging via electronic communication processes. Contact may take place in formal work settings and informal social sessions. Formal settings—such as meetings and conferences—produce the type of knowledge that is typically explicit and nonthreatening to the participants. Typically, it is of lesser value than the contact that occurs in informal settings.

Sharing of knowledge in the formal, organizational structure way is invaluable, of course, but it is often not the knowledge that results in innovative solutions to thorny, often nagging, problems of practice. Informal situations, however, are often the milieus where new insights and creative

problem solving occur. It is in informal settings, where people know and respect each other for their individual intellectual abilities and contributions, that creativity and innovation thrive. Accordingly,

> [T]he process of creating, accumulating, and distributing knowledge . . . is achieved through the functioning of informal groups of people, or autonomous "communities" acting under conditions of voluntary exchange and respect of the social norms that are defined within each group. (Ash and Cohendet 2004, 9)

None of this sharing can take place if the organizational culture does not support the mechanisms of knowledge management. To be successful, a senior-level administrator must champion the activity both within the organization and without. Different performance measurements apply, particularly when comparing public-sector KM initiatives with the same tools and practices applied in the private sector. In government, the profit motive is usually not a limiting factor, whereas earnings and profits are salient concerns in business. The willingness to go to bat for the people and programs during budget negotiations, as well as a vociferously supportive attitude of senior management, help shape an organization's internal environment. They are also among the chief factors that make successful adoption of KM possible.

It is impossible to overemphasize the importance of a positive, collaborative culture. People who share work interests or practices are held together by a common bond of purpose and skills and typically have the same desire for successfully accomplishing the organization's mission. Their skills range from learning by doing, leading relevant conversations, identifying best practices and exemplars, managing arguments and disagreements, and providing mutual support and recognition for participants.

Implementing a knowledge management system or any of its components begins with preparing the organizational culture to accept the KM way of sharing information. This does not mean designing and carrying out a costly and often ineffective program to completely transform the culture of the organization. Federal Highway Administration chief knowledge officer Mike Burk explained what he found to be effective in his organization:

> To implement knowledge management, how much does an organization need to change its culture? Some people believe that a wholesale transformation is required in the way people work and act, but this is largely a myth. The fact is that successful knowledge management programs work with organizational cultures and behaviors, not against them. (Burk 1999)

It is clear that some aspects of a corporate culture can interfere with a knowledge management system. For example, some members of the organization will remain proprietary about their knowledge, believing that the possession of that knowledge places them in a position of power, where others must come to them for help. They fear a loss of control if others gain access to their department's knowledge. Others may not see any personal benefit accruing from sharing their knowledge. Burk concluded that such problems can be addressed by appropriate use of communication about KM and its benefits for everyone in the organization. Formal recognition and reward of individuals who go out of their way to share knowledge is another way of promoting acceptance of the KM program.

The Organizational Learning Subsystem

Government organizations learn by following a process of developing, collecting, and processing the knowledge, experience, and skills that their people need to perform their tasks. However, it has been suggested that government agencies can improve the quality of this learning by developing innovative solutions to old and new problems—and making changes to the system before circumstances become problems (Lawrence 1998).

Organizations learn from interactions with their environment. These interactions occur when the organization develops *collaborative networks* with internal and external stakeholder groups. These networks make it possible to benefit from the knowledge, capabilities, and experiences of those individuals and groups. This collaborative learning is a reflection of the strong bond that exists between the principles and practices of knowledge management and the learning organization outcomes. This bond is increasingly recognized in public-sector organizations around the globe. In the Central American country of El Salvador, for example, a study partially financed by the World Bank strongly endorsed developing KM systems to enable organizational learning to take place in both the public and the private sectors (*Conectándonos al Futuro de El Salvador* 1999).

What are the chief components of an organizational learning subsystem? The first two elements of organizational learning—what Peter Senge refers to as "disciplines"—are inherently personal. One is the knowledge or *personal mastery* held by the people in an agency—what is sometimes referred to as the *intellectual capital* of an organization (Senge 1990; McElyea 2002). The second is the *mental models* that shape and frame the way people think, learn, and react to environmental stimuli.

The next three components are a reflection of the influence placed upon individuals in their interactions with other people in their social organiza-

tions. The first of these three social factors is the *shared vision* of the individuals in the agency. This forms the basis for the shared concern, or passion, over the mission. It is also the basis for the commitment individuals share toward the agency, their unit, and their fellow workers. In another circumstance, it might have been referred to as *loyalty to the cause;* Senge refers to it as "shared vision" (9). It involves identifying the "shared pictures of the future" that result in genuine commitment and voluntary enrollment in serving rather than simply complying with a directive from management.

The second of the three organizational elements is *team learning,* which Senge describes as beginning with dialogue and ending with thinking together. Team learning is about aligning team members' efforts and collaboration. The final element in this subsystem is an echo of the approach taken in this text: *systems thinking*—Senge's "fifth discipline." This makes it possible for all the other elements to function in the organization and its people. It "integrates the disciplines, fusing them into a coherent body of theory and practice" (12).

Double-Learning at the Forest Service

The U.S. Forest Service, once one of the federal government's most admired agencies, is an example of an agency that has been forced in reaction to public pressure to evolve from its traditional, often hidebound role as the guardian of the nation's forests to become instead a conservation organization with many missions and many stakeholders. A white paper produced in May of 2000 described the agency as a "learning organization" (Apple 2000). Clearly, the Forest Service has learned and has changed. However, that change may have been more reactive (adaptive) than proactive (generative).

Beginning in the late 1960s, the Forest Service came under intense pressure and criticism for focusing too much on managing the development of the commodity value of forest products, especially timber and grazing, and for not paying enough attention to such values as wildlife, wilderness, and recreation. It was also being criticized for not responding to shifting societal demands on the non-revenue values. Passage of the National Environmental Policy Act in 1969 forced the service to change; new ways to operate, new missions, and more and more vocal stakeholder groups had to be dealt with. For the Forest Service, the path to becoming a learning organization began with changing employees' visions of themselves from seeing themselves as the forestry experts to viewing themselves as stewards of the nation's trust.

Change for the Forest Service meant developing the capacity to (1) change in response to experience, (2) monitor their operations more closely, (3) iden-

tify the environmental impact of their operations, and (4) begin to listen to their clients for clues to the adequacy of their performance. The Forest Service developed the ability to accept and implement adaptive change by reacting outside pressures.

Generative Change in Canada's PSC

The Public Service Commission of Canada (PSC) is an independent agency responsible for preserving and promoting the values of competence, nonpartisanship, and representativeness among the members of Canada's professional public service. In this role, it is also a key participant in the implementation of the Public Service Modernization Act and, particularly, the Public Service Employment Act, which came into force in 2005. The PSC has also long shown an interest in the concepts of knowledge management and learning organizations. Eton Lawrence (1998), a member of the PSC's policy research and communications branch, quoted a 1998 Privy Council report to the prime minister regarding which areas of the Canadian government needed further improvement:

> In human resources management, the goal is to become a learning- and knowledge-based organization, one able to provide people with the breadth of knowledge and experience necessary to advise and serve in a modern global government.

Lawrence went on to add that, although that this trend is seen in both the public and the private sectors as more or less inevitable, the real challenge government agencies face is how to go about actually transforming an agency into a learning organization. One of the first answers to this conundrum is not simply relying on adaptive learning, but also incorporating generative learning. Generative learning is what happens when people and organizations learn how to go beyond reacting to environmental pressures, to be able to anticipate potential problems—and opportunities—before they occur. Lawrence described this skill as learning that is more deliberative, reflective, and anticipatory. Organizations, to be successful, must learn how to employ both types of learning.

Conclusion

This chapter introduced a model of a vision of a total knowledge management system. The components or subsystems that make up the system include:

- A technology-based *information processes subsystem* that collects, codifies, and records data according to agency needs, in forms that people want and need, according to protocols and procedures set forth by the federal government's enterprise architecture initiative.
- A *social processes subsystem* that transfers and transforms information into knowledge through the processes of socialization, internalization, combining, and externalization.
- A *human interactions subsystem* that employs such tools as knowledge audits, communities of practice, and knowledge registries, among others, in order to begin the transition from a culture of knowledge hoarding to one of knowledge sharing.
- A *collaborative culture subsystem* that makes it the norm for all the experiences and knowledge of all members of a community of interest to be freely shared and employed when and where they are needed for carrying out the mission of the agency.
- An *organizational learning subsystem* that enables the transformation of agency focus solely on the essential single-loop, adaptive change process to also value and implement the more rewarding processes of double-loop, generative learning.

A number of domestic and international public-sector case examples were used to illustrate how the various components discussed in the chapter are implemented in actual agencies and departments.