Knowledge Management in Theory and Practice

Third Edition

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The MIT Press

Cambridge, Massachusetts

London, England

This book was set in Stone Sans and Stone Serif by Toppan Best-set Premedia Limited. Printed and bound in the United States of America.

Library of Congress Cataloging-in-Publication Data

Names: Dalkir, Kimiz, author.

Title: Knowledge management in theory and practice / Kimiz Dalkir

Description: Third Edition. | Cambridge, MA : MIT Press, [2017] | Revised

edition of the author's Knowledge management in theory and practice,

c2011. | Includes bibliographical references and index.

Identifiers: LCCN 2017011534 | ISBN 9780262036870 (hardcover : alk. paper)

eISBN 9780262342797

Subjects: LCSH: Knowledge management.

Classification: LCC HD30.2 .D354 2017 | DDC 658.4/038--dc23 LC record available at https://lccn.loc.gov/2017011534

ePub Version 1.0

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1 Introduction to Knowledge Management

> The store of wisdom does not consist of hard coins which keep their shape as they pass from hand to hand; it consists of ideas and doctrines whose meanings change with the minds that entertain them.
>
> —John Plamenatz (1912–1975)

This chapter provides an introduction to the study of knowledge management (KM). The history of knowledge management concepts is outlined, noting that much of KM existed before the actual term came into popular use. The lack of consensus over what constitutes a good definition of KM is addressed and the concept analysis technique is described as a means of clarifying the conceptual confusion that still persists over what KM is or is not. The multidisciplinary roots of KM are enumerated together with their contributions to the discipline. The two major forms of knowledge, tacit and explicit, are compared and contrasted. The importance of KM today, for individuals, knowledge communities and for organizations are described together with the emerging KM roles and responsibilities, and practitioner and education standards, needed to ensure successful KM implementations.

Learning Objectives

1. Use a framework and a clear language for knowledge management concepts.
2. Define key knowledge management concepts such as intellectual capital, organizational learning and memory, knowledge taxonomy, and communities of practice using concept analysis.
3. Provide an overview of the history of knowledge management and identify key milestones.
4. Describe the key roles and responsibilities required for knowledge management applications.
5. Discuss the key benefits to individuals, groups, and organizations—the value created by KM.

Introduction

The ability to manage knowledge is becoming increasingly more crucial in the today's knowledge economy. The creation and diffusion of knowledge have become increasingly important factors in competitiveness. In fact, more and more, knowledge is being thought of as a valuable commodity that is embedded in products (especially high-technology products) and embedded in the tacit knowledge of highly mobile employees. While knowledge is increasingly being viewed as a commodity or intellectual asset, there are some paradoxical characteristics of knowledge that are radically different than other valuable commodities. These knowledge characteristics include the following:

- Using knowledge does not consume it.
- Transferring knowledge does not result in losing it.
- Knowledge is abundant, but the ability to use it is scarce.
- Much of an organization's valuable knowledge walks out the door at the end of the day.

The advent of the Internet, the World Wide Web, has made unlimited sources of knowledge available to us all. Pundits are heralding the dawn of the Knowledge Age supplanting the Industrial Era. Over fifty years ago, nearly half of all workers in industrialized countries were making or helping to make *things*. By the year 2000, only 20 percent of workers were devoted to industrial work—the rest were knowledge workers (Drucker, 1994; Bart, 2000). Davenport (2005, p. 5) notes that "At a minimum, they comprise a quarter of the U.S. workforce, and at a maximum about half." Labor-intensive manufacturing with a large pool of relatively cheap, relatively homogenous labor and hierarchical management has given way to knowledge-based organizations. There are fewer people who need to do more work. Organizational hierarchies are being put aside as knowledge work calls for more collaboration. The only sustainable advance a firm has comes from what it collectively knows, how efficiently it uses what it knows, and how quickly it acquires and uses new knowledge (Davenport & Prusak, 1998). An organization in the Knowledge Age is one that learns, remembers, and acts based on the best available information, knowledge, and know-how.

The most valuable benefits from KM arise from sharing knowledge with current fellow employees as well as sharing knowledge with future (often unknown) employees. The former focuses on sharing knowledge and ensuring it moves around the organization so everyone can benefit from best practices (adopt newer, better ways of doing things) and lessons learned (avoid repeating things that did not succeed so well). Sharing with present-day colleagues is called knowledge "use" while preserving knowledge to be shared with future knowledge workers is called "reuse."

In parallel, there are two major goals for KM: improving organizational efficiency, through knowledge use and reuse, and increasing the organizational capacity to innovate, through knowledge use and reuse.

In order to ensure that KM creates value, there is a strong need for a deliberate and systematic approach to cultivating and sharing a company's knowledge base—one populated with valid and valuable lessons learned and best practices. In other words, in order to be successful in today's challenging organizational environment, companies need to learn from their past errors and not reinvent the wheel over and over again. Organizational knowledge is not intended to replace individual knowledge but to complement it by making it stronger, more coherent, and more broadly applied. Knowledge management represents a deliberate and systematic approach to ensure the full utilization of the organization's knowledge base, coupled with the potential of individual skills, competencies, thoughts, innovations, and ideas to create a more efficient and effective organization.

> Increasingly, companies will differentiate themselves on the basis of what they know. A relevant variation on Sidney Winter's definition of a business firm *as an organization that knows how to do things* would define a business firm that thrives over the next decade as *an organization that knows how to do new things well and quickly*. (Davenport & Prusak, 1998, p. 13)

Knowledge management was initially defined as the process of applying a systematic approach to the capture, structuring, management, and dissemination of knowledge throughout an organization to work faster, reuse best practices, and reduce costly rework from project to project (Nonaka et al, 2000; Pasternack et & Viscio, 1998; Pfeffer & Sutton, 1999; Ruggles & Holtshouse, 1999). KM is often characterized by a "pack rat" approach to content: "save it, it may prove useful sometime in the future." Many documents tend to be warehoused, sophisticated search engines are then used to try to retrieve some of this content, and fairly large-scale and costly KM systems are built. Knowledge management solutions have proven to be most successful in the capture, storage. and subsequent dissemination of knowledge that has been rendered explicit—particularly lessons learned and best practices.

The focus of Intellectual Capital Management (ICM), on the other hand, is on those pieces of knowledge that are of *business value* to the organization—referred to as intellectual capital or assets. Stewart (1997) defines intellectual capital as "organized knowledge that can be used to produce wealth." While some of these assets are more visible (e.g., patents, intellectual property), the majority consists of know-how, know-why, experience, and expertise that tends to reside within the head of one or a few employees (Klein, 1998; Stewart, 1997). ICM is characterized less by content—because content is filtered and judged, and only the best are inventoried (the top ten for example). ICM content tends to be more representative of peoples' real thinking (contextual information, opinions, stories) due to its focus on actionable knowledge and know-how, with the result that less costly endeavors and a focus on learning (at the individual, community, and organizational level) results, rather than on the building of systems.

A good definition of knowledge management would incorporate both the capturing and storing of knowledge perspective, together with the valuing of intellectual assets. For example:

> Knowledge management is the deliberate and systematic coordination of an organization's people, technology, processes, and organizational structure in order to add value through reuse and innovation. This is achieved through the promotion of creating, sharing, and applying knowledge as well as through the feeding of valuable lessons learned and best practices into corporate memory in order to foster continued organizational learning.

When asked, most executives often state that their greatest asset is the knowledge held by their employees. "When employees walk out the door, they take valuable organizational knowledge with them" (Lesser & Prusak, 2001, p. 1). Managers also invariably add that they have no idea how to manage this knowledge! It is essential to identify that knowledge which is of value and is also at risk of being lost to the organization, through retirement, turnover, and competition using the intellectual capital or asset approach. As Lesser and Prusak (2001, p. 1) note: "The most knowledgeable employees often leave first." In addition, the selective or value-based knowledge management approach should be a three-tiered one—that is, it should also be applied to three organizational levels: the individual, the group or community, and the organization itself. The best way to retain valuable knowledge is to identify intellectual assets and then ensure legacy materials are produced, and subsequently stored in such a way as to make their future retrieval and reuse as easy as possible (Stewart, 2000). These tangible by-products need to flow from individual to individual, between members of a community of practice and, of course, back to the organization itself, in the form of lessons learned, best practices, and corporate memory.

Many knowledge management efforts have been largely concerned with capturing, codifying, and sharing the knowledge held by people in organizations. Although there is still a lack of consensus over what constitutes a good definition of KM (see next section), there is widespread agreement as to the goals of an organization that undertakes KM. Nickols (2000) summarizes this as the following**: "**the basic aim of knowledge management is to leverage knowledge to the organization's advantage." Some of management's motives are obvious: the loss of skilled people through turnover, pressures to avoid reinventing the wheel, pressures for organization-wide innovations in processes as well as products, managing risk, and the accelerating rate with which new knowledge is being created. Some typical knowledge management objectives would be to:

- Facilitate a smooth transition from those retiring to their successors who are recruited to fill their positions.
- Minimize loss of corporate memory due to attrition and retirement.
- Identify critical resources and critical areas of knowledge so that the corporation *knows what it knows and does well—and why.*
- Build up a toolkit of methods that can be used with individuals, with groups, and with the organization to stem the potential loss of intellectual capital.

What Is Knowledge Management?

An informal survey conducted by the author identified over 100 published definitions of knowledge management and of these, at least 72 could be considered to be very good! Girard and Girard (2015) have compiled a very comprehensive list of more than 100 KM definitions[1]. What this indicates is that KM is a very multidisciplinary field of study that covers a lot of ground. This really should not be surprising as applying knowledge to work is integral to most business activities. However, the field of KM does suffer from the "Three Blind Men and an Elephant" syndrome[2]. In fact, there are likely more than three distinct perspectives on KM and each leads to a different extrapolation and a different definition.

Here are a few sample definitions from the business perspective:

> Knowledge management is a business activity with two primary aspects: treating the knowledge component of business activities as an explicit concern of business reflected in strategy, policy, and practice at all levels of the organization; and, making a direct connection between an organization's intellectual assets—both explicit (recorded) and tacit (personal know-how)—and positive business results. (Barclay & Murray, 1997)

> Knowledge management is a collaborative and integrated approach to the creation, capture, organization, access, and use of an enterprise's intellectual assets. (Grey, 1996)

> Knowledge management is the process by which we manage human centered assets … the function of knowledge management is to guard and grow knowledge owned by individuals, and where possible, transfer the asset into a form where it can be more readily shared by other employees in the company. (Brooking, 1999, p. 154)

> The knowledge management focus is on obtaining and synthesizing intellectual capital to maximize decision making and innovation across diverse functions and disparate locations, thus enabling the clients to become high-performance businesses and governments. Far more than a cluster of simple processes, the KM program is also about developing and rewarding a culture of knowledge-sharing—encouraging collaboration among their people to problem solve and build capabilities, regardless of their location. (Accenture)[3]

Another two definitions, this time from the intellectual or knowledge asset perspective:

> Knowledge management consists of "leveraging intellectual assets to enhance organizational performance." (Stankosky, 2008)

> "Knowledge management develops systems and processes to acquire and share intellectual assets. It increases the generation of useful, actionable, and meaningful information and seeks to increase both individual and team learning. In addition, it can maximize the value of an organization's intellectual base across diverse functions and disparate locations. Knowledge management maintains that successful businesses are a collection not of products but of distinctive knowledge bases. This intellectual capital is the key that will give the company a competitive advantage with its targeted customers. Knowledge management seeks to accumulate intellectual capital that will create unique core competencies and lead to superior results." (Bain & Company, 2011)

A definition from the cognitive science or knowledge science perspective:

> Knowledge—the insights, understandings, and practical know-how that we all possess—is the fundamental resource that allows us to function intelligently. Over time, considerable knowledge is also transformed to other manifestations—such as books, technology, practices, and traditions—within organizations of all kinds and in society in general. These transformations result in cumulated [sic] expertise and, when used appropriately, increased effectiveness. Knowledge is one, if not THE, principal factor that makes personal, organizational, and societal intelligent behavior possible. (Wiig, 1993)

Two diametrically opposed schools of thought arise from the library and information science perspective: the first sees very little distinction between information management and knowledge management:

> KM is predominantly seen as information management by another name (semantic drift). (Davenport & Cronin, 2000, p. 1)

> Knowledge management is one of those concepts that librarians take time to assimilate, only to reflect ultimately "on why other communities try to colonize our domains." (Hobohm, 2004, p. 7)

The second school of thought, however, does make a distinction between the management of information resources and the management of knowledge resources:

> Knowledge management "is understanding the organization's information flows and implementing organizational learning practices which make explicit key aspects of its knowledge base … It is about enhancing the use of organizational knowledge through sound practices of information management and organizational learning. (Broadbent, 1997, pp. 8–9).

> Knowledge relates to all the capital owned by people and staff of a company: know-how and expertise, competencies, market experiences, etc. Knowledge management helps companies turn this human capital into intellectual capital by creating value. Unlike content management, knowledge management is not only about storing documents. It is about increasing people skills and expertise thanks to sharing. Knowledge management enables people collaboration and connects them to expertise. The ability to quickly find a subject matter expert and get the answer to a question or assistance in solving a problem is a priority in knowledge management. Knowledge management prevents companies from constantly reinventing the wheel, hence the decreasing supply of talent, the retiring boomers, the staff turnover etc. (Deloitte)[4]

And, some sample definitions from the process/technology perspective:

> Knowledge management is the concept under which information is turned into actionable knowledge and made available effortlessly in a usable form to the people who can apply it. (Patel & Harty, 1998)

> Leveraging collective wisdom to increase responsiveness and innovation. (Frappaolo, 2006)

> A systematic approach to manage the use of information in order to provide a continuous flow of knowledge to the right people at the right time enabling efficient and effective decision making in their everyday business. (Payne & Britton, 2010)

> The tools, techniques, and strategies to retain, analyze, organize, improve, and share business expertise. (Groff & Jones, 2003, p. 2)

> A capability to create, enhance, and share intellectual capital across the organization … a shorthand covering all the things that must be put into place, for example, processes, systems, culture, and roles to build and enhance this capability. (Lank, 1997)

> The creation and subsequent management of an environment that encourages knowledge to be created, shared, learnt, enhanced, organized, and utilized for the benefit of the organization and its customers. (Abell & Oxbrow, 2001)

A number of other definitions can be found at http://www.cems.uwe.ac.uk/~rstephen/courses/UFIE95-20-3/week16/knowledge_management_def.html.

Wiig (1993) also emphasizes that given the importance of knowledge in virtually all areas of daily and commercial life, two knowledge-related aspects are vital for viability and success at any level. These are knowledge *assets* that must be applied, nurtured, preserved, and used to the largest extent possible by both individuals and organizations; and knowledge-related *processes* to create, build, compile, organize, transform, transfer, pool, apply, and safeguard knowledge. These knowledge-related aspects must be carefully and explicitly managed in all affected areas.

> Historically, knowledge has always been managed, at least implicitly. However, effective and active knowledge management requires new perspectives and techniques and touches on almost all facets of an organization. We need to develop a new discipline and prepare a cadre of knowledge professionals with a blend of expertise that we have not previously seen. This is our challenge! (Wiig, in Grey, 1996)

Knowledge management is a surprising mix of strategies, tools, and techniques—some of which are nothing new under the sun: storytelling, peer-to-peer mentoring, and learning from mistakes, for example, all have precedents in education, training, and artificial intelligence practices. Knowledge management makes use of a mixture of techniques from knowledge-based system design, such as structured knowledge acquisition strategies from subject matter experts (McGraw & Harrison-Briggs, 1989) and educational technology (e.g., task and job analysis to design and develop task support systems; Gery, 1991).

This makes it both easy and difficult to define what KM is—at one extreme, KM encompasses everything to do with knowledge. At the other extreme, KM is narrowly defined as an information technology system that dispenses organizational know-how. KM is in fact both of these and many more. One of the few areas of consensus in the field is that KM is a highly multidisciplinary field.

Multidisciplinary Nature of KM

Knowledge management draws upon a vast number of diverse fields such as:

- Organizational science
- Cognitive science
- Computer science
- Linguistics and computational linguistics
- Information technologies
- Information and library science
- Technical writing and journalism
- Anthropology and sociology
- Education and training
- Storytelling and communication studies
- Collaborative technologies such as CSCW and groupware as well as intranets, extranets, portals and other web technologies

The above is by no means an exhaustive list but serves to show the extremely varied roots upon which KM grew out of and continues to be based upon today. Figure 1.1 illustrates some of the diverse disciplines that have contributed to KM.

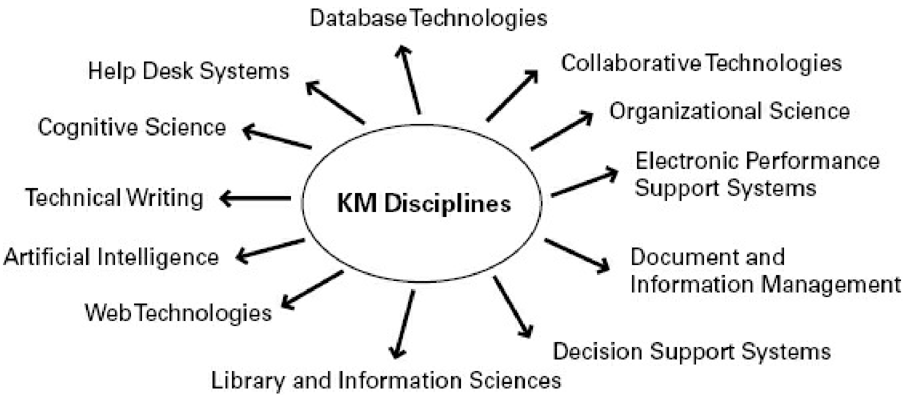

Figure 1.1 Multidisciplinary nature of knowledge management

The multidisciplinary nature of KM represents a double-edged sword: on the one hand, it is an advantage as almost anyone can find a familiar foundation upon which to base their understanding and even practice of KM. Someone with a background in journalism, for example, can quickly adapt their skill set to the capture of knowledge from experts and reformulate this knowledge as organizational stories to be stored in corporate memory. Someone coming from a more technical database background can easily extrapolate his or her skill set to design and implement knowledge repositories that will serve as the corporate memory for that organization. However, the diversity of KM also results in some challenges with respect to boundaries. Skeptics argue that KM is not and cannot be said to be a separate discipline with a unique body of knowledge to draw upon. This attitude is typically represented by phrases such as "KM is just IM" or "KM is nonsensical—it is just good business practices." It becomes very important to be able to list and describe what set of attributes are necessary and in themselves sufficient to constitute knowledge management both as a discipline and as a field of practice that can be distinguished from others.

One of the major attributes lies in the fact that KM deals with knowledge as well as information. Knowledge is a more subjective way of knowing, typically based on experiential or individual values, perceptions, and experience. Popular examples to distinguish data from information from knowledge include:

Data.Content that is directly observable or verifiable: a fact; for example, movie listings giving the times and locations of all movies being shown today—I download the listings.

Information.Content that represents analyzed data; for example, I can't leave before 5 so I will go to the 7 p.m. show at the cinema near my office.

Knowledge.At that time of day, it will be impossible to find parking. I remember the last time I took the car, I was so frustrated and stressed because I thought I would miss the opening credits. I'll therefore take the commuter train. But first, I'll check with Al. I usually love all the movies he hates so I want to make sure it's worth seeing!

Another distinguishing characteristic of KM as opposed to other information management fields is the fact that knowledge in all of its forms is addressed: tacit knowledge and explicit knowledge.

The Two Major Types of Knowledge: Tacit and Explicit

> We know more than we can tell.
>
> —Polanyi, 1966

Tacit knowledge is difficult to articulate and difficult to put into words, text, or drawings. Explicit knowledge represents content that has been captured in some tangible form such as words, audio recordings, or images. Tacit knowledge tends to reside within the heads of "knowers" whereas explicit knowledge is usually contained within tangible or concrete media. However, it should be noted that this is a rather simplistic dichotomy. In fact, the property of "tacitness" is a property of the knower: that which is easily articulated by one person may be very difficult to externalize by another. The same content may be explicit for one person and tacit for another.

There is also somewhat of a paradox at play here: highly skilled, experienced, and expert individuals may find it harder to articulate their know-how. Novices, on the other hand, are more apt to easily verbalize what they are attempting to do because they are typically following a manual or how-to process. Table 1.1 summarizes some of the major properties of tacit and explicit knowledge.

Table 1.1 Comparison of properties of tacit versus explicit knowledge

Properties of tacit knowledge	Properties of explicit knowledge
Ability to adapt, to deal with new and exceptional situations	Ability to disseminate, to reproduce, to access and re-apply throughout the organization
Expertise, know-how, know-why, and care-why	Ability to teach, to train
Ability to collaborate, to share a vision, to transmit a culture	Ability to organize, to systematize; to translate a vision into a mission statement, into operational guidelines
Coaching and mentoring to transfer experiential knowledge on a one-to-one, face-to-face basis	Transfer knowledge via products, services, and documented processes

Typically, the more tacit knowledge is, the more valuable it tends to be. The paradox lies in the fact that the more difficult it is to articulate a concept such as *story*, the more valuable that knowledge may be. This is often witnessed when people make reference to knowledge versus know-how, or knowing something versus knowing how to do something. Valuable tacit knowledge often results in some observable action when individuals understand and subsequently make use of knowledge. Another perspective is that explicit knowledge tends to represent the final end product, whereas tacit knowledge is the know-how or all of the processes that were required in order to produce that final product.

> We have a habit of writing articles published in scientific journals to make the work as finished as possible, to cover up all the tracks, to not worry about the blind alleys or how you had the wrong idea at first, and so on. So there isn't any place to publish, in a dignified manner, what you actually did in order to do the work. (Feynman, 1966)

A popular misconception is that KM focuses on rendering that which is tacit into more explicit or tangible forms, then storing or archiving these forms somewhere, usually some form of intranet or knowledge portal. The "build it and they will come" expectation typifies this approach: Organizations take an exhaustive inventory of tangible knowledge (i.e., documents, digital records) and make them accessible to all employees. Senior management is then mystified as to why employees are not using this wonderful new resource. In fact, knowledge management is broader and includes leveraging the value of the organizational knowledge and know-how that accumulates over time. This approach is a much more holistic and user-centered approach that begins not with an audit of existing documents but with a needs analysis to better understand how improved knowledge sharing may benefit specific individuals, groups, and the organization as a whole. Successful knowledge-sharing examples are gathered and documented in the form of lesson learned and best practices and these then form the kernel of organizational stories.

There are a number of other attributes that together make up a set of what KM should be all about. One good technique for identifying what these attributes are is the concept analysis technique.

Concept Analysis Technique

Concept analysis is an established technique used in the social sciences (such as philosophy and education) in order to derive a formula that in turn can be used to generate definitions and descriptive phrases for highly complex terms. We still lack a consensus on knowledge management–related terms, and these concepts do appear to be complex enough to merit the concept analysis approach. A great deal of conceptual complexity derives from the fact that a word such as *knowledge* is necessarily subjective in nature, not to mention value laden in interpretation.

The concept analysis approach rests on obtaining consensus around three major dimensions of a given concept (shown in figure 1.2).

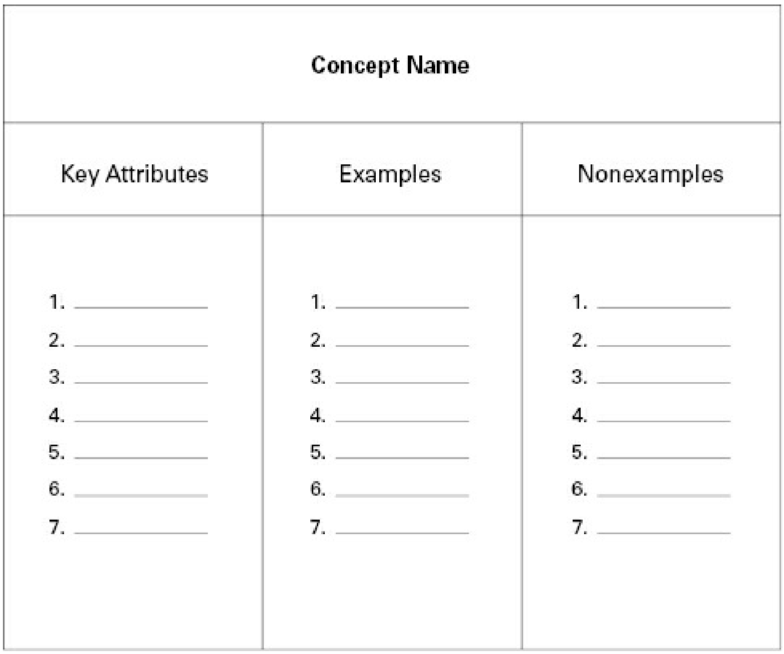

Figure 1.2 Illustration of the concept analysis technique

1. A list of key attributes that must be present in the definition, vision, or mission statement
2. A list of illustrative examples
3. A list of illustrative nonexamples

This approach is particularly useful in tackling multidisciplinary domains such as intellectual capital, as clear criteria can be developed to enable sorting into categories such as knowledge vs. information, document management vs. knowledge management, and tangible vs. intangible assets. In addition, valuable contributions to the organization's intellectual capital are derived through the production of ontologies (semantic maps of key concepts), identification of core competencies, and identification of knowledge, know-how, and know-why at risk of being lost through human capital attrition.

Concept analysis is a technique used to visually map out conceptual information in the process of defining a word (Novak, 1990, 1991). This is a technique derived from the fields of philosophy and science education (Bareholz & Tamir, 1992; Lawson, 1994) and it is typically used in clearly defining complex, value-laden terms such as *democracy* or *religion*. It is a graphical approach to help develop a rich, in-depth understanding of a concept. Figure 1.2 outlines the major components of this approach.

Davenport and Prusak (1998) decry the ability to provide a definitive account of knowledge management since "epistemologists have spent their lives trying to understand what it means to know something." In his 2008 keynote address, Michael Stankosky reiterated this disappointment that we still "don't know what to call it!" If you can't manage what you cannot measure, then you can't measure what you cannot name. Knowledge management, due to this still ongoing lack of clarity and lack of consensus on a definition, presents itself as a good candidate for this approach. In visioning workshops, this is the first activity that participants are asked to undertake. The objective is to agree upon a list of key attributes that are both necessary and sufficient in order for a definition of knowledge management to be acceptable. This is completed by a list of examples and nonexamples, with justifications as to why a particular item was included on the example or nonexample list. Semantic mapping (Jonassen, Beissner, & Yacci 1993; Fisher, 1990) is the visual technique used to extend the definition by displaying words related to it. Popular terms to distinguish clearly from knowledge management include document management, content management, portal, knowledge repository, and so on. Together, the concept and semantic maps visually depict a model-based definition of knowledge management and its closely related terms.

In some cases, participants are provided with lists of definitions of knowledge management from a variety of sources can so they can try out their concept map of knowledge management by analyzing these existing definitions. Definitions are typically drawn from the knowledge management literature as well as internally, from their own organization. The use of concept definition through concept and semantic mapping techniques can help participants rapidly reach a consensus on a formulaic definition of knowledge management, that is, one that focuses less on the actual text or words used and more on which key concepts need to be present, what comprises a necessary and sufficient (complete) set of concepts, and rules of thumb to use in discerning what is and what is not an illustrative example of knowledge management.

Ruggles and Holtshouse (1999) identified the following key attributes of knowledge management:

- Generating new knowledge
- Accessing valuable knowledge from outside sources
- Using accessible knowledge in decision making
- Embedding knowledge in processes, products, and/or services
- Representing knowledge in documents, databases, and software
- Facilitating knowledge growth through culture and incentives
- Transferring existing knowledge into other parts of the organization
- Measuring the value of knowledge assets and/or impact of knowledge management

Some key knowledge management attributes that continue to recur include:

- Both tacit and explicit knowledge forms are addressed; tacit knowledge (Polanyi, 1966) is knowledge that often resides only within individuals, knowledge that is difficult to articulate such as expertise, know-how, tricks of the trade, and so on.
- There is a notion of added-value (the "so what?" of KM).
- The notion of application or use of the knowledge captured, codified, and disseminated (the impact of KM).

It should be noted that a "good enough" or sufficient definition of knowledge has been shown to be effective (i.e., settling for "good enough" as opposed to optimizing; when 80 percent is done because the incremental cost of completing the remaining 20 percent is disproportionately expensive and/or time-consuming in relation to the expected additional benefits). Norman (1988, pp. 50–74) noted that knowledge might reside in two places—in the minds of people and/or in the world. It is easy to show the faulty nature of human knowledge and memory. For example, when typists were given caps for typewriter keys, they could not arrange them in the proper configuration—yet all those typists could type rapidly and accurately. Why the apparent discrepancy between the precision of behavior and the imprecision of knowledge? Because not all of the knowledge required for precise behavior has to be in the mind. It can be distributed—partly in the mind, partly in the world, and partly in the constraints of the world. Precise behavior can emerge from imprecise knowledge (Ambur, 1996). It is for this reason that once a satisfactory working or operational definition of knowledge management has been arrived at, then a knowledge management strategy can be confidently tackled.

It is highly recommended that each organization undertake the concept analysis exercise to clarify their understanding of what KM means in their own context. The best way to do this would be to work as a group in order to achieve a shared understanding at the same time that a clearer conceptualization of the KM concept is developed. Each participant can take a turn to contribute one good example of what KM is and another example of what KM is not. The entire group can then discuss this example/nonexample pair in order to identify one (or several) key KM attributes. Once the group feels they have covered as much ground as they are likely to, the key attributes can be summarized in the form of a KM concept formula such as:

> In our organization, knowledge management must include the following: both tacit and explicit knowledge; a framework to measure the value of knowledge assets; a process for managing knowledge assets …

The lack of agreement on one universal formulation of a definition for knowledge management makes it essential to develop one for each organization (at a very minimum). This "working" or "operational" definition, derived through the concept analysis technique, will render explicit the various perceptions people in that company may have of KM and bring them together into a coherent framework. It may seem strange that KM is almost always defined at the beginning of any talk or presentation on the topic (imagine if other professionals such as doctors, lawyers, or engineers began every talk with "here is a definition of what I do and why") but this is the reality we must deal with. Whether the lack of a definition is due to the interdisciplinary nature of the field and/or because it is still an emerging discipline, it certainly appears to be highly contextual. The concept analysis technique allows us to continue in both research and practice while armed with a common, validated, and clear description of KM that is useful and adapted to a particular organizational context.

History of Knowledge Management

Although the phrase "knowledge management" entered popular usage in the late 1980s (e.g., conferences in KM began appearing, books on KM were published, and the term began to be seen in business-oriented journals), in fact, KM has been around for ages—librarians, philosophers, teachers, and writers have been making use of many of the same techniques. Denning (2002) related how from "time immemorial, the elder, the traditional healer, and the midwife in the village have been the living repositories of distilled experience in the life of the community." Some form of narrative repository has been around for a long time, and people have found a variety of ways to share knowledge in order to build on earlier experience, eliminate costly redundancies, and avoid making at least the same mistakes again. For example, knowledge sharing often took the form of town meetings, workshops, seminars, and mentoring sessions. The primary technology used to transfer knowledge consisted of people themselves—in fact, much of our cultural legacy stems from the migration of different peoples across continents.

Wells (1938), while never using the actual term "knowledge management," described his vision of a "World Brain" that would allow the intellectual organization of the sum total of our collective knowledge. The World Brain would represent "a universal organization and clarification of knowledge and ideas" (Wells, 1938, p. xvi). Wells in fact anticipated the World Wide Web albeit in an idealized manner when he spoke of "… this wide gap between … at present unassembled and unexploited best thought and knowledge in the world … we live in a world of unused and misapplied knowledge and skill" (p. 10). The World Brain encapsulates many of the desirable features of the intellectual capital approach to KM: selected, well-organized, and widely vetted content that is maintained, kept up to date and, above all, put to use to generate value to users, the users' community, and their organization.

What Wells envisaged for the entire world can easily be applied within an organization in the form of an intranet. What is new and termed *knowledge management* is that we are now able to simulate rich, interactive, face-to-face knowledge encounters virtually through the use of new communication technologies. Information technologies such as an intranet and the Internet enable us to knit together the intellectual assets of an organization and organize and manage this content through the lenses of common interest, common language, and conscious cooperation. We are able to extend the depth and breadth or reach of knowledge capture, sharing, and dissemination activities, as we had not been able to do before, and we find ourselves one step closer to Wells' (1938) "perpetual digest … and a system of publication and distribution" (pp. 70–71) "to an intellectual unification … of human memory" (pp. 86–87).

Drucker was the first to coin the term "knowledge worker" in the early 1960s (Drucker, 1964). Senge (1990) focused on the learning organization as one that can learn from past experiences stored in corporate memory systems. Dorothy Barton-Leonard (1995) documented the case of Chapparal Steel as a knowledge management success story. Nonaka and Takeuchi (1995) studied how knowledge is produced, used, and diffused within organizations and how this contributed to the diffusion of innovation.

The growing importance of organizational knowledge as a competitive asset was recognized by a number of people who saw the value in being able to measure intellectual assets (see Sveiby; Kaplan & Norton; APQC, 1996, 1997; Edvinsson & Malone, 1997; among others). A cross-industry benchmarking study was led by APQC's president Carla O'Dell and completed in 1996. It focused on the following KM needs:

1. Knowledge management as a business strategy
2. Transfer of knowledge and best practices
3. Customer-focused knowledge
4. Personal responsibility for knowledge
5. Intellectual asset management
6. Innovation and knowledge creation (APQC, 1996)

The Entovation timeline[5] identifies the variety of disciplines and domains that have blended together to emerge as knowledge management. A number of management theorists have contributed significantly to the evolution of KM such as Peter Drucker, Peter Senge, Ikujiro Nonaka and Hirotaka Takeuchi, and Thomas Stewart. An extract of this timeline is shown in figure 1.3.

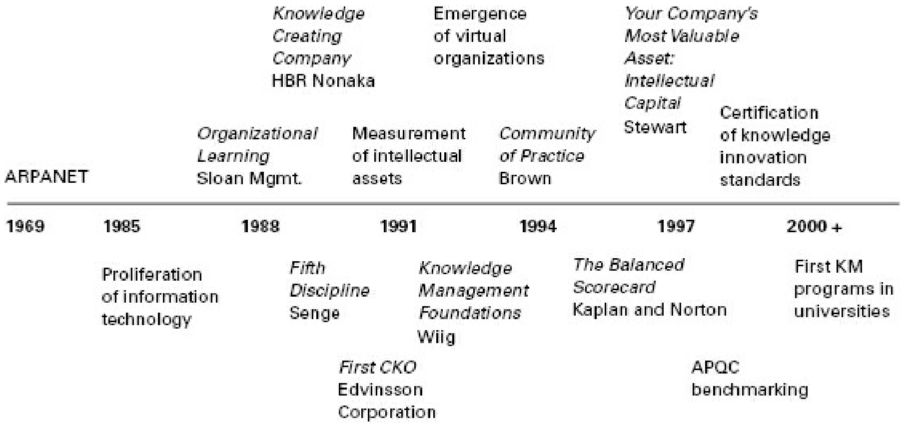

Figure 1.3 A summary timeline of knowledge management

The various eras we have lived through offer another perspective on the history of KM. Starting with the industrial era in the 1800s, we focused on transportation technologies in 1850, communications in 1900, computerization beginning in the 1950s, and virtual workplaces in the early 1980s and the early efforts at personalization and profiling technologies beginning in the year 2000 (Deloitte, Touche, & Tohmatsu, 1999). Figure 1.4 summarizes these developmental phases.

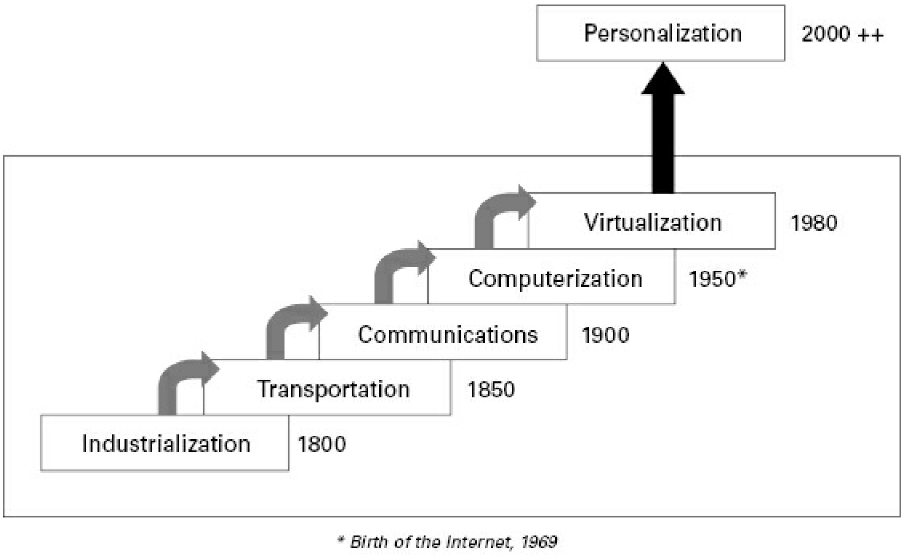

Figure 1.4 Developmental phases in KM history

With the advent of the information or computer age, KM has come to mean the systematic, deliberate leveraging of knowledge assets. Technologies enable valuable knowledge to be *remembered*—via organizational learning and corporate memory—as well as enabling valuable knowledge to be *published*—that is, widely disseminated to all stakeholders. The evolution of knowledge management has occurred in parallel with a shift from a retail model based on a catalog (e.g., Ford's famous quote that you can have a car in any color you like—as long as it is black) to an auction model (as exemplified by eBay) to a personalization model where real-time matching of user needs and services occur in a win-win exchange model.

In 1969, the launch of ARPANET allowed scientists and researchers to communicate more easily with one another in addition to being able to exchange large data sets they were working on. They came up with a network protocol or language that would allow disparate computers and operating systems to network together across communication lines. Next, a messaging system was added to this data file transfer network. In 1991, the nodes were transferred to the Internet and World Wide Web. At the end of 1969, only four computers and about a dozen workers were connected.

In parallel, there were many key developments in information technologies devoted to knowledge-based systems: expert systems that aimed at capturing experts on a diskette, intelligent tutoring systems aimed at capturing teachers on a diskette, and artificial intelligence approaches that gave rise to knowledge engineering, someone tasked with acquiring knowledge from subject matter experts, conceptually modeling this content and then translating it into machine-executable code

(McGraw & Harrison-Briggs, 1989). McGraw and Harrison-Briggs describe knowledge engineering as "involving information gathering, domain familiarization, analysis, and design efforts. In addition, accumulated knowledge must be translated into code, tested and refined" (p. 5). A knowledge engineer is "the individual responsible for structuring and/or constructing an expert system" (p. 5). The design and development of such knowledge-based systems have much to offer knowledge management that also aims at the capture, validation, and subsequent technology-mediated dissemination of valuable knowledge from experts.

By the early 1990s, books on knowledge management began to appear and the field picked up momentum in the mid-1990s with a number of large, international KM conferences and consortia being developed. In 1999, Boisot summarized some of these milestones. Table 1.2 shows an updated summary.

Table 1.2 Knowledge management milestones

Year	**Entity**	**Event**
1980	DEC, CMU	XCON Expert System
1986	Dr. K Wiig	Coined KM concept at UN
1989	Consulting firms	Started internal KM projects
1991	Nonaka and Takeuchi	HBR article
1993	Dr. K Wiig	First KM book published
1994	KM Network	First KM Conference
1998	Davenport and Prusak	Publish *Working Knowledge*
Mid-1990s	Consulting firms	Start offering KM services
Late 1990s	Key vertical industries	Implement KM and start seeing benefits
2000–2003	Academia	KM courses/programs in universities with KM texts
2003 to present	Professional and Academic Certification	KM degrees offered by universities, by professional institutions such as KMCI Knowledge Management Consortium International (information available at: http://www.kmci.org/) and PhD students completing KM dissertations
2015	KM added to ISO Standard 9001: 2015	While not a KM standard per se, knowledge is recognized as an organizational resource to be managed in a new clause
2013 to present	AIIM Standards Board Committee on KM Education Standards	The Association for Information and Image Management Standards Board established a committee for KM Education and Training Standards; draft completed 2016

At the 24th World Congress on Intellectual Capital Management in January 2003, a number of KM gurus united in sending out a request to academia to pick up the KM torch. Among those attending the conference were Karl Sveiby, Leif Edvinsson, Debra Amidon, Hubert Saint-Onge, and Verna Allee. They made a strong case that KM had up until now been led by practitioners problem-solving by the seat of their pants, and that it was now time to focus on transforming KM into an academic discipline, promoting doctoral research in the discipline, and providing a more formalized training for our future practitioners. Today, universities around the world offer courses in KM and quite a few business and library schools offer degree programs in KM (Petrides & Nodine, 2003).

In parallel, the position of Chief Knowledge Officer can be found in a variety of organizations. There are many more dedicated KM professionals and quite a few more KM teams since the year 2000. KM is listed as a core competency in many places and is included in performance and promotion evaluation criteria by many HR departments. As Wiig predicted in his 1997 paper titled "Knowledge Management: Where Did It Come From and Where Will It Go?," "we can expect that KM—as an explicit and primarily standalone management initiative—will disappear from view within a decade or two" (p. 10). The success of KM will, ironically, be seen when KM can no longer be seen: in other words, when KM has become a part of the way things are done, much like quality assurance or ethical work practices. KM will no longer be something to be done in addition to work, but fully integrated in work processes. A good example is the lessons learned process: it simply becomes a number of steps in good project management practice.

In the last decade or so, KM has continued to evolve and the focus has shifted from asking "what is it?" and "why should we be concerned about it" to "how do we do it?" The focus of research, practice, and even KM education has turned to how to effectively implement KM to meet challenges such as knowledge continuity in the face of turnover, improved efficiencies through successful remembering and learning from the past, and leveraging KM networking practices to promote creativity and innovation. For example, IDC predicts that the overwhelming majority of organizational content will be unstructured by the year 2020 (Schubmehl & Vesset, 2014). That is to say, content will not be organized into classification systems such as taxonomies, which serve to structure content and make it easier to find. KM will thus become increasingly focused on managing content: ensuring it is well organized, well understood, and easy to find and use.

There have also been significant advances in the standardization of both KM practice and KM education. In October 2015, the ISO 9001 standard (https://www.iso.org/obp/ui/#iso:std:iso:9001:ed-5:v1:en) was revised to include a substantial section on KM. Knowledge is explicitly identified as an organizational resources that must be effectively managed in the following new clause:

> Clause 7.1.6. Knowledge
>
> Determine the knowledge necessary for the operation of its processes and to achieve conformity of products and services.
>
> This knowledge shall be maintained and made available to the extent necessary.
>
> When addressing changing needs and trends, the organization shall consider its current knowledge and determine how to acquire or access any necessary additional knowledge and required updates.
>
> Note 1: Organizational knowledge is knowledge specific to the organization; it is generally gained by experience. It is information that is used and shared to achieve the organization's objectives.
>
> Note 2: Organizational knowledge can be based on: a) Internal Sources (e.g., intellectual property; knowledge gained from experience; lessons learned from failures and successful projects; capturing and sharing undocumented knowledge and experience; the results of improvements in processes, products, and services) and b) External Sources (e.g., standards, academia, conferences, gathering knowledge from customers or external providers).

The existence of a standard that directly addresses KM helps to legitimize KM practice. The evolution toward standardization and even professionalism of KM is greatly helped by this new standard. The message is clear: KM is an important and integral part of good business practice. It has the potential to generate great value and therefore needs to be addressed in a more formal manner.

In parallel, AIIM (the Association for Information and Image Management) established a Committee on KM Education and Training Standards. The call for participation was sent out in 2013 (see http://www.kminstitute.org/sites/default/files/Call_for_Participation_AIIM_KM_Standards-1.pdf). The objective was to:

> develop a framework of standards for the field of knowledge management. AIIM's standards development and credentialing infrastructure will support development of three standards, including:
>
> 1. Standards and credentialing of competencies for individuals as knowledge management professionals, including different levels of professional development, variety of areas of specialization
> 2. Standards and certification of organizations as knowledge organizations, with reference to different levels of maturity and various efforts of specializations
> 3. Standards and credentialing of education and training programs, with reference to different levels of intensity and coverage

This work is still in progress but is an example of a similar move to standardize and formalize KM educational practices. While not at the same level as a new standard, the goal of establishing common learning objectives for KM holds great promise in ensuring the critical core concepts and skills are part and parcel of KM programs.

From Physical Assets to Knowledge Assets

Knowledge has increasingly become more valuable than the more traditional physical or tangible assets. For example, traditionally, an airline organization's assets included the physical inventory of airplanes. Today, however, the greatest asset possessed by an airline is the SABRE reservation system, software that enables the airline to not only manage the logistics of its passenger reservations but also to implement a seat yield management system. The latter refers to an optimization program that is used to ensure that maximum revenue is generated from each seat sold—even if each and every seat carried a distinct price. Similarly, in the manufacturing sector, the value of nonphysical assets such as Just-In-Time (JIT) inventory systems is rapidly proving to provide more value. These are examples of intellectual assets, which generally refer to an organization's recorded information, and human talent where such information is typically either inefficiently warehoused or simply lost, especially in large, physically dispersed organizations (Stewart, 1991).

This has led to a change in focus to the useful lifespan of a valuable piece of knowledge—when is some knowledge of no use? What about knowledge that never loses its value? The notion of knowledge obsolescence and archiving needs to be approached with a fresh lens. It is no longer advisable to simply discard items that are past their due date. Instead, content analysis and a cost–benefit analysis are needed in order to manage each piece of valuable knowledge in the best possible way.

Intellectual capital is often made visible by the difference between the book value and the market value of an organization (often referred to as "goodwill"). Intellectual assets are represented by the sum total of what employees of the organization know and know how to do. The value of these knowledge assets is at least equal to the cost of recreating this knowledge. The accounting profession still has considerable difficulty in accommodating these new forms of assets. Some progress has been made (e.g., Skandia was the first organization to report intellectual capital as part of its yearly financial report) but there is much more work to be done in this area. As shown in figure 1.5, intellectual assets may be found at the strategic, tactical, and operational levels of an organization.

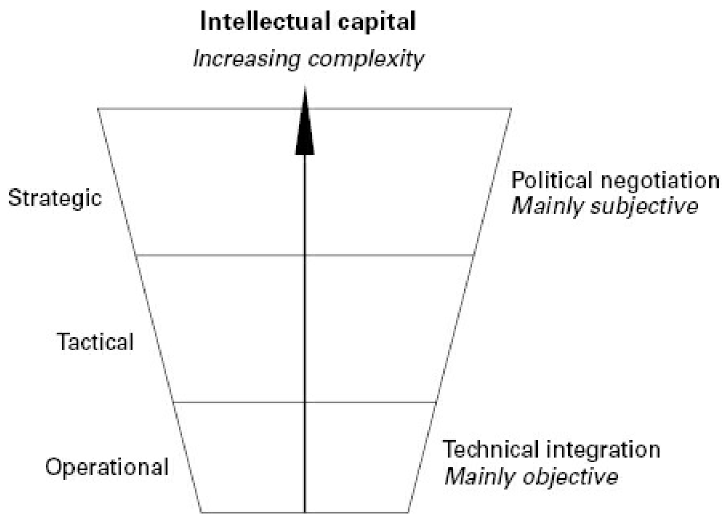

Figure 1.5 Three levels of intellectual capital

Some examples of intellectual capital include:

Competence—the skills necessary to achieve a certain (high) level of performance

Capability—strategic skills necessary to integrate and apply competencies

Technologies—tools and methods required to produce certain physical results

Core competencies are the things that an organization knows how to do well, that provide a competitive advantage. These are situated at a tactical level. Some examples would be a process, a specialized type of knowledge or particular kind of expertise that is rare or unique to the organization. Capabilities are found at a more strategic level. Capabilities are those things that an individual knows how to do well which, under appropriate conditions, may be aggregated to organizational competencies. Capabilities are potential core competences and sound KM practices are required in order for that potential to be realized. A number of business management texts discuss these concepts in greater detail (e.g., Hamel & Prahalad, 1990). It should be noted that the more valuable a capability is, the less it is shared among many employees, then the more vulnerable the organization becomes should that employee leave.

Organizational Perspectives on Knowledge Management

Wiig (1993) considers knowledge management in organizations from three perspectives, each with different horizons and purposes:

> *Business perspective*—focusing on why, where, and to what extent the organization must invest in or exploit knowledge. Strategies, products and services, alliances, acquisitions, or divestments should be considered from knowledge-related points of view.
>
> *Management perspective*—focusing on determining, organizing, directing, facilitating, and monitoring knowledge-related practices and activities required to achieve the desired business strategies and objectives.
>
> *Hands-on perspective*—focusing on applying the expertise to conduct explicit knowledge-related work and tasks.

The business perspective easily maps onto the strategic nature of knowledge management, the management perspective to the tactical layer, and the hands-on perspective may be equated with the operational level. The universal or horizontal nature of KM has created a situation where KM does not seem to have a universally accepted "home" as it can be found in such departments as human resources, information technology, information management, specific business units, or within the corporate strategy unit.

In parallel, the same situation exists within KM education. KM programs can be found in such academic departments as Arts, Science, Library/Information Science, Law, Management, and Education—again, there is no universally accepted "home" or disciplinary affiliation. The multidisciplinary nature of KM is reflected in both practice and education. Ideally, all relevant business functions and disciplinary areas should be involved but in practice, this is simply not feasible. The best compromise is to create cross-functional teams for KM strategy, governance, and implementation within organizations and develop interdisciplinary programs of study in academia. In organizations, cross-functional teams will typically consist of members from human resources and information technology to represent the critical KM dimensions of people and technology. In addition, strategic decision makers need to be either actively members or recipients of recommendations of members in order to be able to effectively manage and leverage knowledge resources. In academic, the short-term compromise would be to cross-list KM courses in more than one faculty.

The Columbia Information and Knowledge Strategy Master's program mirrors the evolution of KM. This program was previously the Information and Archive Management program and before that the Digital Resource Management unit. A key KM attribute emphasized by them is that of collaboration—both as an essential skill for KM practitioners but also as an integral part of the meaning of KM.

Although not everyone in the Library and Information Science (LIS) community is positively inclined toward KM (tending to fall back on arguments that IM is enough and that KM is encroaching upon this territory, as shown in some of the earlier definitions), others see KM as a means of enlarging the scope of activities that information professionals can participate in. Gandhi (2004) notes that knowledge organization has always been part of the core curriculum and the professional toolkit of LIS; and Martin et al. (2006) point out that LIS professionals are also expert in content management. The authors go on to state that

> libraries and information centers will continue to perform access and intermediary roles which embrace not just information but also knowledge management. The difference today is that these traditional roles could be expanded if not transformed … through activities aimed at helping to capture tacit knowledge and by turning personal knowledge into corporate knowledge that can be widely shared through the library and applied appropriately. (p. 15)

Blair (2002) notes that the primary differences between traditional information management practiced by LIS professional and knowledge management consist of collaborative learning, the transformation of tacit knowledge into explicit forms, and the documentation of best practices (and presumably their counterpart, lessons learned). The author often uses the phrase "connecting people to content and connecting people to people" to highlight the addition of non-document-based resources that play a critical role in KM. Increasingly, KM and IM have combined forces, particularly in the area of business or predictive analytics. While knowledge discovery and data mining have always been part of the KM landscape, there is an increasingly important role played by data aggregators and big data analytics.

As with KM itself, there is no *best* or *better* perspective; instead, the potential added value is to combine the two perspectives in order to get the most out of KM. One of the easiest ways of doing so would be to ensure that both perspectives—and both types of skill sets—are represented on your KM team.

Why Is KM Important Today?

The major business drivers behind today's increased interest and application of KM lie in four key areas:

1. *Globalization of business:* Organizations today are more global—multisite, multilingual, and multicultural in nature.
2. *Leaner organizations:* We are doing more and we are doing it faster but we also need to work smarter as knowledge workers—increased pace and workload.
3. *Corporate amnesia*: We are more mobile as a workforce, which creates problems of knowledge continuity for the organization and places continuous learning demands on the knowledge worker—we no longer expect to work for the same organization for our entire career.
4. *Technological advances*: We are more connected—information technology advances have made connectivity not only ubiquitous but has radically changed expectations: we are expected to be *on* at all times and the turnaround time in responding is now measured in minutes not weeks.

Today's work environment is more complex due to the increase in the number of subjective knowledge items we need to attend to everyday. Filtering over 200 emails, faxes, and voicemail messages on a daily basis should be done according to good time management practices and filtering rules but more often than not, workers tend to exhibit a Pavlovian reflex to beeps announcing the arrival of new mail or the ringing of the phone that demands immediate attention. Knowledge workers are increasingly being asked to think on their feet with little time to digest and analyze incoming data and information, let alone time to retrieve, access, and apply relevant experiential knowledge. This is due both to the sheer volume of tasks to attend to and the greatly diminished turnaround time. Today's expectation is that everyone is *on* all the time—as evidenced by the various messages embodying annoyance at not having connected, such as voicemails asking why you haven't yet responded to an email and emails asking why you haven't returned their call!

Knowledge management represents one response to the challenge of trying to manage this complex, information-overloaded work environment. As such, KM is perhaps best categorized as a science of complexity. One of the largest contributors to the complexity is that information overload represents only the tip of the iceberg—only that information that has been rendered explicit. KM also must deal with the yet to be articulated or tacit knowledge. To further complicate matters, we may not even be aware of all the tacit knowledge that exists—we may not "know that we don't know." Maynard Keynes (in Wells, 1938, p. 6) hit upon a truism when he stated "these … directive people who are in authority over us, know scarcely anything about the business they have in hand. Nobody knows very much, but the important thing to realize is that they do not even know what is to be known." Though he was addressing politics and the economic consequences of peace, today's organizational leaders have echoed his words countless times.

In fact, we are now entering the third generation of knowledge management, one devoted to content management. In the first generation, the emphasis was placed on containers of knowledge or information technologies in order to help us with the dilemma exemplified by the much quoted phrase "if only we knew what we know" (O'Dell & Grayson, 1998). The early adopters of KM, large consulting companies that realized that their primary product was knowledge and that they needed to inventory their knowledge stock more effectively, exemplified this phase. A great many intranets and internal knowledge management systems were implemented during the first KM generation. This was the generation devoted to finding all the information that had up until then been buried in the organization with commonly produced by-products encapsulated as reusable best practices and lessons learned.

Reeling from information overload, the second generation swung to the opposite end of the spectrum, to focus on people, which could be phrased as "if only we knew who knows about." There was growing awareness of the importance of human and cultural dimensions of knowledge management as organizations pondered why the new digital libraries were entirely devoid of content (i.e., information junkyards) and why the usage rate was so low. In fact, the information technology approach of the first KM generation leaned heavily toward a top-down, organization-wide monolithic KM system. In the second generation, it became quite apparent that a bottom-up or grassroots adoption of KM led to much greater success and that there were many grassroots movements—which later became dubbed "communities of practice." Communities of practice are good vehicles to study knowledge sharing or the movement of knowledge throughout the organization to spark not only reuse for greater efficiency but knowledge creation for greater innovation.

The third stage of KM brought about an awareness of the importance of content—how to describe and organize content so that intended end users are aware it exists, can easily access and apply this content. This phase is characterized by the advent of metadata to describe the content in addition to the format of content, content management, and knowledge taxonomies. After all, if knowledge is not put to use to benefit the individual, the community of practice and/or the organization, then knowledge management has failed. Bright ideas in the form of light bulbs in the pocket are not enough—they must be plugged in and this can only be possible if people know what there is to be known, can find it when they need, can understand it and—perhaps most important—are convinced that this knowledge should be put to work. A slogan for this phase might be something like: "taxonomy before technology" (Koenig, 2002, p. 3).

Nancy Dixon has another take on the three eras of KM. She lists the three major phases as: leveraging explicit knowledge, leveraging experiential knowledge, and leveraging collective knowledge (Dixon, 2010). KM evolved from capturing documents and specific content (1995 to 2000) to being able to connect to knowledgeable people using communities of practice and expertise locator systems (from 2000 to 2005). This was followed by increasingly complex KM solutions that created new knowledge through collective interactions such as conversations in order to integrate multiple perspectives (2005 to present).

Dixon (2010) notes that initially KM focused on creating repositories and databases with the best practices and lessons learned of the organized in a "library model," but by the year 2000 it became clear that it was difficult to get people to document and contribute their knowledge to this library. Users did not make use of this content and some of the more valuable knowledge was not documented at all. The focus shifted to tacit knowledge around this time. Etienne Wenger had published *Communities of Practice* in 1999 and Nancy Dixon published *Common Knowledge* in 2000. Organizations began implementing more reflective exercises such as project post mortems and after action reviews in order to have groups of employees share their tacit knowledge. Expertise locator systems helped to "point" to knowledgeable people in the organization, and communities of practice were created to facilitate knowledge sharing among professionals. While these forms of peer-to-peer sharing worked well, it was difficult to integrate managers, it was difficult to document and share this knowledge more widely, and it did not contribute as much to innovation as was initially expected. The final phase, leveraging collective expertise, began around 2005 and Dixon (2010) notes that it held great promise in processes such as appreciative inquiry, knowledge cafés, and other conversation-based knowledge management in small and large groups. The new social media were also easily integrated together with predictive analytics, big data, and crowdsourcing to increase internal efficiency but also to promote greater organizational innovation.

A parallel evolution occurred, and is still taking place, in that KM projects were initially heavily dedicated to improving efficiency through reuse of internal best practices and avoidance of internal lessons learned. The second goal of KM, to promote innovation, was largely neglected. There is today an increasing emphasis on more externally focused KM that not only promotes efficiency but increases the capacity of the organization to innovate. KM can significantly contribute to all phases of the innovation cycle, beginning with creativity and ideation, followed by concept development and prototyping, and ending with the commercialization of a new product or service (e.g., Trott, 2004).

KM for Individuals, Groups, and Organizations

Knowledge management provides benefits to individual employees, to groups, and to the organization itself. This three-tiered view of KM helps emphasize why KM is important today (see figure 1.6).

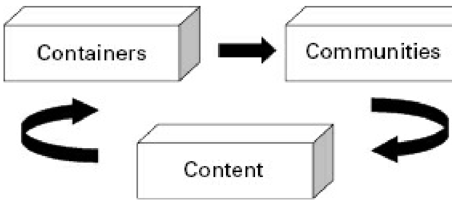

Figure 1.6 Summary of the three major components of KM

For the individual, KM:

- Helps people do their jobs and save time through better decision making and problem solving

- Builds a sense of community bonds within an organization
- Helps people to keep up to date
- Provides challenges and opportunities to contribute

For groups, KM:

- Develops professional skills
- Promotes peer-to-peer mentoring
- Facilitates more effective networking and collaboration
- Develops a professional code of ethics that members can adhere to
- Develops a common language

For the organization, KM:

- Helps drive strategy
- Solves problems quickly
- Diffuses best practices
- Improves knowledge embedded in products and services
- Cross-fertilizes ideas and increases opportunities for innovation
- Enables organizations to better stay ahead of the competition
- Builds organizational memory

Some critical KM challenges are to manage content effectively, facilitate collaboration, help knowledge workers connect and find experts, and help the organization to learn and make decisions based on complete, valid, and well-interpreted data, information, and knowledge.

In order for knowledge management to succeed, it has to tap into what is important to knowledge workers—what is of value to them and to their professional practice, as well as what the organization stands to gain. It is important to get the balance right—if the KM initiative is too big it risks being too general, too abstract, too top-down, and far too remote to catalyze the requisite level of buy-in from individuals. If the KM initiative is too small, however, than it may not be enough to provide sufficient interaction between knowledge workers to generate synergy. The KM technology must be supportive and management must commit itself to putting into place the appropriate rewards and incentives for knowledge management activities. Last but not least, participants need to develop KM skills in order to participate effectively. These KM skills and competencies are quite diverse and varied, given the multidisciplinary nature of the field, but one particular link is often neglected and that is the link between KM skills and information professionals' skills. KM has resulted in the emergence of new roles and responsibilities and a great many of these can benefit from a healthy foundation from not only information technology (IT) but also information science. In fact, KM professionals have a crucial role to play in all KM processes, which is described in more detail in chapter 2.

Key Points

- KM is not necessarily something completely new but has been practiced in a wide variety of settings for some time now—albeit under different monikers.
- Knowledge is more complex than data or information—it is subjective, often based on experience and highly contextual.
- There is no generally accepted definition of KM but most practitioners and professionals concur that KM treats both tacit and explicit knowledge with the objective of adding value to the organization.
- Each organization should define KM in terms of the business objective; concept analysis is one way of accomplishing this.
- KM is all about applying knowledge in new, previously unencumbered or novel situations.
- KM has its roots in a variety of different disciplines.
- The KM generations to date have focused first on containers, next on groups, and finally on the content itself.

Discussion Points

1. Use concept analysis to clarify the following terms:
   a. Intellectual capital versus physical assets
   b. Tacit knowledge versus explicit knowledge
   c. Use versus reuse
2. "Knowledge management is not anything new." Would you argue that this statement is largely true or false? Why or why not? Use historical antecedents to justify your arguments.
3. What are the three generations of knowledge management to date? What was the primary focus of each?
4. What are the different types of roles required for each of the above three generations?
5. What are the two major overarching goals for KM?
6. What are the key benefits of KM?

Notes

1. See http://www.johngirard.net/km.

2. See http://www.jainworld.com/literature/story25.htm.

3. See http://graduateway.com/knowledge-management-in-accenture/.

4. See https://www2.deloitte.com/lu/en/pages/strategy/solutions/knowledge-management.html.

5. Available at http://www.entovation.com/timeline/timeline.htm.

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2 Knowledge Management Processes

> A little knowledge that acts is worth infinitely more than much knowledge that is idle.
>
> —Kahlil Gibran (1883–1931)

This chapter provides a description of the major processes involved in knowledge management, encompassing the capture, creation, codification, sharing, accessing, applying, and reuse of knowledge within and between organizations. Major KM processes are presented from Meyer and Zack (1996), Bukowitz and Williams (2000), McElroy (2003), Wiig (1993), Carlile and Rebentisch (2003), and Evans et al. (2015). A comprehensive review of KM process frameworks by Heisig (2009) is included. A synthesis of these approaches is then developed as a framework for following the path information takes to become a valuable knowledge asset for a given organization. This chapter concludes with a discussion of the strategic and practical implications of managing knowledge throughout the KM life cycle.

Learning Objectives

1. Describe how valuable individual, group, and organizational knowledge is captured, created, codified, shared, accessed, applied, and reused throughout the knowledge management cycle.
2. Compare and contrast major KM processes: are some using the same label for the same process? Are some distinct processes?
3. Define the major KM processes and provide concrete examples of each.
4. Identify the major challenges and benefits of each KM process.
5. Describe the additional challenges posed by global or distributed KM processes.

Introduction

Effective knowledge management requires an organization to identify, generate, acquire, diffuse, and capture the benefits of knowledge that provides a strategic advantage to that organization. A clear distinction must be made between information—which can be digitized—and true knowledge assets—which can only exist within the context of an intelligent system. As we are still far from the creation of artificial intelligence systems, this means that knowledge assets reside within a human knower—not the organization per se. A knowledge-information cycle can be envisaged as the route information follows in order to become transformed into a valuable strategic asset for the organization via a knowledge management cycle.

One of the major KM processes aims at identifying and locating knowledge and knowledge sources within the organization. Valuable knowledge is then translated into explicit form, often referred to as codification of knowledge, in order to facilitate more widespread dissemination. Networks, practices, and incentives are instituted to facilitate person-to-person knowledge transfer as well as person-knowledge content connections in order to solve problems, make decisions, or otherwise act based on the best possible knowledge base. Once this valuable, field-tested knowledge and know-how is transferred to an organizational knowledge repository, it is said to become part of "corporate memory." This is sometimes also referred to as "ground truth."

As was the case with a generally accepted definition of KM, a similar lack of consensus exists with respect to the terms used to describe the major steps in the KM cycle. Table 2.1 summarizes the major terms found in the KM literature:

Table 2.1 A comparison of key KM processes

Wiig (1993)	McElroy (1999)	Bukowitz and Williams (2000)	Meyer and Zack (1996)	Carlile and Rebentisch (2003)	Evans, Dalkir, and Bidian (2015)
Creation	Individual and group learning	Get	Acquisition	Identify explicit, create tacit knowledge	
Sourcing	Knowledge claim validation	Use	Refinement		
Compilation	Information acquisition	Learn	Store/retrieve	Store	Store
Transformation	Knowledge validation	Contribute	Distribution	Share	
Dissemination	Knowledge integration	Assess	Presentation		
Application		Build/sustain		Use	Retrieve
Value realization		Divest		Learn	Transform

However, upon closer inspection, the differences are not really that great. The terms used differ but there does appear to be some overlap in terms of the different types of steps involved in a KM cycle. Heisig (2009) undertook a very comprehensive review where he compared 160 KM frameworks. He too found that a wide range of terms were used however there were common underlying categories for KM processes such as: share, create, use, store, identify, and acquire. To this end, the following frameworks were selected as they met the following criteria:

- Implemented and validated in real-world settings
- Comprehensive with respect to the different types of steps found in the KM literature
- Included detailed descriptions of the KM processes involved in each of the steps

These KM cycle approaches from Meyer and Zack (1996), Bukowitz and Williams (2000), McElroy (2003), Wiig (1993), Carlile and Rebentisch (2003), and Evans et al. (2015)) are described in greater detail in this chapter.

Major Approaches to the KM Cycle

The Meyer and Zack KM Cycle

The Meyer and Zack KM cycle is derived from work on the design and development of information products (Meyer & Zack, 1996). A number of lessons learned from the cycle that physical products follow within an organization can be applied to the management of knowledge assets. Information products are broadly defined as any information *sold* to internal or external customers such as databases, news synopses, customer profiles, and so forth. Meyer and Zack (1996) propose that research and knowledge about the design of physical products can be extended into the intellectual realm to serve as the basis for a KM cycle.

This approach provides a number of useful analogies such as the notion of a product platform (the knowledge repository) and the information process platform (the knowledge refinery) to emphasize the notion of value-added processes required in order to leverage the knowledge of an organization. The KM cycle consists primarily of creating a higher value-added knowledge product at each stage of knowledge processing. For example, a basic database may represent an example of knowledge that has been created. Value can then be added by extracting trends from this data. The original information has been repackaged to now provide trend analyses that can serve as the basis for decision making within the organization. Similarly, competitive intelligence can be gathered and synthesized in order to repackage raw data into meaningful, interpreted, and validated knowledge that is of immediate value to users—that is, it can be put into action directly. Yet another example is a news gathering service that summarizes or repackages information to meet the needs of distinct, different individuals through profiling and personalizing value-added activities.

Meyer and Zack echoed other authors in stressing "the importance of managing the evolution and renewal of product architecture for sustained competitive success … different architectures result in different product functionality, cost, quality, and performance. Architectures are … a basis for product innovation …" (1996, p. 44). Research and knowledge about the design of physical information products can inform the design of a KM cycle. In Meyer and Zack's approach, the interfaces between each of the stages are designed to be seamless and standardized. Experience suggests the critical importance of specifying internal and external user interfaces in order to do so.

The Meyer and Zack KM cycle processes are composed of the technologies, facilities, and processes for manufacturing products and services. They suggest that information products are best viewed as a repository comprising information content and structure. Information content is the data held in the repository that provides the building blocks for the resulting information products. The content is unique for each type of business or organization. For example, banks have content relating to personal and commercial accounts, insurance companies hold information on policies and claims, pharmaceutical companies will have accumulated a large body of scientific and marketing knowledge around each product under design or currently sold.

In addition to the actual content, the other important elements to consider are the overall structure and approach as to how the content is stored, manipulated, and retrieved. The information unit is singled out as the formally defined atom of information to be stored, retrieved, and manipulated. This notion of a unit of information is a critical concept that should be applied to knowledge items as well. A focus at the level of a knowledge object distinguishes KM from document management. While a document management system (DMS) stores, manipulates, and retrieves documents as integral wholes, KM can easily identify, extract, and manage a number of different knowledge items (sometimes referred to as "knowledge objects") within the same document. The unit under study is thus quite different—both in nature and scale. This again links us back to the notion that KM is not about exhaustive collection of voluminous content but rather more selective sifting and modification of existing captured content. The term often used today is "content management systems."

Different businesses once again make use of unique meaningful information units. For example, a repository of financial statements is held in Mead's Data System Nexis and the footnotes can be defined as information units. A user is able to select a particular financial statement for analysis based on key attributes of the footnotes. An expertise location system may have, as knowledge objects, the different categories of expertise that exist within that organization (e.g., financial analysis) and these attributes are used to search for, select, and retrieve specific knowledgeable individuals within the company.

The structure for the repository further includes schemes for labeling, indexing, linking, and cross-referencing the information units that together comprise the content of KM. Although Meyer and Zack addressed the information product, their approach is applicable not only to knowledge objects but to sources of missed opportunity in the KM field. We are, ironically, not always practicing what we are preaching. This is quite evident in KM approaches to knowledge organization throughout the KM cycle: knowledge does indeed possess unique attributes—however, this does not mean we should adopt a tabula rasa approach and reinvent decades' worth of tried, tested, and true methods and approaches to content management. This is particularly true of explicit, formal, and codified knowledge where this type of knowledge really follows mostly similar processes as information products do in general. In the case of tacit knowledge, content management approaches need to be further adapted but once again, solid content management should serve as a departure point.

The repository becomes the foundation upon which a firm creates its family of information and knowledge products. This means that the greater the scope, depth, and complexity, the greater the flexibility for deriving products and thus the greater the potential variety within the product family. Such repositories often form the first kernel of an organizational memory or corporate memory for the company. A sample repository for a railway administration organization is shown in figure 2.1.

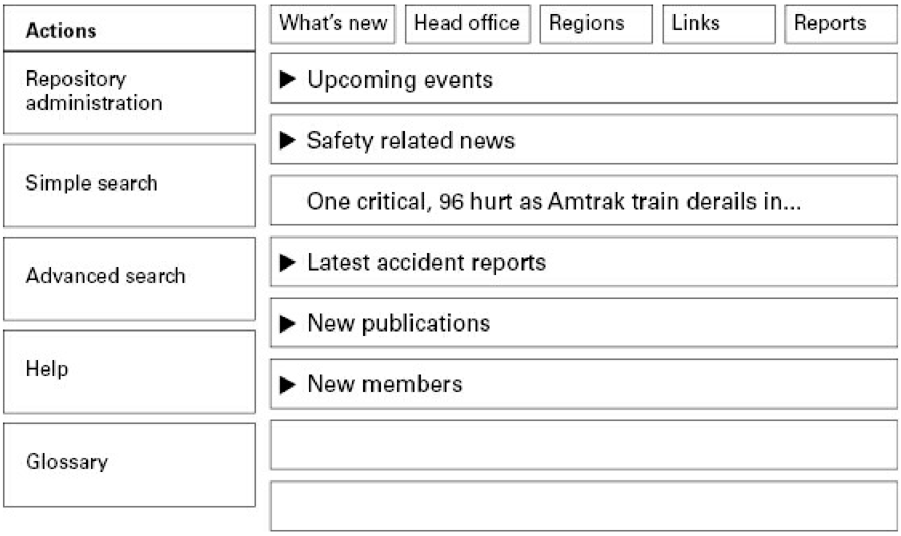

Figure 2.1 Sample screen for a repository

Meyer and Zack analyzed the major developmental stages of a knowledge repository and these stages were mapped on to a KM cycle consisting of: acquisition, refinement, storage/retrieval, distribution, and presentation/use. Meyer and Zack refer to this as the "refinery." Figures 2.2 and 2.3 summarize the major stages in the Meyer and Zack cycle.

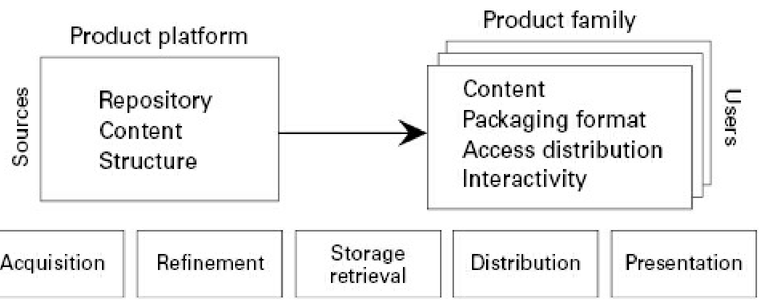

Figure 2.2 High-level view of the Meyer and Zack Information Cycle

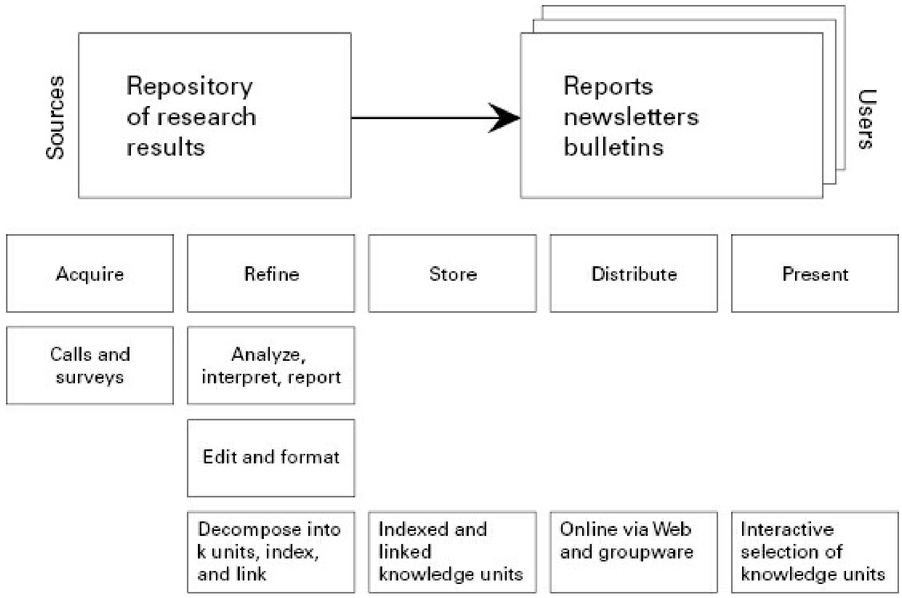

Figure 2.3 Detailed view of the Meyer and Zack Information Cycle

Acquisition of data or information addresses the issues regarding sources of raw materials such as scope, breadth, depth, credibility, accuracy, timeliness, relevance, cost, control, exclusivity, and so on. The guiding principle is the well-known adage of "garbage in garbage out"—that is, source data must be of the highest quality, otherwise the intellectual products produced downstream will be inferior.

Refinement is the primary source of value added. This may be physical (e.g., migrating from one medium to another) or logical (restructuring, relabeling, indexing, and integrating.) Refining also refers to cleaning up (e.g., sanitizing content so as to ensure complete anonymity of sources and key players involved) or standardizing (e.g., conforming to templates of a best practice or lesson learned as used within that particular organization). Statistical analyses can be performed on content at this stage to conduct a meta-analysis (e.g., high-level summary of key themes, or patterns found in a collection of knowledge objects). This stage of the Meyer and Zack cycle adds value by creating more readily usable knowledge objects and by storing the content more flexibly for future use.

Storage/retrieval forms a bridge between the upstream acquisition and refinement stages that feed the repository and downstream stages of product generation. Storage may be physical (file folders, printed information) or digital (database, knowledge management software).

Distribution describes how the product is delivered to the end user (e.g., fax, print, email) and encompasses not only the medium of delivery but also its timing, frequency, form, language, and so on.

The final step is presentation or use. It is here that context plays a very important role. The effectiveness of each of the preceding value-added steps is evaluated here: does the user have sufficient context to be able to make use of this content? If not, the KM cycle has failed to deliver value—to the individual and ultimately to the organization.

In order for the cycle to work as intended, front-end knowledge needs to be provided. This is typically in the form of rules on how to identify source information, acquire it, refine it, and subsequently add it to the organization's information repository. There may also be a similar need at the final stage—rules on how content may be distributed and used, such as copyright, attribution, confidentiality, and other restrictions that may apply.

The repository and the refinery together enable the management of valuable knowledge of a firm. They need to in turn be supported by the firm's core capabilities in information technology, internal knowledge about their business, external knowledge about current and emerging environments, as well as how the firm organizes and manages itself. The flexibility with which the firm can create content-based products forms the basis of the firm's ability to realize market leverage from its information assets.

Although it is not explicitly described in the Meyer and Zack cycle, there is also a notion of having to continually renew the repository and the refinery in order to avoid obsolescence. Renewal should be added to the cycle diagram in the form of a feedback loop that involves rethinking the basic content and structure of the repository to decide whether different, newer products or repackaging is required. This may mean increasing the depth of an analysis, updating a report, greater integration, more sophisticated cross-linking, or greater standardization of content.

The Meyer and Zack model is one of the most complete descriptions of the key elements involved in the knowledge management model. Its strength derives primarily from its comprehensive information-processing paradigm that is almost completely adaptable to knowledge-based content. In particular, the notion of refinement is a crucial stage in the KM cycle and one that is often neglected.

The Bukowitz and Williams KM Cycle

Bukowitz and Williams (2000, p. 8) describe a Knowledge Management Process Framework that outlines "how organizations generate, maintain, and deploy a strategically correct stock of knowledge to create value." This framework is shown in figure 2.4.

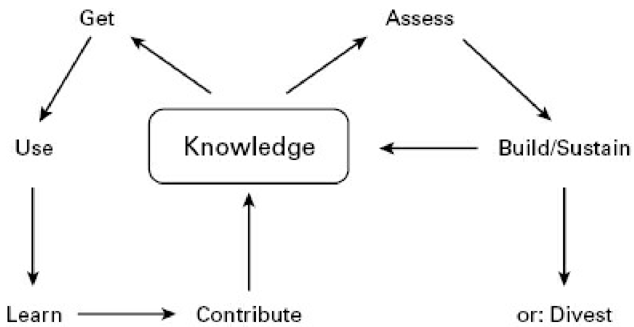

Figure 2.4 The Bukowitz and Williams KM Cycle

In this framework, knowledge consists of knowledge repositories, relationships, information technologies, communications infrastructures, functional skill sets, process know-how, environmental responsiveness, organizational intelligence, and external sources, among others. The "get," "learn," and "contribute" phases are tactical in nature. They are triggered by market-driven opportunities or demands and typically result in day-to-day use of knowledge to respond to these demands. The "assess," "build/sustain," or "divest" stages are more strategic in nature, triggered by shifts in the macroenvironment. These stages focus on more long-range processes of matching intellectual capital to strategic requirements.

The first stage, get, consists of seeking out information needed in order to make decisions, solve problems, or innovate. The challenge today is not so much in finding information but in dealing effectively with the enormous volume of information that can be obtained. Technology has created great strides in providing access to an ever-increasing pool of information. The resultant information overload has created a critical need to be able to sift through the vast volume of content, identify the knowledge of value, and to then manage this knowledge effectively and efficiently. Information professionals have traditionally fulfilled this role and they are certainly needed—more than ever. User needs must be well understood in order to match information seekers with the best possible content. This involves knowing where knowledge resources exist and can be accessed.

Where KM diverges from IM is that getting of content encompasses not only traditional explicit content (e.g., a physical or electronic document) but also tacit knowledge. This means information users need not only be connected to content but also to content experts—people—where most of the valuable tacit knowledge resides. The term "cybrarian" is sometimes used to describe the new knowledge professional role. The key tasks are to organize knowledge content; maintain timeliness, completeness, and accuracy; profile users' information needs; access/navigate/filter voluminous content in order to respond to users' needs; and help train users with new knowledge repository technologies (information literacy).

The next use stage deals with how to combine information in new and interesting ways in order to foster organizational innovation. The focus is primarily on individuals and then on groups. The narrow focus on innovation as the reason for making use of intellectual assets is somewhat limiting in this KM cycle. The authors discuss a number of techniques to promote serendipity and outside-of-the-box thinking or creativity-enhancing techniques. Although the notion of promoting the most fluid flow of knowledge is a worthwhile pursuit, the uses of knowledge are much wider in scope than innovation.

The learn stage refers to the formal process of learning from experiences as a means of creating competitive advantage. An organizational memory is created so that organizational learning becomes possible—from both successes (best practices) and failures (lessons learned). The links between learning and creating value are harder to establish than those of getting and using information. Learning in organizations is important because it represents the transition step between the application of ideas and the generation of new ones. Time must be taken to reflect on experience and consider its possible value elsewhere. There should be a strong link between organizational strategy and organizational learning activities. Learning is absolutely essential after the getting and using of content—otherwise, the content is simply warehoused somewhere and not making a difference in how things are done within the organization.

The contribute stage of the KM cycle deals with getting employees to post what they have learned to the communal knowledge base (e.g., a repository). This is the only way to make individual knowledge visible and available across the entire organization—where appropriate. The last caveat is added, as there is a tendency toward warehousing of all knowledge, which should not be the focus of KM. Many authors use this sequence of steps and they have the unfortunate effect of creating the misconception that KM is all about making public all that resides within the heads of individuals. Needless to say, the impact on motivation of employees plummets considerably! The point of the exercise is not to post everything on the company intranet but to cull those experiences from which others in the organization may also benefit. This implies that the experience has potential to be generalized. In fact, a great deal of content to be shared organization-wide must first be repackaged in a generic format in order to be of use to a wider audience.

Examples of content that employees should be encouraged to contribute include the transfer of best practices across the organization to apply the experience gained from experience or unit to others, and lessons learned, which refer to less successful outcomes that should be noted so that the same mistakes are not repeated by others. The authors describe a number of carrots and sticks that can be used to promote knowledge sharing. Practice has proven that knowledge sharing does not succeed without any heavy direct pay-per-contribution schemes; nor does it suceed with equally onerous punish-the-withholders mentality. In order for successful knowledge sharing to occur, it must make sense—that is, the benefits to both the organization and the individuals must exist and be clearly perceived as such. The other critical success factor appears to lie with the successful deployment of knowledge brokers—professionals who assume the responsibility of gathering, repackaging, and promoting knowledge nuggets throughout the organization. Third, a good system should be in place to maintain the results of organizational learning—a good organizational memory management system, often in the form of an intranet of some sort. Part of good organizational memory management practice should be to always maintain attribution, require authorization for dissemination, provide feedback mechanisms, and keep track of knowledge reuse. One of the best rewards of contributing is to be notified of how popular your contributions were (which is analogous to a citation index for scholarly publications).

Next, the assess stage deals more with the group and organizational level. Assessment refers to the evaluation of intellectual capital. This requires the organization to define mission-critical knowledge and map current intellectual capital against future knowledge needs. The organization must also develop metrics to demonstrate that it is growing its knowledge base and profiting from its investments in intellectual capital. The theory of the organization needs to be expanded to include capturing the impact of knowledge on organizational performance. This includes identifying new forms of capital such as human capital (competencies), customer capital (the customer relationship), organizational capital (knowledge bases, business processes, technology infrastructure, values, norms, and culture), and intellectual capital (the relationship between human, customer, and organizational capital). Assessment must take into account these new types of assets and focus on how easily and flexibly the organization can convert its knowledge into products and services of value to the customer. A new set of frameworks, processes, and metrics that evaluate the knowledge base must be incorporated into the overall management process.

The build and sustain step in the KM cycle ensures that future intellectual capital of the organization will keep the organization viable and competitive. Resources must be allocated to the growth and maintenance of knowledge, and they should be channeled in such a way as to create new knowledge and reinforce existing knowledge. At the tactical level, the inability to locate and apply knowledge to meet an existing need results in a lost opportunity. At the strategic level, coming up short on the *right* knowledge delivers a much more serious blow—loss of competitiveness and ultimately of organizational viability.

The final step in the Bukowitz and Williams KM cycle is the divest step. The organization should not hold on to assets—physical or intellectual—if they are no longer creating value. In fact, some knowledge may be more valuable if transferred outside the organization. In this step of the KM cycle, organizations need to examine their intellectual capital in terms of the resources required to maintain it and whether these resources would be better spent elsewhere. This involves understanding the why, when, where, and how of formally divesting parts of the knowledge base. An opportunity cost analysis of retaining knowledge should be incorporated into standard management practice. It is necessary to be able to understand which parts of the knowledge base will be unnecessary for sustaining competitive advantage and industry viability.

Traditional divestiture decisions regarding knowledge include obtaining patents, spinning off companies, outsourcing work, terminating a training program and/or employees, replacing/upgrading technologies, and ending partnerships, alliances, or contracts. However, KM requires a planned purposeful form of divesting that means that the decision to be made is a strategic one, not an operational task. Ideally, unnecessary knowledge should not have been acquired in the first place—the organization should put into place processes to clearly discriminate between forms of knowledge that can be leveraged and those that are of limited use. Knowledge that is a drain on resources should be converted into value. This often involves converting rather than getting rid of knowledge—for example, by redeploying the knowledge elsewhere within or outside of the organization.

The Bukowitz and Williams KM cycle introduces two new critical phases: the learning of knowledge content and the decision as to whether to maintain this knowledge or divest the organization of this knowledge content. This KM cycle is more comprehensive than the Meyer and Zack cycle as the notion of tacit as well as explicit knowledge management has been incorporated.

The McElroy KM Cycle

McElroy (1999) describes a knowledge life cycle that consists of the knowledge processes of knowledge production and knowledge integration, with a series of feedback loops to organizational memory, beliefs, claims, and the business-processing environment. The high-level processes are shown in figure 2.5.

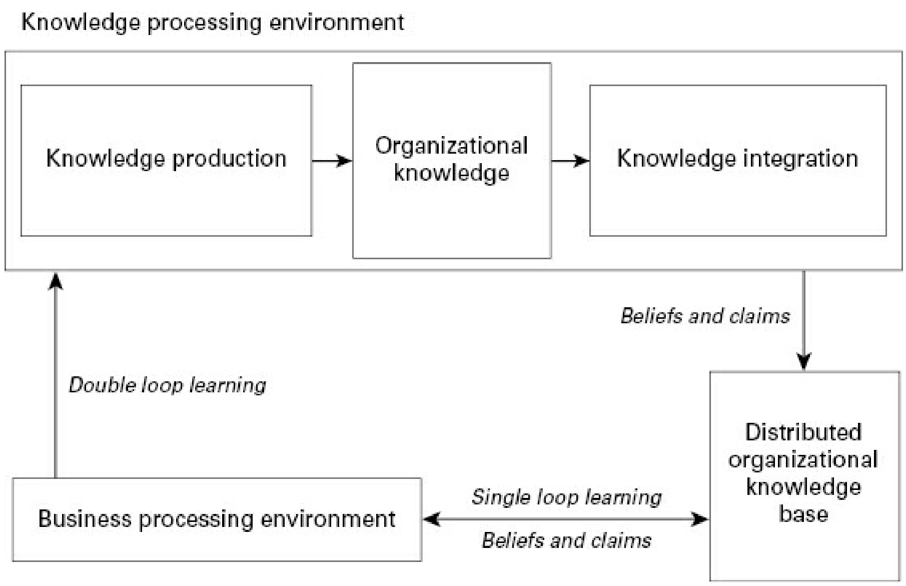

Figure 2.5 High-level processes in the McElroy KM Cycle

McElroy emphasizes that organizational knowledge is held both subjectively in the minds of individuals and groups and objectively in explicit forms. Together, they comprise the distributed organizational knowledge base of the company. Knowledge use in the business-processing environment results in outcomes that either match expectations or outcomes that fail to do so. Matches reinforce existing knowledge, leading to its reuse, whereas mismatches lead to adjustments in business processing behavior via single loop learning (Argyris & Schon, 1978). Successive failures from mismatches will lead to doubt and ultimately rejection of existing knowledge, which will in turn trigger knowledge processing to produce and integrate new knowledge, this time via double-loop learning (Argyris & Schon, 1978).

The term “problem claim formulation” represents an attempt to learn and state the specific nature of the detected knowledge gap. Knowledge claim formulation follows as a response to validated problem claims via information acquisition and individual and group learning. New knowledge claims are tested and evaluated via knowledge claim evaluation processes. Evaluation of knowledge claims lead to surviving knowledge claims which will be integrated as new organizational knowledge or falsified/undecided knowledge claims. The record of all such outcomes becomes part of the distributed organizational knowledge base via knowledge integration. Once integrated, they are used in business processing. Experience gained from the use of knowledge in the organizational knowledge base gives rise to new claims and resulting beliefs, triggering the cycle to begin all over again.

In knowledge production, the key processes are: individual and group learning, knowledge claim formulation, information acquisition, codified knowledge claim, and knowledge claim evaluation. Figure 2.6 illustrates these knowledge production processes.

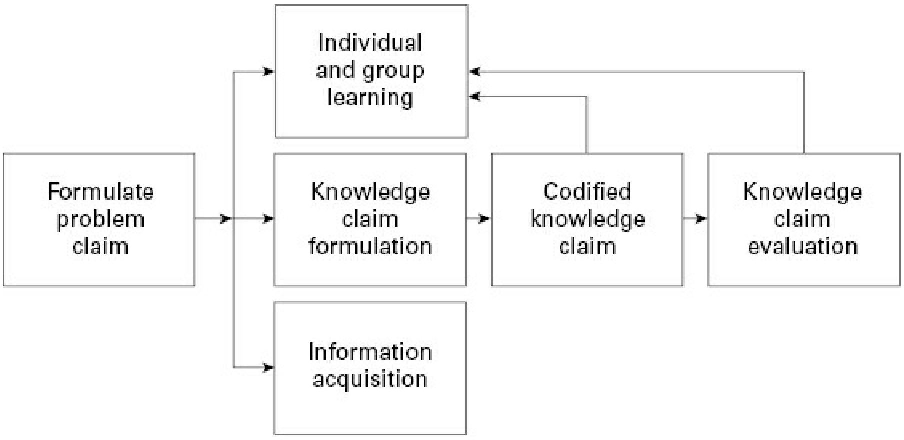

Figure 2.6 Knowledge production processes in the McElroy KM Cycle

Individual and group learning represents the first step in organizational learning. Knowledge is information until it is validated. Knowledge claim validation involves codification at an organizational level. A formalized procedure is required for the receipt and codification of individual and group innovations. Information acquisition is the process by which an organization deliberately or serendipitously acquires knowledge claims or information produced by others, usually external to the organization. This stage plays a fundamental role in the formulation of new knowledge claims at the organizational level. Examples include competitive intelligence, subscription services, library services, research initiatives, think tanks, consortia, and personalized information services. Knowledge claim evaluation is the process by which knowledge claims are evaluated to determine their veracity and value. This implies that they are of greater value than existing knowledge in the organizational knowledge base. Figure 2.7 shows some of the components of this stage of the knowledge cycle.

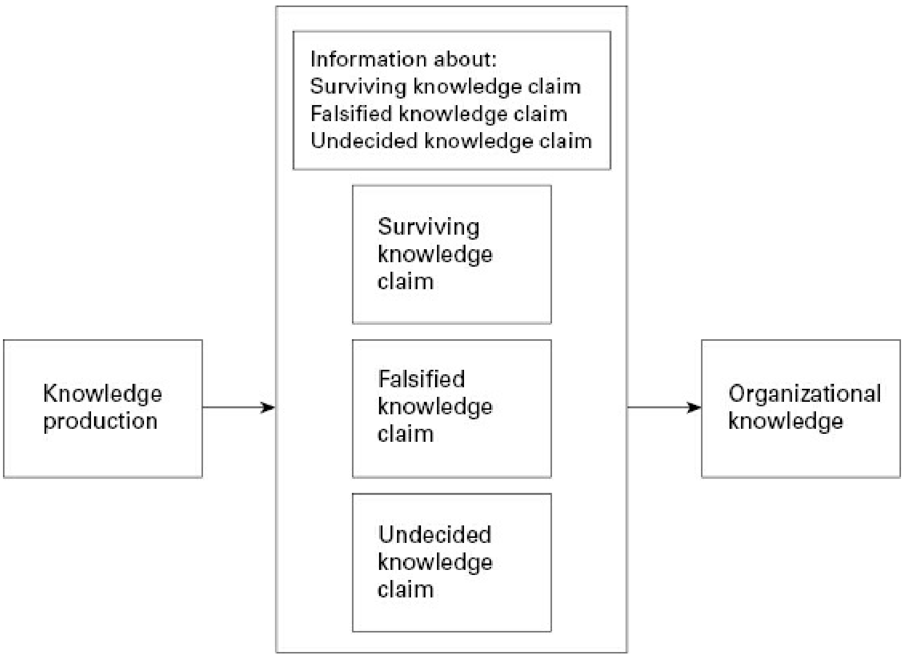

Figure 2.7 Knowledge claim evaluation processes in the McElroy KM Cycle

Knowledge integration is the process by which an organization introduces new knowledge claims to its operating environment and retires old ones. This includes all knowledge transmission such as teaching, knowledge sharing, and other social activities that communicate either an understanding of previously produced organizational knowledge to knowledge workers, or integrate newly minted knowledge. Figure 2.8 describes this stage of the KM cycle.

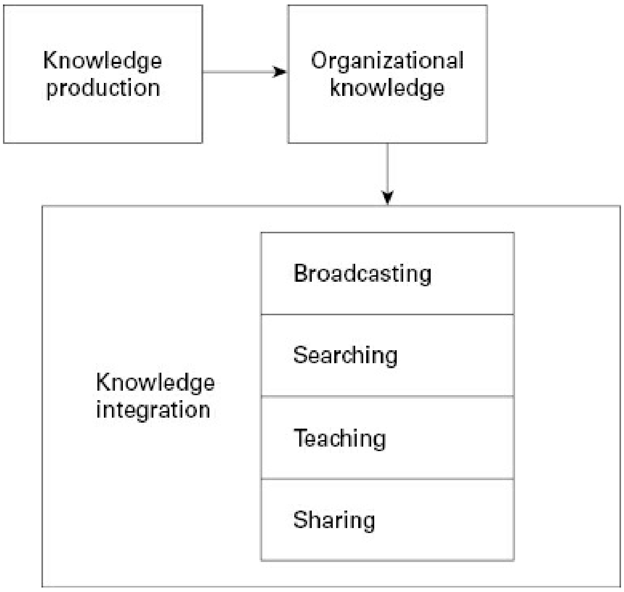

Figure 2.8 Knowledge integration processes in the McElroy KM Cycle

One of the great strengths of the McElroy cycle is the clear description of how knowledge is evaluated and how a conscious decision is made as to whether or not it will be integrated into the organizational memory. The validation of knowledge is a step that clearly distinguishes knowledge management from document management. The KM cycle does more than address the storage and subsequent management of documents or knowledge that has been warehoused as is. The KM cycle focuses on processes to identify knowledge content that is of value to the organization and its employees.

The Wiig KM Cycle

Wiig (1993) focuses on the three conditions that need to be present for an organization to conduct its business successfully: it must have a business (products and services) and customers for them, it must have resources (people, capital, facilities), and it must have the ability to act. The third point is emphasized in the Wiig KM cycle.

Knowledge is the principal force that determines and drives the ability to act intelligently. With improved knowledge we know better what to do and how to do it. Wiig identifies the major purpose of KM as an effort: "to make the enterprise intelligent-acting by facilitating the creation, cumulation [*sic*], deployment, and use of quality knowledge" (p. 39). Working smarter means that we must approach our tasks with greater expertise—that we must acquire as much relevant and high-quality knowledge as possible and apply it better in a number of different ways. Working smarter "involves making use of all the best knowledge we have available" (p. 51).

Wiig's KM cycle addresses how knowledge is built and used as individuals or as organizations. There are four major steps in this cycle, as shown in figure 2.9:

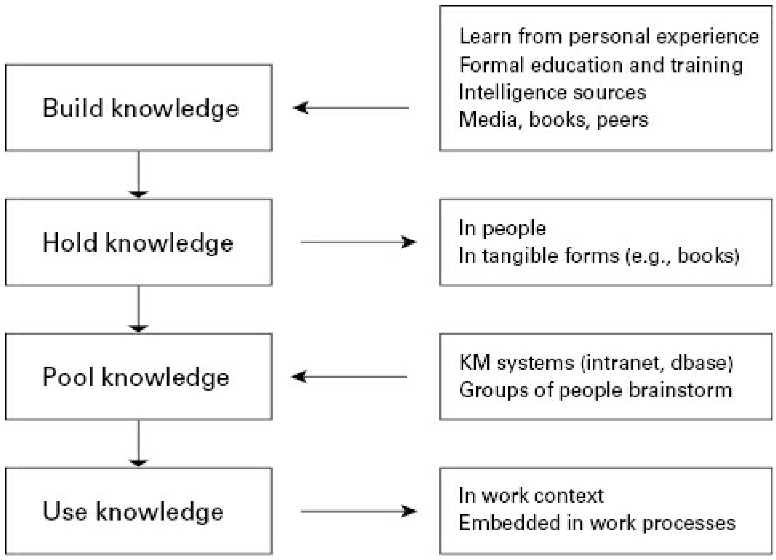

Figure 2.9 The Wiig KM Cycle

1. Building knowledge
2. Holding knowledge
3. Pooling knowledge
4. Applying knowledge

Although the steps are shown as independent and sequential, this is a simplification since some of the functions and activities may be performed in parallel. It is also possible to cycle back to repeat functions and activities performed earlier but with a different emphasis and/or level of detail. The cycle addresses a broad range of learning from all types of sources: personal experience, formal education or training, peers, and intelligence from all sources. We can then hold knowledge either within our heads or in tangible forms such as books or databases. Knowledge can then be pooled and used in a variety of different ways depending on the context and the purpose.

The cycle focuses on identifying and relating the functions and activities that we engage in to make products and services as knowledge workers.

Building knowledge refer to a wide range of activities ranging from market research, focus groups, surveys, competitive intelligence, and data mining applications. Building knowledge consists of five major activities:

1. Obtain knowledge
2. Analyze knowledge
3. Reconstruct/synthesize knowledge
4. Codify and model knowledge
5. Organize knowledge

Knowledge creation may occur through R&D projects, innovations by individuals to improve they way in which they perform their tasks, experimentation, reasoning with existing knowledge, and hiring new people. Knowledge creation may also be through knowledge importing (e.g., elicit knowledge from experts, from procedure manuals, by a joint venture to obtain technology, or by transferring people between departments). Finally, knowledge may be created through observing the real world (e.g., site visits, observing processes after the introduction of a change).

Knowledge analysis consists of:

- Extracting what appears to be knowledge from obtained material (e.g., analyze transcripts and identify themes, listen to an explanation, and select concepts for further consideration)
- Abstract extracted materials (e.g., form a model or a theory)
- Identify patterns extracted (e.g., trend analysis)
- Explain relations between knowledge fragments (e.g., compare and contrast, causal relations)

- Verify that extracted materials correspond to meaning of original sources (e.g., meaning has not been corrupted through summarizing, collating etc.).

Knowledge synthesis or reconstruction consists of generalizing analyzed material to obtain broader principles, generating hypotheses to explain observations, establishing conformance between new and existing knowledge (e.g., corroborating validity in light of what is already known), and updating the total knowledge pool by incorporating the new knowledge.

Codifying and modeling knowledge addresses how we represent knowledge in our minds (e.g., mental models), how we then assemble the knowledge into a coherent model, how we document the knowledge in books and manuals, and how we encode it in order to post it to a knowledge repository.

Finally, knowledge is organized for specific uses and according to an established organizational framework (e.g., standards, categories). Some examples would include a help desk service or a list of frequently asked questions (FAQs) on the company intranet. This organization is usually done using some form of knowledge ontology (conceptual model) and taxonomy (classification rules). Examples would include an official list of key words or categories, knowledge object attribute specifications, and guidelines for translation.

Holding knowledge consists of remembering, accumulating knowledge in repositories, embedding knowledge in repositories, and archiving knowledge. Remembering knowledge means that the individual has retained or remembered that item of knowledge (e.g., knowledge has been internalized, understood by a given individual). Accumulating knowledge in a repository means creating a computer-resident knowledge base and encoding knowledge so that it can be stored in organizational memory. Knowledge is then embedded in the repository by ensuring they are part of business procedures (e.g., added to a procedures manual, training course). Finally knowledge must be archived by creating a scientific library and by systematically retiring out-of-date, false, or no longer relevant knowledge from the active repository. The latter typically involves storing the content in another, less costly or less bulky medium for less frequent future retrieval.

Examples of knowledge held by companies includes intellectual property, patents, knowledge documented in the form of research reports, technical papers, or tacit knowledge, which remains in the minds of individuals but which may be elicited and embedded in the knowledge base or repository (e.g., tips, tricks of the trade, case studies, videotapes of demonstrations by experts, and task support systems). In this way, the valuable knowledge held by the organization is documented in repositories or in people and is herefore available for future reference and use.

Knowledge pooling consists of coordinating knowledge, assembling knowledge, and accessing and retrieving the knowledge. Coordination of knowledge typically requires the formation of collaborative teams to work with particular content in order to create a "who knows what" network. Once knowledge sources are identified, they are then assembled into background references for a library or repository in order to make subsequent access and retrieval easier. Focus groups are often used in order to arrive at a consensus as to how this can best be achieved. Access and retrieval then addresses being able to consult with knowledgeable people about difficult problems, obtaining a second opinion from an expert, or discussing a difficult case with a peer.

Knowledge can be accessed and retrieved directly from the repository as well (e.g., using a knowledge base system to obtain advice on how to do something or reading a knowledge document in order to be able to arrive at a decision).

Organizations may pool knowledge in a variety of ways. An employee may realize that he or she does not have the necessary knowledge and know-how to solve a particular problem. The individual can contact others in the organization that have faced and solved similar problems by either obtaining the information from the organizational knowledge repository or by finding an expert through the expertise locator network and contacting that person directly to obtain help. The individual can then organize all this information and request that more experienced knowledge workers validate the content.

Finally, there are too many potential ways to apply the knowledge to list exhaustively. Some examples include:

- Use established knowledge to perform a routine task (e.g., make standard products, provide a standard service, or use the expert network to find out who is knowledgeable about a particular area).
- Use general knowledge to survey exception situations at hand) e.g., determine what the problem is, estimate potential consequences).
- Use knowledge to describe situation and scope (e.g., identify the problem and in general how it should be handled).

- Select relevant special knowledge to handle the situation (e.g., identify who you need to consult with or have address the problem).
- Observe and characterize situation with special knowledge (e.g., compare with known patterns and history; collect and organize required information to act).
- Analyze situation with knowledge (e.g., judge whether it can be handled internally or if outside help will be required).
- Synthesize alternative solutions with knowledge (e.g., identify options, outline different approaches that may be taken).
- Evaluate potential alternatives using special knowledge (e.g., determine risks and benefits of each possible approach).
- Use knowledge to decide what to do (e.g., rank alternatives, select on, and do a reality check).
- Implement selected alternatives, (e.g., execute the task, and authorize the team to proceed).

When knowledge is applied to work objects, routine and standard tasks are approached in a different way from difficult or unusual tasks. Routine or standard tasks are typically carried out using compiled knowledge that we can readily access and use almost unconsciously or automatically. Difficult tasks are usually performed in a more deliberate and conscious manner as knowledge workers cannot use automated knowledge in unanticipated situations.

Figure 2.10 summarizes the key activities in the Wiig KM cycle.

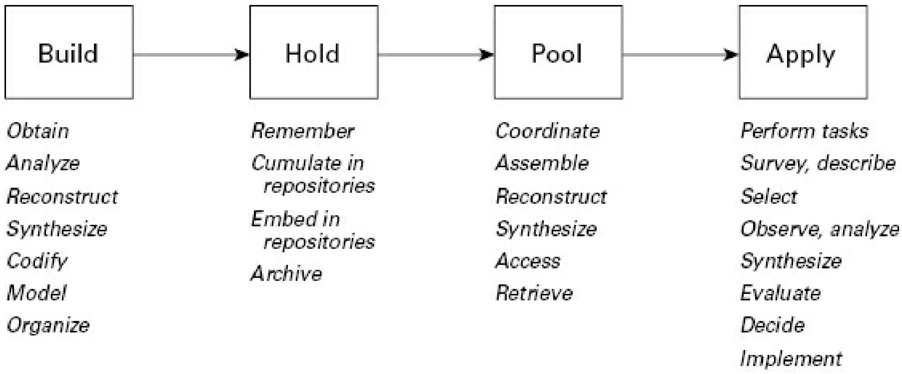

Figure 2.10 Summary of the key Wiig KM Cycle activities

One of the major advantages of the Wiig approach to the KM cycle is the clear and detailed description of how organizational memory is put into use in order to generate value for individuals, groups, and the organizational itself. The myriad ways in which knowledge can be applied and used are linked to decision-making sequences and individual characteristics. Wiig also emphasizes the role of knowledge and skill, the business use of that knowledge, constraints that may prevent that knowledge from being fully used, opportunities and alternatives to managing that knowledge, and the expected value added to the organization.

The Carlile and Rebentisch Knowledge Transformation Cycle

Carlile and Rebentisch (2003) studied how knowledge became integrated in complex technologies and products and they emphasized the path-dependent nature of knowledge transfer from one organizational group to another. New knowledge is often created through the integration of knowledge from different sources (e.g., to solve a problem, to develop a new product). Knowledge can move from one person to another as well as from one organizational unit to another. In addition, knowledge is preserved in some type of organizational storage system (often called organizational memory). The high-level cycle therefore consists of three major stages: acquisition, storage, and retrieval, as shown in figure 2.11.

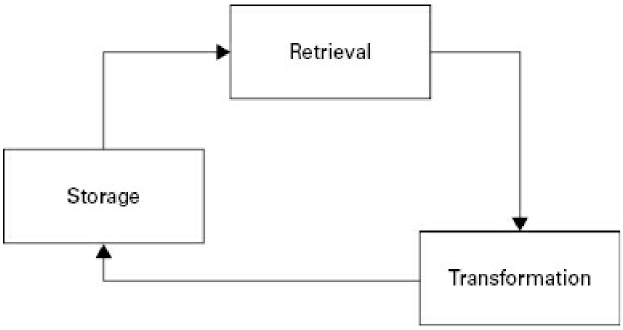

Figure 2.11 The three major stages of the Carlile and Rebentisch Knowledge Transformation Cycle

Storage consists of adding new knowledge to existing knowledge. This cycle begins with the storage process in order to underline the fact that knowledge rarely exists in a vacuum. There is almost always some organizational knowledge that already exists (although it may not necessarily be systematic and complete). Knowledge can then be retrieved from this explicit storage (typically explicit knowledge from databases, reports, etc.) but also from tacit knowledge from people. This step involves being able to identify knowledge that is needed (so people do need to know it exists), searching for this knowledge, finding it, and then assessing whether or not it is relevant, accurate, useful. and up to date. In other words, there is an assessment as to whether or not the knowledge is worthwhile. Transformation is emphasized over acquisition in order to not lose track of the fact that most reuse of knowledge does not consist of "as is" reuse: knowledge tends to be changed, at least updated, before it is reused. Once knowledge has been deemed useful, then the transformation stage begins. This may involve documenting previously undocumented knowledge, refining it, adding new metadata, and updating the knowledge.

However, more often than not, things change between the time knowledge is stored and the time it is retrieved to be used again. The organization has changed, the employees have changed, and the environment has changed (e.g., new technologies, new laws, and new challenges). The usefulness of the stored knowledge may have decreased significantly. Not only is the knowledge potentially less valuable and less useful but it may actually be detrimental to use (i.e., incorrect knowledge, or outdated knowledge). It is therefore critical to try to document the context of any given knowledge in the cycle. The more metadata (description of the content) we can capture, the more we increase the likelihood of being able to reuse this knowledge.

Box 2.1

A vignette: The importance of metadata in knowledge processes

Context: A government organization responsible for the public automobile insurance plan protects all citizens in the event of injury or death resulting from a traffic accident. Anyone involved in a traffic accident is referred to this organization and they receive any benefits they are eligible for through them. When the KM team began working with them on a KM strategy, they noticed that there was a small group of employees who worked with the "orange" files. Intrigued, the KM team asked what was special or different about this group and the files they handled. The explanation was that they were the most senior employees—senior in the sense that they were the oldest. They were the only ones allowed to handle the "orange" files, which represented accidents that had happened so long ago that different legislation had to be applied. In other words, they were the only ones who remembered what was and was not covered under previous legislative periods. The benefits one is entitled to depend on the year of one's car accident. The KM team immediately decided to prioritize this group and set up documenting metadata on these files. This meant documenting the laws and provisions that were in effect during different periods of time. Only in this way could the valuable knowledge be acquired (documented), preserved (stored as metadata), and retrieved for future use (once the employees retired as they were eligible to within about five years).

The Evans, Dalkir, and Bidian KM Cycle (KMC)

The KMC is a holistic view of KM processes that incorporates the major steps in the processes presented in the form of seven phases: identify, store, share, use, learn, improve, and create (see figure 2.12). The major contributions are a clear distinction between identifying existing knowledge (typically in explicit form) and creating new knowledge, as well as the addition of double-loop learning (Argyris and Schon, 1978, 1996), to show the process of learning and improving as knowledge is moved through the process cycle.

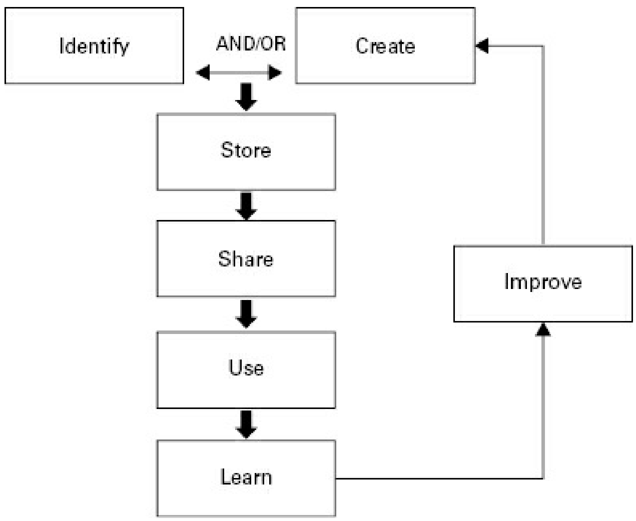

Figure 2.12 The seven KM processes in the Evans, Dalkir, and Bidian KMC

Some type of catalyst is required to mobilize the KM processes. This would typically be a knowledge need or request. The first step is to determine whether the knowledge exists or needs to be created. For example, a document may summarize the key points or you may need to sit down with the design team to elicit the key points of their innovation. Next, the knowledge should be stored in some type of organizational system and then shared both within the organization and, as appropriate, outside the organization (e.g., throughout a professional network). Once shared, knowledge can be used to solve problems, make decisions, improve on products and services, innovate, and so on. The next step, "learn," is often overlooked. Together with "improve," these stages serve to document metadata, to update, refine and, as needed, correct existing knowledge, add to it, and extend the knowledge. Single-loop learning refers to incremental improvements while double-loop learning is a much more holistic review of the knowledge, which serves not just to improve (e.g., efficiency) but recast the knowledge (effectiveness). Improvements are then fed back into the KM process cycle.

Evans et al. (2015) also associate a number of technologies as being particularly relevant and useful for each KM process. For example, workflow mining and analysis can help identify and create knowledge, automated classification or taxonomy tools can help store knowledge, expertise locator systems can help share knowledge, knowledge networks can help use knowledge, visualization analytics can help to learn. and lessons learned databases can be used to improve upon the knowledge.

An Integrated KM Cycle

A synthesis of the preceding steps from the six approaches to a KM cycle is shown in table 2.2. The last column summarizes Heisig's 2009 summary.

Table 2.2 A synthesis of the key KM processes

Meyer and Zack (1996)	Bukowitz and Williams (2000)	McElroy (1999)	Wiig (1993)	Carlile and Rebentisch (2003)	Evans, Dalkir, and Bidian (2015)	Heisig (2009)
Acquire	Get	Individual and group learning	Create	Store	Identify and create	Create, generate, develop, build, produce, acquire, collect, import, get, gather
Refine	Use	Knowledge claim validation	Source	Retrieve	Use	Use, apply, leverage, reuse, exploit, derive value, deploy
Store and retrieve	Learn	Information acquisition	Compile	Transform	Store	Store, retain, capture, codify, package, archive, document, maintain, preserve
Distribute	Contribute	Knowledge validation	Transform		share	Share, transfer, distribute, communicate, diffuse, disseminate
Present	Assess	Knowledge integration	Disseminate		Learn	Identify, organize, classify, structure, review, analyze, screen, categorize, map
	Build/sustain		Apply		Improve	
	Divest		Value realization			

While the authors use different labels to describe each of the KM cycle stages, they often refer to the same general type of knowledge processing. Table 2.3 represents an amalgamation of the major KM cycle steps that each of the six approaches had in common. The combined steps have been placed in a logical chronological order. The additional steps contributed by each of the four approaches were then added to this table, providing a comprehensive overview of knowledge processing throughout the organizational lifecycle of knowledge. However, it is important to note that while the cycle is presented as a sequential progression of steps, knowledge management processes typically occur in parallel. For example, as shown in the Evans et al. cycle, codification of tacit knowledge and identification of already documented explicit knowledge occur at the same time.

Table 2.3 Synthesis of knowledge processing steps contributed by each of the approaches

Steps in Common	Step added by
1. Knowledge capture	Evans et al
2. Knowledge creation	Evans et al
2a. Knowledge contribution	Bukowitz and Williams
2b. Knowledge filtering and selection	Bukowitz and Williams
3. Knowledge codification	
3a. Knowledge refinement	Meyer and Zack; Bukowitz and Williams; Carlile and Rebentisch
4. Knowledge sharing	
5. Knowledge access	

5a. Knowledge learning	Bukowitz and Williams; Evans et al
6. Knowledge application	
6a. Knowledge evaluation	McElroy; Bukowitz and Williams
7. Knowledge reuse	
7a. Knowledge reuse or divestment	Bukowitz and Williams

Some of these processing steps are alternatives—for example, new knowledge must be created and/or existing knowledge captured and knowledge is either reused or divested. Regrouping by alternative processing choices thus yields ten major knowledge-processing steps:

1. Knowledge capture/creation/contribution
2. Knowledge filtering/selection
3. Knowledge codification
4. Knowledge refinement
5. Knowledge sharing
6. Knowledge access
7. Knowledge learning
8. Knowledge application
9. Knowledge evaluation
10. Knowledge reuse/divestment

Next, an integrated KM cycle can be distilled from our preceding study of some of the major approaches that have been undertaken to describe the key processes that should make up the KM cycle. The integrated cycle subsumes most of the steps involved in the KM cycles discussed in this chapter and classifies them into three major stages:

1. Knowledge capture and/or creation
2. Knowledge sharing and dissemination
3. Knowledge acquisition and application

In the transition from knowledge capture/creation to knowledge sharing and dissemination, knowledge content is assessed. Knowledge is then made contextual in order to be understood (acquired) and used (application). This stage then feeds back into the first one in order to update the knowledge content as well as to allow single and double loop learning to occur. The integrated KM process cycle is outlined in figure 2.13.

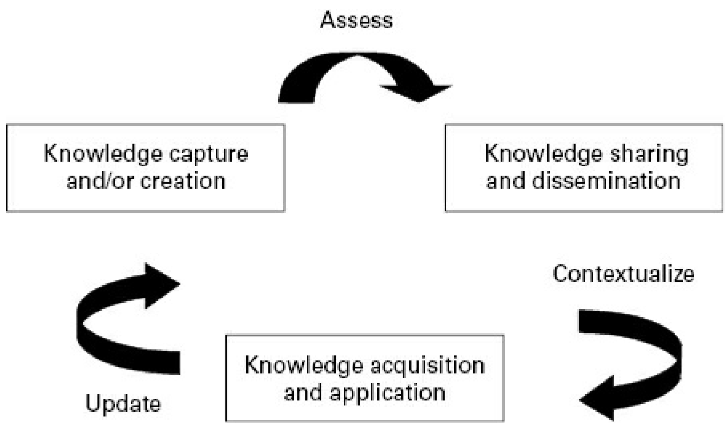

Figure 2.13 An Integrated KM Cycle

Knowledge capture refers to the identification and subsequent codification of existing (usually previously unnoticed) internal knowledge and know-how within the organization and/or external knowledge from the environment. Knowledge creation is the development of new knowledge and know-how—innovations that did not have a previous existence within the company. When knowledge is inventoried in this manner, the next critical step must be some form of assessment against selection criteria that will follow closely the organizational goals. Is this content valid? Is it new and better—in other words, is it of sufficient value to the organization such that it should be added to the store of intellectual capital?

Once it has been decided that the new or newly identified content is of sufficient value, the next step lies in contextualizing this content. This involves maintaining a link between the knowledge and those knowledgeable about that content: the author or originator of the idea, subject matter experts, and also those who have garnered significant experience in making use of this content. Contextualization also implies identifying the key attributes of the content in order to better match to a variety of users; for example, personalization to translate the content into one preferred by the end user or the creation of a short executive summary to better accommodate the time constraints of a senior manager. Finally, contextualization will often succeed when the new content is firmly yet seamlessly embedded in the business processes of the organization.

The knowledge management cycle is then reiterated as users understand and decide to make use of content. The users will validate usefulness, they will signal when it becomes out of date or when situations are encountered where this knowledge is not applicable. Users will help validate the scope of the content or to what extent the best practices and lessons learned can be generalized. They will also, quite often, come up with new content, which they can then contribute to the next cycle iteration, resulting in both individual, group, and organizational learning

Box 2.2

A vignette: A typical day in the life of knowledge in an organization

Context: A major international consulting organization wanted to document lessons learned from its major projects. This represented a first step toward becoming a learning organization. From a scan of what other similar companies were doing, their competitive intelligence led them to select the implementation of an after action review (AAR) in the form of a project post mortem. The AAR was a new procedure and it was initially piloted with a group of experienced consultants. Project managers who became experienced with the post mortem were subsequently asked to become resource people for those willing to learn and try it out. A new role of knowledge journalist was created in order to have a neutral, objective person who had not been a member of the original project team who could facilitate the post mortem process and capture the key learning outcomes from the project. Finally, the post mortem was added as an additional step to be completed by all project managers before they could officially check off that a project has been deemed formally completed.

Knowledge Processing Steps

1. *Knowledge capture/creation/contribution*.An after-action review process is created within the organization such that at the end of each project, a meeting is held to have project team members contribute ideas as to what could have been improved.

2. *Knowledge filtering/selection*.During the meeting, the facilitator helps establish criteria for lessons learned such as was it a factor beyond the control of team members (in which case nothing much can be done in the future to mitigate against this event). Project team members must reach a consensus on the criteria that will be used to decide which lessons learned will be documented and why.

3. *Knowledge codification*.The meeting notes are transcribed and the KM team (including the knowledge journalist) along with the project team agrees on how the lessons learned will be written up (e.g., format, length, classification tags for future retrieval).

4. *Knowledge refinement*.The KM team then improves upon the original text of the lessons learned (e.g., sanitizing or removing information that can identify the project and/or the people involved, abstracting so that the lessons to be learned are more generalized and therefore applicable to more than one specific context).

5. *Knowledge sharing*.The existence of the lessons learned are publicized and made available to others (may be organization-wide, may be to specific targeted groups).

6. *Knowledge access*.The lessons learned are stored in a database with adequate metadata or tags that will enable easy access and retrieval (e.g., tagging by the type of lesson such as "poor team communication," by date, by type of project and other meaningful tags).

7. *Knowledge learning*.Some of the lessons learned are incorporated into an employee orientation session and others into a project management-training course. In this way, the material is used to enable role playing and to provide themes for group discussion. An example would be a lessons learned that addressed attitudes that were not compatible for good teamwork. Another project team may decide to use some of the documented lessons learned for storytelling sessions where participants are asked to take on the perspective of another team member. In this way, the team members acquire some pseudo experience in "walking in someone else's shoes," which should afford them a different view on the events that occurred.

8. *Knowledge application*.A project manager embarking on a new project calls up the lessons learned from similar projects from the organization's lessons learned database. A quick scan of the sorts of things that went wrong in the past help the manager to prepare a risk management and contingency plan for these known challenges. At best, the same mistakes will not be repeated (which is not to say that human creativity being what it is, new ones will not arise!)

9. *Knowledge evaluation*.A few people in the organization access the same learned lesson

but find that the lesson is neither quite relevant nor valid in their particular contexts. They contact the KM team to have additional tags added to this documented lesson—tags that indicate the specific situations in which this is a valid lesson as well as the specific conditions under which the lesson is not to be applied (an example may be subsidiaries where the workforce is represented by a union and other subsidiaries who are not unionized).

10. *Knowledge reuse/divestment*. The KM team performs its annual cleanup of the lessons learned database and finds that some can be replaced by newer and more comprehensive lessons. A few lessons are no longer relevant due to changes in the organization, changes in the business environment, or both (e.g., technology issues with an older version of software that are now moot with the newer version being used).

Strategic Implications of the KM Cycle

Knowledge represents the decisive basis for intelligent, competent behavior—at all three levels: individual, group, and the organization itself. Only a conscious and organized reflection of lessons learned and best practices discovered will allow companies to leverage their hard-won knowledge assets. A knowledge architecture needs to be designed and implemented in order to enable the staged processing and transformation of knowledge, much like information products are processed, in order to ensure that the knowledge objects reach intended end-users and are put to good use. The objective is to retain and share knowledge with a wider audience. Information and communication technologies such as groupware, intranets, and knowledge bases or repositories provide the necessary infrastructure to do so. Business processes and cultural enablers provide the necessary incentives and opportunities for all knowledge workers to become active participants throughout the knowledge management cycle.

Practical Considerations for Managing Knowledge

It is important to understand the different stages of managing knowledge throughout the KM cycle—however it is not enough. From a practical perspective, in order to manage knowledge it is also necessary to have an organizing principle—a framework—to classify the different types of activities and functions needed to deal with all knowledge-related work within and between organizations. This framework is often encapsulated in the form of a theory or model of KM. Several major KM models are presented in the next chapter.

Key Points

- There are a number of different approaches to the knowledge management cycle such as those by McElroy, Wiig, Bukowitz and Willams, Meyer and Zack, Carlile and Rebentisch, and Evans, Dalkir and Bidian.
- By comparing and contrasting these and by validating them through experience gained to date with KM practice, the major stages are identified as knowledge capture and creation, knowledge sharing and dissemination, and knowledge acquisition and application.
- The critical processes throughout the KM cycle assess the worth of content based on organizational goals, contextualize content in order to better match with a variety of users, and continuously update with a focus on updating, archiving as required, and modifying the scope of each knowledge object.

Discussion Points

1. Discuss the different KM cycles approaches and how they may be integrated into a comprehensive, integrated approach to the effective management of knowledge within an organization.
2. Provide an example of how each of the major KM cycle stages listed below can add value to knowledge and increase the strategic worth of the knowledge asset:
    a. Capture
    b. Codify
    c. Create
    d. Share
    e. Acquire
    f. Apply
3. Where are the go/no decisions in KM processes? What types of information would you require in order to decide whether or not the knowledge content would continue on to the next step of the cycle?

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3 Knowledge Management Models

Furious activity is no substitute for understanding

—H. H. Williams (1858–1940)

A robust theoretical foundation is required as the basis of any knowledge management initiative that is to succeed. 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. Sixteen different knowledge management models are described in this chapter. The models all present distinct perspectives on the key conceptual elements that form the infrastructure of knowledge management. This chapter describes, compares, and contrasts each 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 models to key KM concepts and the major phases of the KM cycle.
3. List the strengths and weaknesses of each KM model.

Introduction

> In an economy where the only certainty is uncertainty, the one sure source of lasting competitive advantage is knowledge.
>
> —I. Nonaka and H. Takeuchi (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. There is a tendency 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—many people felt this was yet another buzzword and bandwagon that they were expected to jump upon. One of the reasons that KM has now established itself more credibly as both an academic discipline of study and a professional field of practice is the work that has been done on theoretical or conceptual models of knowledge management. Early on, more pragmatic considerations about the processes of KM 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 became more and more of an issue. Cultural and contextual influences further increased the complexity involved in KM and these factors had to also be taken into account in a model or framework that could situate and explain the key KM concepts and processes. Last but not least, measurements were needed in order to be able to monitor progress toward and attainment of expected KM benefits.

This holistic approach is one that encompasses all the different types of content to be managed from data to information to knowledge but also from tacit to explicit and back to tacit knowledge type conversions. The KM models presented in this chapter all attempt to address knowledge management in a holistic and comprehensive manner.

Davenport and Prusak (1998, p. 2) provide the following distinctions among data, information, and knowledge, which recap the examples 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 mixing 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 those who know. 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 among data, information, and knowledge as operational, and 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 people and within each human being, and that we have to consider knowledge to be among the most important corporate assets.

It is, however, important to note that there is neither a need to choose one over the other nor to create mutually exclusive categories. There is a great deal of overlap and a great deal of value in the many different types of content. Content management is perhaps a better, more general term than knowledge management in this respect.

Nonaka and Takeuchi (1995) provide, on the other hand, 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 it is necessary to create knowledge in order to produce innovation. 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 a process of every individual's active creation and organization of the experiences. When a person tacitly knows, he/she does and acts without distance, uses the body, and has a great difficulty to explain in words, rules, and algorithms the process he/she is involved in.

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.

A thesis of Polanyi is that all knowledge is either tacit or rooted in tacit knowledge. Tacit knowledge is hard to express in formalized ways, and is context-specific, personal, and difficult to communicate. On the other hand, explicit knowledge is codified, expressed in formal and linguistic ways, easily transmittable and storable, expressible in words and algorithms; however, it represents only the tip of the iceberg of the entire body of knowledge. This definition of the tacit/explicit concepts makes clear the importance of considering adequately the tacit dimension.

The 80/20 rule appears to apply here—roughly 80 percent of our knowledge is in tacit form as individuals, as groups, and as an organization. Only 15–20 percent 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 for this section 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/or researchers.
3. The models have been implemented and field-tested with respect to reliability and validity.

This is not meant to be an exhaustive list nor the 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 to explain, describe, and better predict how best to manage knowledge.

The von Krogh, Roos, and Kleine Model of Organizational Epistemology

The original von Krogh and Roos KM model (1995) distinguishes between individual knowledge and social knowledge and the authors take an epistemological approach to managing organizational knowledge: the organizational epistemology KM model. Whereas the definition of organizational has been problematic and the term is often used interchangeably with information, there are a number of issues that 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 cognitive 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 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 in nature. 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 does not reside 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 in both the individuals of an organization and at the social level, in the relations among the individuals. Knowledge is characterized as *embodied* that is, "everything known is known by somebody" (von Krogh & Roos, 1995, p.50). Unlike the cognitive perspective, where knowledge is viewed as an abstract entity, connectionism maintains that there cannot be knowledge without a knower. This fits nicely with the concept of tacit knowledge that is very difficult to abstract out of someone and make 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, successfully and unsuccessfully.

In 1998, von Krogh, Roos, and Kleine examined the fragile nature of KM in organizations. They describe this fragility in terms of the mindset of the individuals, communication in the organization, the organizational structure, and 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, then 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 who serve to stimulate individual knowledge development, group sharing of knowledge, and organizational retention of valuable knowledge-based content. This approach was further refined (von Krogh, Ichijo, & 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 to underpin a theoretical model of knowledge management, especially due 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 knowledge model and is a component of the models discussed in this chapter.

The Nonaka and Takeuchi Knowledge Spiral Model

Nonaka and Takeuchi (1995) studied how Japanese companies were successful in achieving creativity and innovation. They quickly found that it was far from a mechanistic processing of objective knowledge. Instead, they found 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 successful track record in innovation of Japanese enterprises stems from the more tacit-driven approach to knowledge management. They argue that Western culture considers knower and known as separate entities (harkening back to the cognitive approach, which places greater importance on communicating and storing explicit knowledge). In contrast, the structural characteristics of the Japanese language and influences such as Zen Buddhism lead the Japanese to consider that there is a oneness of humanity and nature, body and mind, self and other (Nonaka & Takeuchi, 1995). It follows that it may be easier for Japanese managers to engage in the process of "indwelling," a term used by Polanyi (1966) to define the involvement of the individuals 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 (from the individual to the group to the organization, in the ontological dimension).

Nonaka and Takeuchi underline the necessity of a sort of integration of the two approaches, from the cultural, epistemological, and organizational points of view, in order to acquire new cultural and operational tools to better build knowledge-creating organizations. Their construct of the "hypertext organization" is the formalization of the need for an integration of the traditionally opposed concepts of Western and Japanese schools of thought.

Knowledge creation always begins with the individual. A brilliant researcher has an insight that ultimately leads to a patent. A middle manager has an intuition about market trends that becomes the catalyst for an important new product concept. 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 valuable, 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 it occurs at all levels of the organization. In many cases, the creation of knowledge occurs in an unexpected or unplanned way.

According to Takeuchi and Nonaka, knowledge conversion constitutes 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 is interactive and spiral (pp. 62–63). There are four modes of knowledge conversion, as shown in figure 3.1:

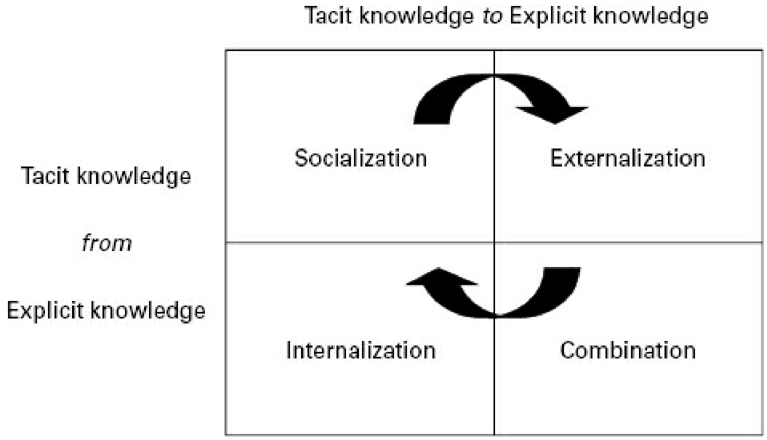

Figure 3.1 The Nonaka and Takeuchi model of knowledge conversion

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

Socialization (tacit-to-tacit) consists of the sharing of knowledge in face-to-face, natural, and typically social interactions. This involves arriving at a shared 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 as well as it is 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)

For example, Honda organizes “brainstorming camps” during which there are detailed discussions 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. Brainstorming meetings are used by Honda not only to develop new products but also to improve its managerial systems and its commercial strategies. Many other organizations organize similar “Knowledge Days,” “Knowledge Cafés,” or “Knowledge Jams” to encourage this type of tacit-to-tacit knowledge sharing.

Externalization (tacit-to-explicit) is a process that 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 & 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 somehow be written down, taped, drawn, or made tangible or concrete in some manner. An intermediary is often needed at this stage because it is always more difficult to 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 (e.g., format, length, level of detail, etc.) in order to increase its scope (i.e., so that a wider audience can understand and apply this content now).

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 understood that the most frequent problem was that of drums, so they 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 that of combination (explicit-to-explicit), the process of recombining discrete pieces of explicit 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 happens 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.

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

Finally, the last conversion process, internalization (explicit-to-tacit) occurs through the diffusion and embedding of newly acquired behavior and newly understood or revised mental models. Internalization is very strongly linked to "learning by doing." Internalization converts or integrates shared and/or individual experiences and knowledge into individual mental models. Once new knowledge has been internalized, it 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 manifest as an observable change, that is, they now do their jobs and tasks differently.

For example, General Electric 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 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. The reason is that it is only when knowledge is internalized into individuals' tacit knowledge bases in the form of shared mental models or technical know-how that this knowledge becomes 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 & Takeuchi, 1995, p. 69) as illustrated in figure 3.2. 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 the use of analogy, metaphor, and model, in the externalization quadrant. This explicit knowledge is then systemized and recombined in the combination quadrant—whereupon it once again becomes part of individuals' experience. In the internalization quadrant, knowledge has once again this become tacit knowledge.

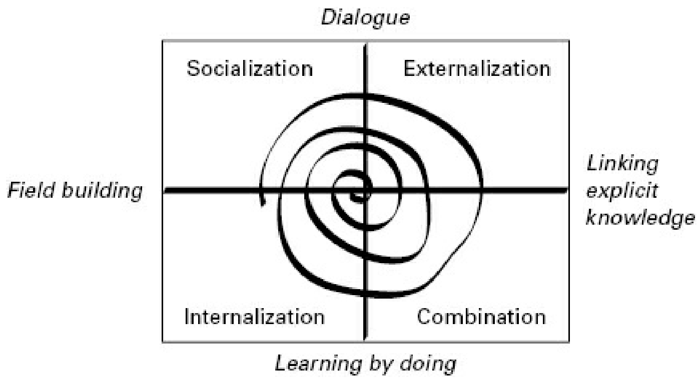

Figure 3.2 The Nonaka and Takeuchi knowledge spiral

The Nonaka and Takeuchi model has proven to be one of the more robust in the field of KM and it continues to be applied in a variety of settings. One of its greatest strengths is the simplicity of the model—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 the major shortcomings is that while 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 these forms of knowledge.

Box 3.1
A vignette: Skidmore, Owings, & Merrill LLP (SOM) (Pulsifer, 2008)

SOM (http://www.som.com) is a leading architecture, urban design, and planning, engineering, and interior architecture firm in the United States. Founded in 1936; SOM has completed more than 10,000 projects in over fifty countries. Most architectural and engineering firms operate in an environment filled with guidelines and regulations derived from best practices and standards that are often disseminated through the company's intranet. SOM also has CAD (computer-aided design) libraries, drafting standards, employee directories, and social networks—in other words, bits and pieces of KM. So why did they need a KM model in addition to these piecemeal implementations? The model was necessary in order to have a deeper understanding of how KM contributes to the goals of the company. In this type of industry, as with many others, tacit knowledge consists of the creative and innovative knowledge—pretty much the polar opposite of the well-documented explicit knowledge such as guidelines and standards. A KM model helps SOM to harness both types of knowledge in order to perform efficiently, effectively, and competitively. A comprehensive easy-to-apply KM model can help decision makers and all employees. With it they can make the best use of tacit and explicit knowledge and apply processes to transform knowledge from one form to the other. A KM model, together with the KM process cycle discussed in the previous chapter, can be used by SOM as a checklist—to ensure that all key KM components have been addressed—not just addressed well but also addressed coherently, since KM components are highly interdependent and integrated with one another. In the absence of a model, the firm can continue implementing KM pieces in an ad hoc fashion but will rarely succeed in bringing the pieces together in order to better attain company goals and objectives.

A good KM model is a framework that positions goals, procedures, and enablers to help the firm capitalize on their valuable knowledge assets. With a KM model, everyone can understand what KM is expected to do for SOM, why they should share their knowledge, how they should share, and how they can assess the costs and benefits that result. The KM model will help ensure that everyone shares the same understanding of the role of KM throughout their career —from their employee orientation as new hires to their exit interview and knowledge handover at the end of their career. The SOM KM framework helps ensure that valuable knowledge is not lost when senior employees leave, that information and knowledge flows among departments, that work is not duplicated, and that errors are minimized. The company is better able to centrally gather, measure, and analyze how well they have met their goals. Finally, the KM model helps SOM leadership to better shape and support the firm's business strategy. Each group within SOM needs to operate on this common KM framework in order to promote individual, departmental, and organizational success.

The Choo Sense-Making KM Model

Choo (1998) described a model of knowledge management that stresses sense making (largely based on Weick, 2001), knowledge creation (based on Nonaka & Takeuchi, 1995), and decision-making (based on, among others, bounded rationality, Simon, 1957, among others). 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 of the phases, sense making, knowledge creation and decision-making, has an outside stimulus or trigger.

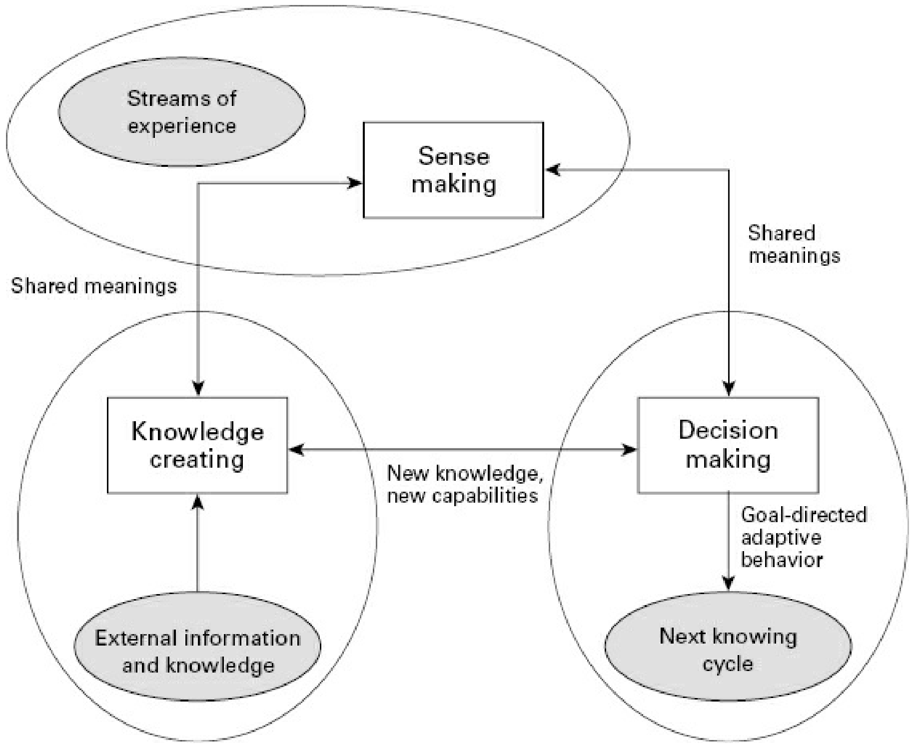

Figure 3.3 Overview of Choo's (1998) knowledge management model

The sense making stage is the one that attempts to make sense of the information streaming in from the external environment. Priorities are identified and used to filter the information. Common interpretations are constructed by individuals from the exchange and negotiation of information fragments combined with their previous experiences. Weick (2001) proposed a theory of sense making to describe how chaos is transformed into sensible, 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 damaging the entire system. For example, a human being is tightly coupled, but the human genome is loosely coupled. Loose coupling permits adaptation, evolution, and extension. Sense making can be thought of as a loosely coupled system where individuals construct their own representation of reality by comparing current with past events.

Weick (2001) purports that sense making in organizations consists of four integrated processes:

1. Ecological change
2. Enactment
3. Selection
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. This 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, to rearrange, to single out, or to 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 where 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 is seen 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 through the provision of 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 & Nalebuff, 1991; Bierman & Fernandez, 1993), chaos theory, emergent theory and complexity theory (e.g., Gleick, 1987; Fisher, 1984; Simon, 1969; Stewart, 1989; Stacey, 1992), and 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 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 tried 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 had 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. Bounded rationality theory was first proposed by Simon (1976) 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 individuals’ use of limited information analysis, evaluation, and processing, shortcuts and rules of thumb (sometimes called heuristics), and “satisficing” (blend of satisfying and sufficing) 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 the group may not have fully exhausted all the possibilities but has managed to capture roughly 80 percent of them. Continuing on would result in the law of diminishing returns—so much more effort would be required to incorporate the remaining 20 percent that generally participants would agree that what they have so far is good enough to proceed with.

One of the strengths 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, as 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 the knowledge will be used for. 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 in a semantic network way 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:

- Completeness
- Connectedness
- Congruency
- 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. There are very few knowledge objects that 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 be congruent 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 where we know something but often from a particular point of view or for a specific purpose we have in mind. We organize much of our knowledge using the dual dimensions of perspective and purpose (e.g., just-in-time knowledge retrieval or just enough or on-demand knowledge).

Semantic networks are useful ways of representing different perspectives on the same knowledge content. Figures 3.4 through 3.8 show examples of different perspectives on the same knowledge object (a car) using semantic networks.

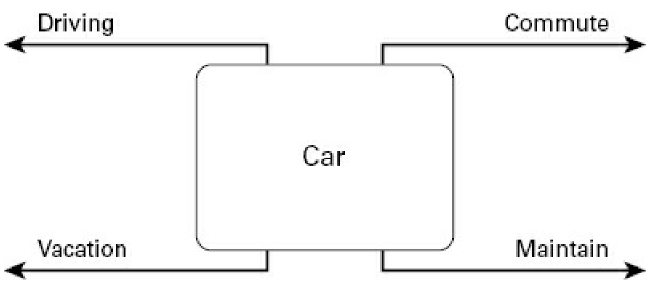

Figure 3.4 Example of a semantic network

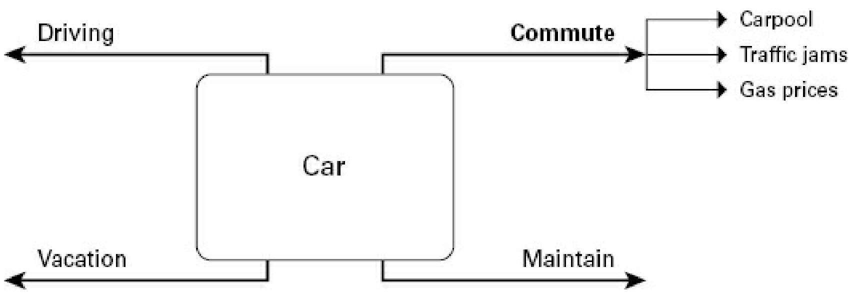

Figure 3.5 Example of a semantic network—"commute" view

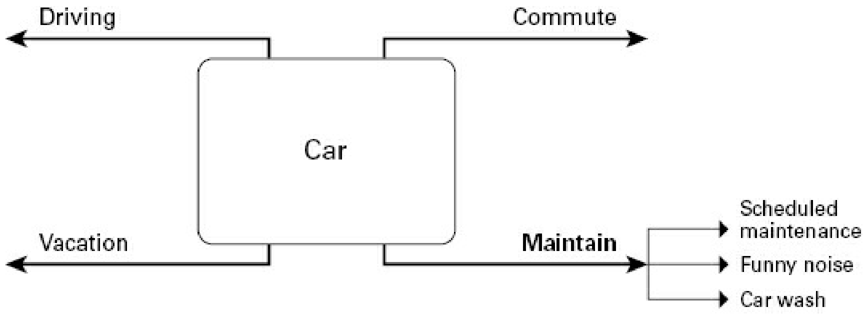

Figure 3.6 Example of a semantic network—"maintain" view

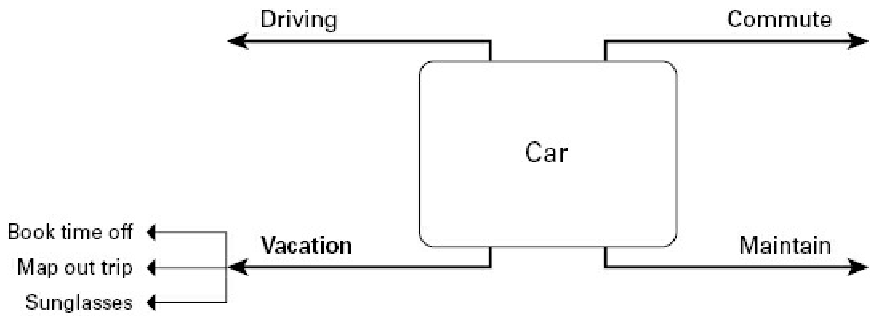

Figure 3.7 Example of a semantic network —"vacation" view

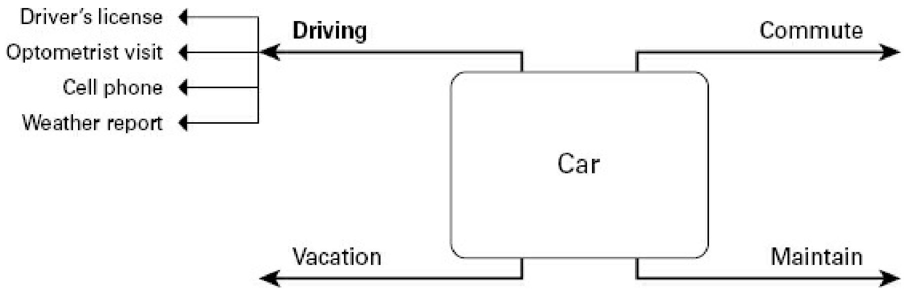

Figure 3.8 Example of a semantic network—"driving" view

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 the fourth Nonaka and Takeuchi quadrant of 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 that he does not know," that is, who doesn't have even an awareness that the knowledge exists, 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).

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

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. 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 Wiig does not use the term, this knowledge form would be common in communities of practice, informal networks of likeminded professionals that 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. Personal knowledge is typically more tacit than explicit and used unconsciously 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 deals with 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 summarizes the Wiig KM model.

Table 3.2 Wiig KM matrix

		Type of Knowledge		
Form 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 ok	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?

To summarize, Wiig (1993) proposes a hierarchy of knowledge that consists of public, shared, and personal knowledge forms. Wiig's hierarchy of knowledge forms is shown in figure 3.9.

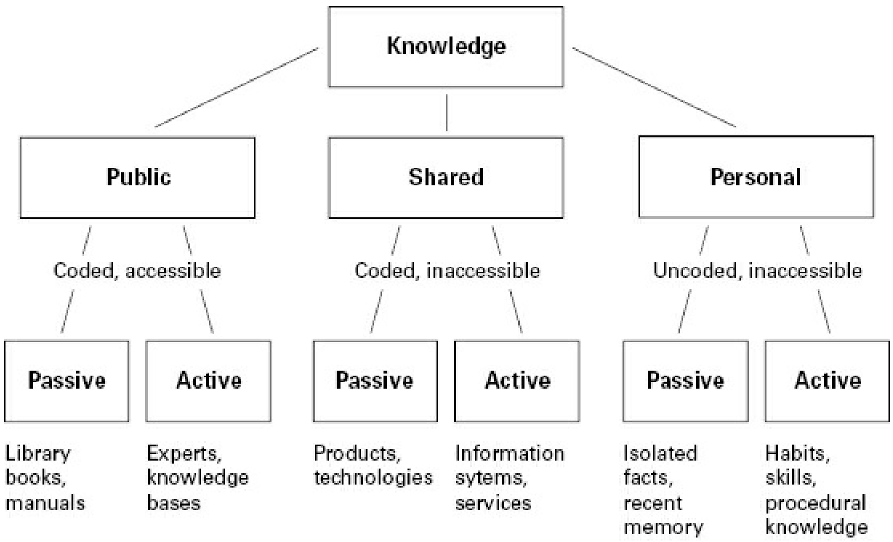

Figure 3.9 Wiig hierarchy of knowledge forms

The major strength of the Wiig model is that despite having been formulated in 1993, the organized approach to categorizing the type of knowledge to be managed remains as a very 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 going beyond the simple tacit/explicit dichotomy. The major shortcoming is that very little has been published in terms of research and/or practical experience in implementing this model.

The Boisot I-Space KM Model

The Boisot KM model is based upon 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/her expectations or prior knowledge. The effective movement of information goods is very much dependent on senders and receivers sharing the same coding scheme or language. A "knowledge good" is a concept that in addition 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. The assumption is that well-codified abstract content is much easier to understand and apply than highly contextual content. Boisot's KM model does address 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 that 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 (refer to figure 3.10):

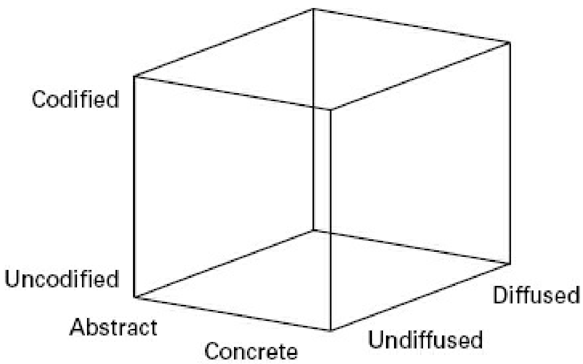

Figure 3.10 The Boisot I-Space KM model

1. Codified—uncodified
2. Abstract—concrete
3. Diffused—undiffused

The activities of coding, abstracting, diffusing, absorbing, 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 are described in table 3.3.

Table 3.3 The social learning cycle in Boisot's I-Space KM model (adapted from Boisot, 1998)

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	Abstracting	• 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	Diffusing	• 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 which 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 achieving proportional to population size
5	Absorbing	• 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 which 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 in behavioral practices • Absorption and impact often work in tandem

The strength of the Boisot model is that it incorporates a theoretical foundation of social learning. The Boisot model serves to link together content management, information management, and knowledge management in a very effective way. In a very 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 to map and manage an organization's knowledge assets as social learning cycle—something that is not directly addressed by the other KM models. However, the Boisot model appears to be somewhat less well known and less accessible, and as a result it has not had widespread implementation. More extensive field testing of this KM model would provide feedback regarding its applicability as well as provide more guidelines on how best to implement the I-Space approach.

Complex Adaptive System Models of KM

The Intelligent Complex Adaptive Systems (ICAS) KM theory of the organization views the organization as an intelligent complex adaptive system—the ICAS model of KM (e.g., Beer, 1981; Bennet & 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 that 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 arises or emerges as a result of all of 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.

Bennet and Bennet (2004) also describe a complex adaptive system approach to KM but the conceptual roots are somewhat different from the Beer (1981, 1989) 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 a 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 operate according to the rules and context of relationships with the other components and the external world.

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

To survive and successfully compete, an organization will also require 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
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.

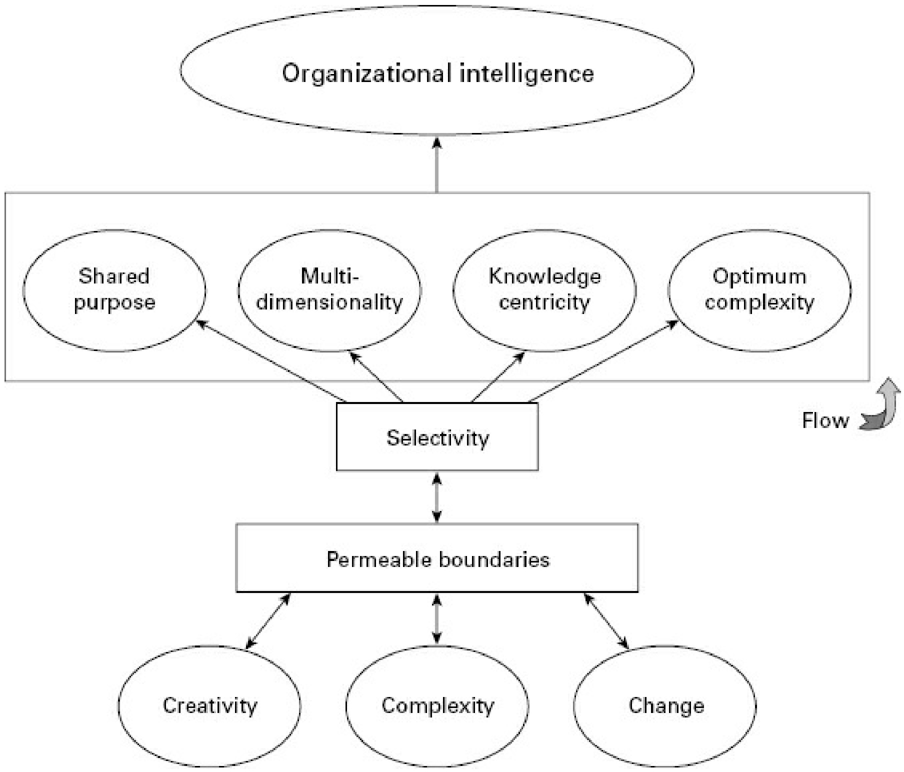

Figure 3.11 Overview of ICAS knowledge management model

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 ability of the organization 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 Choo sense-making model's approach. Unity and a shared purpose represent the ability of the organization 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 "one-firm firm" or 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 value of content in KM as opposed to a more exhaustive warehousing approach.

The process of selectivity consists of the filtering of 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 the 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 the 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—only 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
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 can solve problems and they take the outputs of the creative processes as their inputs. Decision making is the selection of one or more alternatives that were 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-adaptive-system-theory-based KM models are definitely showing 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.

The European Foundation for Quality Management KM Model

The European Foundation for Quality Management (EFQM) model (Bhatt 2000; 2001; 2002) looks at the way in which knowledge management is used to attain the goals of an organization. This model is based on traditional models of quality and excellence so there are very strong links between KM processes and expected organizational results. Figure 3.12 shows the major components of the EQFM KM model.

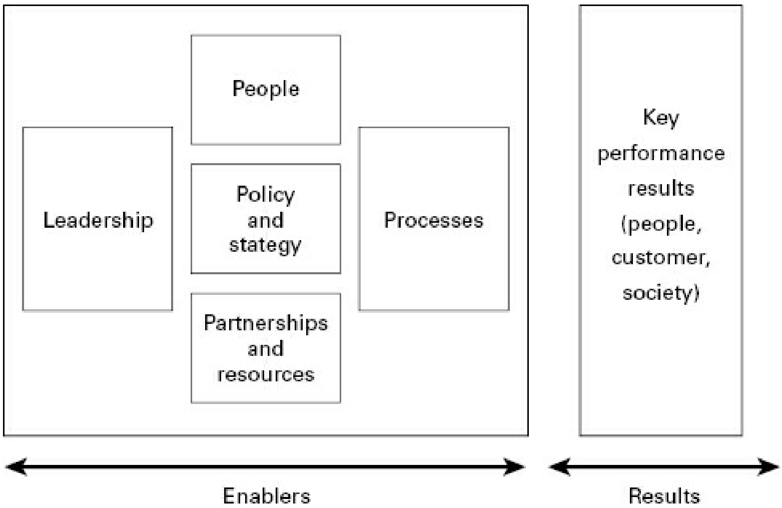

Figure 3.12 The key components of the EFQM model

The major components are: leadership, people, policy, and strategy, partnerships and resources, processes, and the ultimate key—performance results. The role of KM as a whole is thus clearly positioned as an enabler that helps a company achieve its goals—that is to say, the company's goals and not KM-oriented goals. This is an excellent depiction of the role of KM. One of the major reasons why KM fails occurs when KM is pursued for the sake of KM itself. This is analogous to producing incomplete sentences when attempting to articulate the justification for KM. For example, "the objective of the KM program/project/initiative is to promote greater sharing of knowledge" as opposed to "the objective of the KM program is to promote the greater sharing of knowledge so that our sales force can collectively benefit from all the best practices and lessons learned accumulated to date in order to provide faster and better front-line service."

The Inukshuk KM Model

The Inukshuk KM Model (Girard, 2005) was developed to help Canadian government departments to better manage their knowledge. This model was developed by both reviewing existing major models to extract five key enablers (technology, leadership, culture, measurement, and process) and by conducting quantitative research to validate these enablers. The name *inukshuk* is derived from the human-shaped figures built by piling stones on one another by the Inuit in the northern part of Canada to serve as navigational aids. There were three main reasons for choosing this symbol to represent KM: it is well-recognized in Canada; it emphasizes the key role played by people in KM; and while all inukshuks are similar they are not identical, reflecting the variations in KM implemented in different organizations. Figure 3.13 depicts the major components of the Inukshuk KM Model.

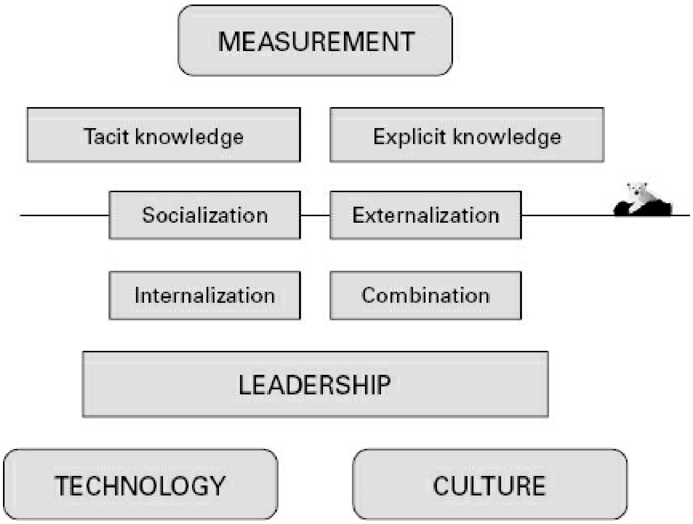

Figure 3.13 Overview of the inukshuk KM model

The process element is directly derived from the SECI model (Nonaka & Takeuchi, 1995). Technology and culture represent critical structural elements that help maintain the integrity of the figure. Measurement and leadership are placed at the very top to represent the importance of the overarching functions of measuring the impact of KM and providing leadership and support for its implementation.

The McAdams and McCreedy KM Model

McAdams and McCreedy (1999) conducted a review of three types of KM models: knowledge category models, intellectual capital models, and socially constructed models. Knowledge category models, as the name implies, look at explicit and tacit forms of knowledge such as the Nonaka and Takeuchi model and the Boisot model described earlier in this chapter. An example of an intellectual capital model is the Skandia model, presented later in this chapter. The authors worked on the socially constructed models of KM, beginning with the 1997 Demarest KM model (which in turn was an adaption of the 1989 Clark and Staunton KM model). Socially constructed KM models emphasize organizational knowledge creation through social exchange processes. Figure 3.14 outlines the major features of the McAdams and McCreedy model.

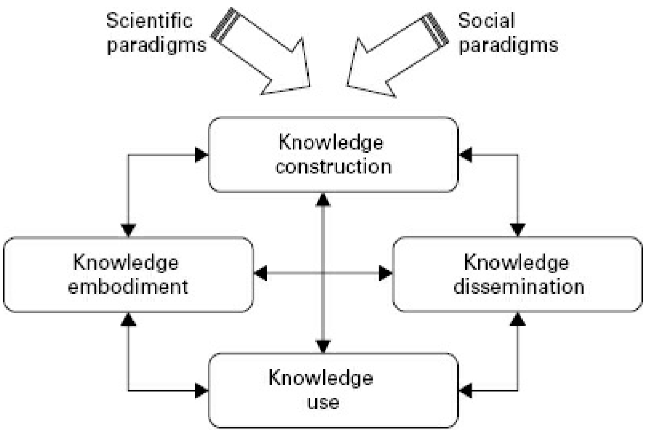

Figure 3.14 The McAdams and McCreedy model

As knowledge is created through social interactions, it becomes part and parcel of the "way things are done" in an organization. This is referred to as "embodied knowledge." This valuable knowledge is then disseminated so that it can be used. Social construction of knowledge is guided by both social and scientific paradigms, and knowledge use yields both individual and organizational benefits. In other words, the construction of knowledge is not solely governed by scientific inputs or data but also through social interactions as employees interact with one another. In this way, organizational knowledge becomes contextualized to the reality of the organization and its employees.

Stankosky and Baldanza's KM Pillars Model

The key dimensions of this model by Stankosky and Baldanza (2001) include the four pillars of leadership, organization, technology, and learning, as shown in figure 3.15. Leadership consists of organizational strategies, mission and goals. The KM strategy must always be aligned with the overall business strategy of the company. This serves to ensure that KM brings value, that employees buy in to KM, and KM implementation will succeed due to senior levels of support. The organization refers the organizational change that is needed to integrate KM, typically a change in organizational culture. This may include recognizing the expertise of employees more, ensuring information and knowledge is disseminated and shared throughout the organization, and starting to embed KM processes into organizational processes. Technology refers to KM tools to document, store, share, and preserve knowledge. As noted in the previous chapter, there are tools that are relevant and can be used for each major KM process at the individual, group, and organizational levels. The final pillar, learning, refers to using KM and KM tools to improve (e.g., to be more efficient, to make fewer errors, to produce better quality products, to innovate more, and so on). This comprises both individual and organizational learning as well as ensuring the organization has a learning culture.

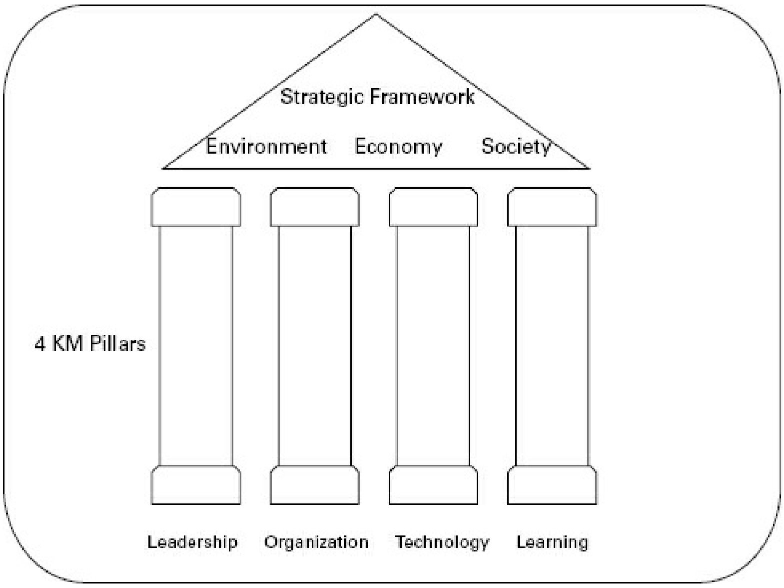

Figure 3.15 Stankosky and Baldanza's KM pillars model

KM is inseparable from organizational change which is in turn inseparable from learning processes. Managers need to recognize the value that resides in their employees and invest in them to ensure they can continue to learn and improve. The model recognizes the multidisciplinary nature of KM and identifies a number of contributing or relevant disciplines such as management science, organizational development, cognitive science/psychology, and computer science.

The Wang and Noe Knowledge Sharing Model

Models of knowledge sharing address the numerous enablers and obstacles including organizational culture, individual characteristics, interpersonal characteristics, and motivational factors, among others. One example of a knowledge sharing model is described by Wang and Noe (2009). The others conducted empirical research results to inform a theoretical framework of knowledge sharing. Wang and Noe reviewed over seventy studies published since 1999. As discussed more fully in the next chapter, knowledge sharing is a critical element of successful KM as it serves to ensure that what is learned becomes known, understood, and used by all employees of a given organization. This in turn leads to many benefits such as increased efficiency, fewer mistakes, and better performance at the individual, group, and organizational levels. In this model, there are a number of environmental factors, individual characteristics, motivational factors, perceptions, and knowledge-sharing behaviors that comprise the theoretical framework. These are shown in figure 3.16.

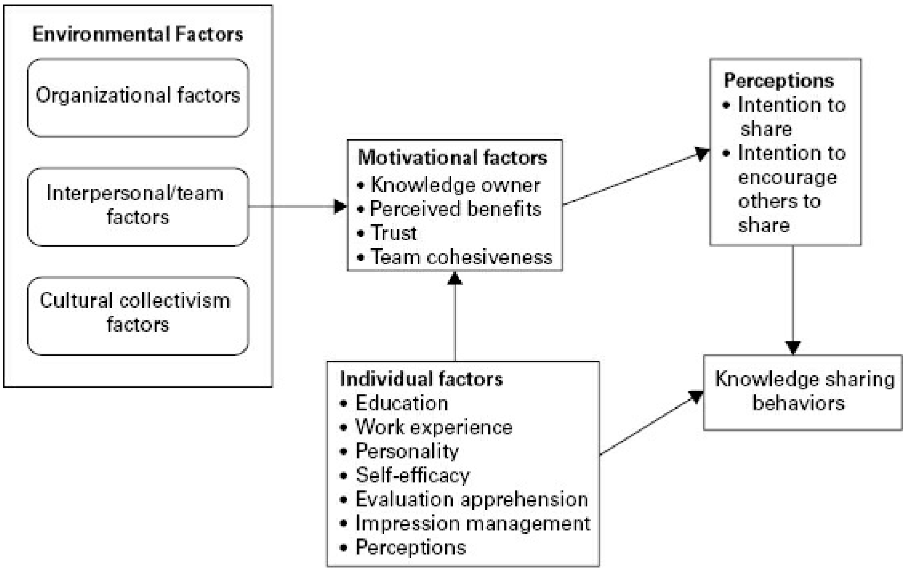

Figure 3.16 The Wang and Noe knowledge sharing model

Environmental factors include the organizational culture, and interpersonal and team characteristics, as well as collective cultural characteristics. Organizational culture consists of "long-standing organizational values and practices" (Wang & Noe, 2009, p.117) that either support or hinder knowledge sharing. These include the perceived costs of knowledge sharing, the availability of technologies such as intranets, emphasis on individual competition vs. cooperation, emphasis on innovation vs. efficiency, and the existence of role models among senior management. Knowledge sharing may be facilitated if organizational structures are less hierarchical, if they have open workspaces that offer job rotation opportunities, or if they have a significant number of informal meetings in addition to formal ones. Management support and encouragement of knowledge sharing is also very important.

Interpersonal and team characteristics include team cohesiveness (usually higher when team members have worked together for a long time), compatible personality and communication styles, perceived equality of status, and the cultural dimension of collectivism. This is distinguished from organizational culture and refers to different national cultures and languages of the team members. Certain cultures, such as the Chinese culture, have a tradition of favoring collectivism or favoring sharing of knowledge for the good of the organization, whereas other cultures, such as those of North America, tend to favor individualism over group identity. It is important to note here that there are a number of studies on the role of national culture on KM (e.g., see Lin et al, 2013) but these should never be taken as proof of any causality. Simple generalizations are to be avoided lest they become stereotypes.

In terms of interpersonal characteristics, motivations, and perceptions of knowledge sharing, trust and attitudes were found to be key factors. When employees felt they owned knowledge rather than the organization, they were more likely to engage in knowledge sharing. If they perceive there will be personal benefits to sharing their knowledge (e.g., respect, reputation), then they will share their knowledge. Conversely, if they expect negative outcomes such as others taking credit for their work, they will be less likely to share. Trust is an important mediator of knowledge sharing that has been studied extensively by many researchers (e.g., Evans et al., 2015). People tend to share their knowledge more when they perceive other team members to be honest, fair, and principled (i.e., to have integrity). Affect-based (how you feel about another person) and cognition-based (objective assessment of their credibility, expertise, authority, etc.) trust tended to be more important than benevolence-based trust (belief that they want to help others, do the right thing, behave as a good citizen, etc.).

Finally, individual characteristics that influence knowledge sharing include education, work experience, personality, self-efficacy, evaluation apprehension, impression management, and perceptions (e.g., knowledge as power). Individuals who are open to new ideas, are curious, have high level of comfort with using collaborative technologies, and higher levels of education and greater seniority are more likely to share their expertise. Newer employees tend to use technologies to share knowledge more often than more senior workers. Employees may feel sharing knowledge will help them develop their peer networks and help manage impressions others have of them. Self-efficacy can be increased, as can self-confidence, through training and peer-to-peer mentoring.

Individuals with high levels of evaluation apprehension fear that if they share their knowledge, it may be critiqued or negatively evaluated and will therefore be very hesitant to share. Similarly, individuals who believe that possessing knowledge others do not provides them with more power (e.g., higher status, recognition, importance, and even job security) will obviously be less inclined to share their knowledge.

These factors all play a role in determining the extent to which a given employee will intend to share their knowledge as well as whether they will intend to encourage others to share their knowledge. Once the intention is acted upon, knowledge will be shared.

Intellectual Capital Models

Van den Berg (2003) reviewed a number of Intellectual Capital (IC) models. These models grew out of methods of measuring intangible assets, knowledge being the prime form of such assets. Intellectual Capital Management (ICM) has become very important for all organizations as it became increasingly clear that "strategies used by organizations to develop, maintain, and exploit knowledge for innovation, constitute an important topic in the field of business strategy" (p.7). Once the existence of knowledge assets became firmly established, it became necessary to be able to measure their value. Traditional methods of valuing organizational assets were no longer adequate and misrepresented the true value of the company in question. A number of financial and nonfinancial measures were developed in order to include the value of intangible assets along with the more traditional, tangible ones.

A well-known IC model is the Skandia IC Navigator (Edvinsson and Malone, 1997), shown in figure 3.17. The idea was to explain the difference between book value (the sum total of all measurable, tangible assets of a company) and market value (what the market valued the company at). The total market value is the sum of its financial capital plus its intellectual capital. This model created a taxonomy of organizational assets which is still widely used today.

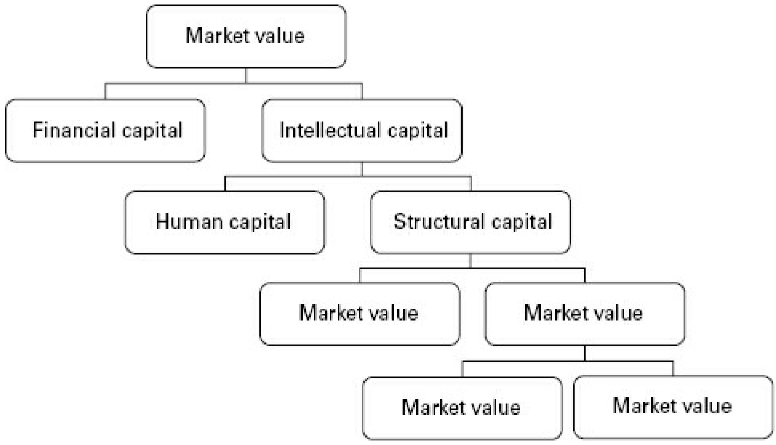

Figure 3.17 The Skandia IC Navigator intellectual capital model

Intellectual capital is categorized as human capital, structural capital, and organizational capital. Human capital is primarily composed of human knowledge, expertise, and experience. Structural capital everything that remains behind when employees leave for the day: physical inventory, patents, and so on. Organizational capital is further subdivided into innovation capital and process capital. One of the strengths of this model is that it explicitly notes the important roles played by the organization: its structure and its processes. Since the inception of the model, there have been many extensions to it (e.g., social capital, creativity capital, cultural capital, and educational capital, among others).

KM Strategy Models

The first knowledge management strategy model is still in widespread use today. Hansen et al. (1999) distinguished a codification vs. personalization KM strategy. Codification relies heavily on information technologies to document and make accessible explicit knowledge. Personalization, on the other hand, focuses on face-to-face knowledge sharing of tacit knowledge. These two very different strategies were first identified for different types of consulting services but they apply to all types of organizations when looking at a KM strategy. Each has its strengths and its drawbacks. Codification can contribute to operational efficiencies and standardization as knowledge can be more easily reused. Knowledge is accessible more quickly and to a wider group of users.

Personalization in contrast requires more time as users are not simply retrieving content form a system but engaging in a conversation with another individual. These conversations typically lead to deeper understanding and can also trigger epiphanies, insights, and innovations. Instead of investing in repositories, personalization strategies invest in building networks such as expertise locator systems.

Earl (2001) developed a preliminary taxonomy of seven KM strategies consisting of different "schools" of KM:

1. Systems
2. Cartographic
3. Engineering
4. Commercial
5. Organizational
6. Spatial
7. Strategic

Technocratic schools include systems, cartographic, and engineering schools; commercial schools are part of the economic school; and behavioral schools include organizational, spatial, and strategic schools. Table 3.4 highlights the key features of each of these seven KM schools.

Table 3.4 Extract and interpretation of Earl's seven KM schools

	Systems	Cartographic	Engineering	Commercial	Organizational	Spatial	Strategic
Goal	Knowledge base	Knowledge directory	Knowledge flows	Knowledge assets	Knowledge pooling	Knowledge exchange	Knowledge capabilities
Focus	Technology	Maps	Processes	Income	Networks	Space	Mindset
"Philosophy"	Codification	Connectivity	Capability	Capitiliza-Tion	Collaboration	Contactivity	Consciousness
Unit	Domain	Enterprise	Activity	Know-how	Communities	Place	Business
Critical success factor	Incentives to contribute	Incentives to share	Learning and distribution	Institution-alized processes	Knowledge culture	Design for interaction	Artifacts

Blackman and Henderson (2005) note that the first three technocratic schools focus mostly on the management of explicit information and knowledge using information technologies. Economic schools are concerned with monetizing knowledge assets to create organizational revenue streams. The last three schools are labeled behavioral schools because they focus on making management more proactive in creating, sharing and using knowledge as a valuable resource for their organization.

In the systems school, the focus is on explicit knowledge that has been stored in some type of KM system, typically with little or no human intervention. For example, users are asked to contribute their completed knowledge audits directly to a repository or library of audits on the organizational portal. In the cartographic school, the focus is on tacit knowledge. Typically experts are profiled in an expertise locator system so that users can find out who can help them. For example, an employee may need help with a knowledge audit and they would put this into the search engine which would then return the names of employees who have this expertise and experience. In the engineering school, knowledge is embedded in business processes so that employees can obtain the knowledge they need when they need it as they are carrying out their tasks. For example, an employee conducting a knowledge audit would be able to click on examples and templates during various stages of the audit.

In the commercial school, knowledge is converted into a revenue-generating asset or is monetized in some way. For example, a knowledge audit kit is made available for purchase or a knowledge-auditing service is offered to clients of the organization.

In the organizational school, learning is promoting through interactions, networks, and collaboration so that employees can learn from one another and provide assistance to one another. Examples include a community of practice, a knowledge jam, peer assists, and other networks that facilitate knowledge sharing among employees (e.g., on the theme of knowledge audit best practices and lessons learned). In the spatial school, new spaces and office layouts need to be implemented in order to promote knowledge sharing conversations in order for exciting new ideas to emerge—for example, a less formal space for a brainstorming activity on how to improve the knowledge auditing process. Finally, in the strategic school, the focus is on converting some knowledge into strategic knowledge, including internal efficiencies through reuse but also innovating and looking at the bigger and longer term picture. For example, generalizing some of the lessons learned gleaned from analyzing knowledge audits to making changes in the organizational design and priorities.

Collaboration Models

Pugh (2011) developed the knowledge jam model of collaboration and knowledge sharing. The knowledge jam is a deliberate, planned, and systematic event that has as its primary objective discovering and capturing tacit knowledge. Knowledge jams can be thought of as more structured forms of brainstorming. There is an agenda and a facilitator. Typically, complex, difficult, or even wicked problems are addressed but a secondary objective is to help build connections so that participants get to know one another and create relationships that they will draw upon again in the future.

There are a number of different actors, each with a specific role to play in the knowledge jam: knowledge originators, knowledge brokers, the facilitator, and the sponsor. Knowledge originators are individuals or teams that share a common job (e.g., team in a service center). They may be experts or senior experienced employees. Brokers serve to translate new ideas, innovation, best practices, and so on, into organizational practices. They learn from each jam and bring back the results to integrate into the organization. The facilitator is in charge of the process and makes sure everyone is heard and that tacit knowledge is elicited. The sponsor ensures the jam is well aligned with strategic business objectives and that there is both political support and incentives (e.g., from senior management). The jam is therefore primarily a conversation between knowledge originators and brokers, coordinated by the facilitator and supported by the sponsor.

There are five major steps in a knowledge jam: select, plan, discover/capture, broker, and reuse. In the first phase, select, sponsors and facilitators prioritize critical knowledge that is relevant to what the knowledge originators do (e.g., customer care). The facilitator and the sponsor establish the scope of the knowledge and identify the originators to invite to the jam. In the plan phase, originators and brokers set develop the agenda, identifying the knowledge capture themes. The facilitator may elect to do some pre-jam interviews with originators to help establish the agenda. In the discover/capture phase, there is a 90-minute facilitated conversation to elicit tacit knowledge, make sense of it, and document it. Brokers ask questions of originators but everyone is encouraged to ask questions. Typically the facilitator or scribe will write down notes and project these to participants. Participants may be physically present or remote, in which case some type of desktop conferencing software may be used (e.g., Skype, WebEx). The broker phase serves to translate the elicited knowledge and insights into practical and feasible organizational applications. This means selecting strategies (e.g., change management), tools, and other resources that will be required. The final phase is reuse, when the knowledge elicited from the knowledge jam session is integrated into projects. The value of this knowledge can also be measured by the frequency of reuse and the impact on products, services, and operations.

Hansen (2009) also proposed a model for collaboration that consists of three major steps:

1. Evaluate opportunities for organization-wide collaboration across different business units.
2. Analyze whether any of the four barriers to collaboration exist in the organization.
3. Tailor solutions to these barriers using a combination of three collaboration enablers.

The four potential barriers to collaboration are: the “not-invented-here” barrier, hoarding knowledge, ineffective searching for knowledge, and the “transfer” barrier where we only want to collaborate with people we know very well. The three collaboration enablers are the unification lever, which gets everyone to target the same goal, the T-shape lever, which promotes working within and across business units simultaneously, and the networks lever, which gets employees to use their personal networks.

The not-invented-here barrier is primarily a motivational barrier. Employees may be status-conscious or feel that looking outside the organization is an admission of lack of competence. The “not-willing-to-help barrier” may be due to perceived competition with the other employees or a sense of ownership of the knowledge. In extreme cases, there is knowledge hoarding because knowledge is perceived as giving power. Employees may feel knowledge sharing will take too much time and will reap little reward. The search barrier is all too common and refers to being unable to find information or people that could help. The networks may not be extensive enough and there may not be many easy-to-use collaboration tools. The transfer barrier refers to people who don’t know how to work well together. It may be due to difficulties in sharing tacit knowledge when employees have little in common with others. Without a common base of shared identify (e.g., profession) and trust, knowledge sharing will not succeed.

The three enablers can be used to address these potential barriers to collaboration. The unification enabler consists of creating an overarching goal that all team members can identify with and buy into. Leadership can be exercised (e.g., by being good collaboration role models), to emphasize that collaboration is a core value of the organization. The T-shaped enabler can be used to show employees that they can personally benefit by collaborating with others (e.g., showing how best practices and lessons learned can be generalized across units). The networks lever can be used to create and/or strengthen interactions, social networks, and cross-unit relationships. (e.g., by supporting thematic knowledge jams and communities of practice). Hansen (2009) also notes that collaborating with new people will be more likely to result in both greater synergy and more innovations. Collaboration will also help arrive at better quality decisions and solutions. The potential to increase revenue and/or improve service quality is then expected to follow. However, the author warns that collaboration is not a magical solution to all organizational ills. Collaboration is required, justified, and beneficial in some circumstances—as with any organizational practice. A solid business case must exist for collaboration or, at the very least, a cost–benefit analysis should be conducted. Collaboration does not often occur spontaneously as most employees are focused on their own tasks, deadlines, and priorities.

This last model is a good note to end on as it represents a good aggregation of the key elements from most KM models. While there remains diversity in terms of KM models, the major components are beginning to gain more consensus and acceptance. Few KM researchers and practitioners would argue against including KM measurement, leadership, technology, culture, and process in a solid KM model.

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 that they make up. Models supplement the concept analysis approach outlined in chapter 1 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 in order for strategic business goals to be successfully albeit partially addressed by KM initiatives. KM is not a silver bullet and it will not 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 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 key role played by KM models 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 enable not only a better description of what is happening but they 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 to get organizations to where they want to be with their knowledge management efforts. Lai and Chu (2000) reviewed the influence that major KM models have had on KM practice and found that measurement was the most influential component. The next in terms of level of influence were culture (including reward and motivation components) followed by technology as a strong enabler of KM.

Key Points

- Knowledge management encompasses data, information, and knowledge (sometimes referred to collectively as "content") and it addresses both tacit and explicit forms of knowledge.
- The von Krogh et al KM model takes an organizational epistemology approach and emphasizes that knowledge resides both in the minds of individuals and in the relations they form with other individuals.
- The Nonaka and Takeuchi KM model focuses on knowledge spirals that explain the transformation of tacit knowledge into explicit knowledge and then back again as the basis for individual, group, and organizational innovation and learning.
- Choo and Weick adopt a sense-making approach to model knowledge management that focuses on how information elements are fed into organizational actions through sense making, knowledge creating, and decision making.
- The Wiig KM model is based on the principle that in order for knowledge to be useful and valuable, it must be organized through a form of semantic network that is connected, congruent, and complete and has perspective and purpose.
- The Boisot model introduces three key dimensions of knowledge beyond tacit and explicit; codified, abstract, and diffused knowledge
- Complex adaptive systems are particularly well suited to model KM as they view the organization much like a living entity concerned with independent existence and survival. Beer (1981, 1989) and Bennet and Bennet (1981) have applied this approach to describe the cohesiveness, complexity, and selective pressures that operate on intelligent complex adaptive systems (ICAS).
- The EFQM model introduces the major components of leadership, people, policy and strategy, and partnerships and resources, in addition to processes as being key enablers of organizational success.
- The inukshuk model reprises the key enablers that form part of most KM models and assembles these components in a highly visual and symbolic fashion to depict the key importance that people play in KM. Canadian government leaders have applied this model.
- The McAdams and McCreedy model incorporates the social constructivist view of how knowledge is created.
- The Stankosky and Baldanza model includes the key roles played by learning and organizational change in KM.
- The Wang and Noe knowledge sharing model introduces the core factors that influence whether or not knowledge is shared.
- The Skandia intellectual capital model adds the notion of different types of knowledge assets and how their value can be measured.
- The KM strategy models emphasize the importance of matching your KM model to the organizational business goals.
- The collaboration models emphasize the critical success factors that must be in place if effective knowledge sharing is to occur, especially tacit knowledge sharing.

Discussion Points

1. Compare and contrast the cognitive and connectionist/constructivist approaches to knowledge management. Why is the connectionist approach more suited to the von Krogh et al. and the McAdams and McCreedy models? What are the strengths of this approach? What are its weaknesses? Use examples to make your points.
2. Describe how the major types of knowledge (e.g., tacit and explicit) are transformed in the Nonaka and Takeuchi knowledge spiral model of KM. Use a concrete example to make your point (e.g., a bright idea that occurs to an individual in the organization).
   a. Which transformations would prove to be the most difficult? Why?
   b. Which transformation would prove to be fairly easy? Why?
   c. What other key factors would influence how well the knowledge spiral model worked within a given organization?
3. In what ways is the Choo model similar to the Nonaka and Takeuchi KM model? In what ways do they differ?
   a. How does the integration of a bounded rationality approach to decision making strengthen this model? Give some examples.
   b. List some of key triggers that are required in order for the sense-making KM model approach to be successful.
4. How is the Wiig KM model related to the Nonaka and Takeuchi model? In what important ways do they differ?
   a. List some examples of internalization to illustrate how each of the five levels differs.
   b. How do public, private, and shared knowledge differ? What are the implications of managing these different types of knowledge according to the Wiig KM model?
5. Outline the general strategy you would use in order to implement the Boisot I-Space KM model. Where would you expect to encounter difficulties? What would be some of the expected benefits to the organization of applying this approach?
6. What is the major advantage of a complex adaptive system approach to a KM model? What are some of the drawbacks?
   a. Provide an everyday example of requisite variety. Next, apply this to the management of knowledge in an organization. What are the elements needed in order to successfully regulate a complex adaptive system? Why?
7. What additional factors do the EFQM and Inukshuk KM models introduce?
8. How would you go about identifying whether your company has a personalization KM strategy or codification KM strategy model?
9. What are some of the advantages of the knowledge jam over informal brainstorming?
10. What are some potential obstacles identified in the collaboration models? What approaches would you undertake to address each one of these?

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4 Knowledge Capture and Codification

> If written directions alone would suffice, libraries wouldn't need to have the rest of the universities attached.
>
> —Judith Martin (1938–), *Washington Post* columnist and author

This chapter addresses the first phase of the knowledge management cycle, knowledge capture of explicit knowledge and tacit knowledge creation. The major approaches, techniques, and tools used to elicit tacit knowledge, to trigger the creation of new knowledge, and to subsequently organize this content in a systematic manner (codification) are presented. These approaches represent a multidisciplinary methodology that integrates what we have found to be successful in a variety of other fields such as knowledge acquisition for the development of expert systems, instructional design techniques for course content creation and organization, task analysis techniques used in the development of performance support systems, and taxonomic approaches that originate from library and information studies.

Learning Objectives

1. Become familiar with the basic terminology and concepts related to knowledge capture and codification.
2. Describe the major techniques used to elicit tacit knowledge from subject matter experts.
3. Define the major roles and responsibilities that come into play during the knowledge capture and codification phase.
4. Outline the general taxonomic approaches used in classifying knowledge that has been captured.
5. Analyze the type of knowledge to be captured and codified, select the best approach to use, and discuss its advantages and shortcomings for a given knowledge elicitation application.

Introduction

The first high-level phase of the knowledge management cycle, as seen in figure 4.1, begins with knowledge capture and codification. More specifically, tacit knowledge is captured or elicited and explicit knowledge is organized or coded. More often than not, these two processes occur in parallel.

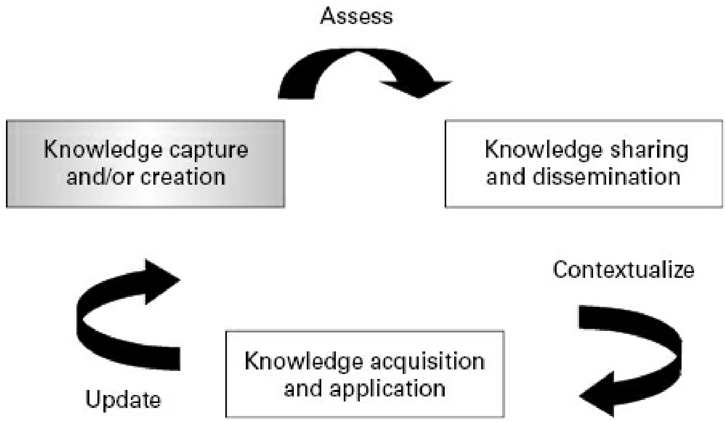


Figure 4.1 An integrated KM cycle

In knowledge capture, a distinction needs to be made between the capture and identification of existing knowledge and the creation of new knowledge. In most organizations, explicit or already identified and coded knowledge typically represents only the tip of the iceberg. Traditional information systems departments primarily deal with highly structured (records- or forms-oriented) data that makes up much less than 5 percent of a company's information. In knowledge management, we need to also consider knowledge that we know is present in the organization, which we can then set out to capture. There remains, however, that interesting area of knowledge that we don't know about. This as-yet-unidentified knowledge will require additional steps in its capture and codification. Finally, there is knowledge that we know we do not have. We will need to facilitate the creation of this new, innovative content (refer to figure 4.2).

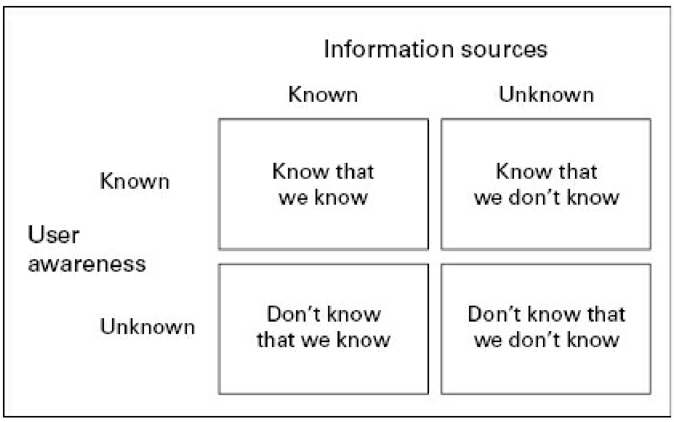


Figure 4.2 The known-unknown matrix (Frappaolo, 2006)

Capturing the knowledge in an organization is not purely about technology. Indeed, many firms find that IT plays only a small part in ensuring that information is available to those that need it. The approach needed depends on the kind of business, its culture, and the ways in which people solve problems. Some organizations generally deliver standard products and services, while others are constantly looking for new ways of doing things. Knowledge capture can therefore span a whole host of activities, from organizing customer information details into a single database to setting up a mentoring program. We need to capture both types of knowledge—explicit and tacit. Knowledge about standardized work, for example, can be described explicitly and is easily captured in writing. On the other hand, where there is innovation and creativity, people will also need some direct contact (Moorman & Miner, 1997). Knowledge capture cannot, therefore, be a purely mechanistic "add-on" because it has to do with the discovery, organization, and integration of knowledge into the very fabric of the organization. Knowledge has to be captured and codified in such a way that it can become a part of the existing knowledge base of the organization. Every organization has a history, which provides a backdrop to the growth and evolution of the organization. Every organization has a memory. The embodiment of the organizational memory is the experience of its employees combined with the tangible data and knowledge stores in the organization (Walsh & Ungson, 1991). Bush (1945) envisioned "instruments ... which, if properly developed, will give man access to and command over the inherited knowledge of the ages." Knowledge that is not captured in this way becomes devalued and eventually ignored. Knowledge is more than statements, declarations, and observations: it represents an intellectual currency that produces the most value when circulated. It may have unrealized potential and value, but unless it is spent, its value is not tested.

In today's fast-paced economy, an organization's knowledge base is quickly becoming its only sustainable competitive advantage. As such, this resource must be protected, cultivated, and shared among organizational members. Until recently, companies could succeed based upon the individual knowledge of a handful of strategically positioned individuals. Increasingly, however, competitive advantage is to be gained by making individual knowledge available within the organization, becoming organizational knowledge. Organizational knowledge complements individual knowledge and makes it stronger and broader. The full utilization of an organization's knowledge base, coupled with the potential of individual skills, competencies, thoughts, innovations, and ideas will enable a company to compete more effectively in the future. Competitiveness is becoming increasingly dependent on an organization's agility or ability to respond to changes in a very timely manner. The major component of agility lies in the skills and learning abilities of the knowledge workers within that organization.

There's no doubt that knowledge capture may be difficult, particularly in the case of tacit knowledge. Tacit knowledge management is the process of capturing the experience and expertise of the individual in an organization and making it available to anyone who needs it. The capture of explicit knowledge is the systematic approach of capturing, organizing, and refining information in a way that makes information easy to find, and facilitates learning and problem solving. Knowledge often remains tacit until someone asks a direct question. At that point tacit can become explicit, but unless that information is captured for someone else to use again at a later date, learning, productivity, and innovation are stifled.

Once knowledge is explicit it should be organized in a structured document that will enable multipurpose use. The best KM tools enable knowledge creation once and then leveraging it across multiple channels, including phone, email, discussion forums, Internet telephony, and any new channels that come online. There are a wide variety of techniques used to capture and codify knowledge and many of these have their origins in fields other than knowledge management (e.g., artificial intelligence, sociology, instructional design), which are described here.

Tacit Knowledge Capture

Traditionally, knowledge capture has emphasized the individual's role in gathering information and creating new knowledge. The literature shows a lack of consensus on the role of the individual in knowledge acquisition. Some authors (e.g., Nelson & Winter, 1982) purport that the firm is a learning entity unto itself—that is, it has some cognitive capabilities that are quite apart from the individuals who comprise it. In contrast, other authors (e.g., Dodgson, 1993) do not believe that organizations per se can acquire knowledge and learn—only individuals can learn. A middle ground is needed where individuals in the firm play a critical role in organizational knowledge acquisition.

Learning at the individual level, however, is widely accepted to be a fundamentally social process—something that cannot occur without group interaction in some form. Individuals thus learn from the collective and at the same time the collective learns from the individuals (e.g., Crossan, et al., 1999). According to Crossan's 4I model (see figure 4.3), organizational learning involves a tension between assimilating new learning (exploration) and using what has been learned (exploitation). Individual, group, and organizational levels of learning are linked by the social and psychological processes of intuiting, interpreting, integrating, and institutionalizing (the four I's). Zietsma et al. (2002) modified this slightly by including the process of attending at the stage of intuiting and the process of experimenting through the process of interpreting.

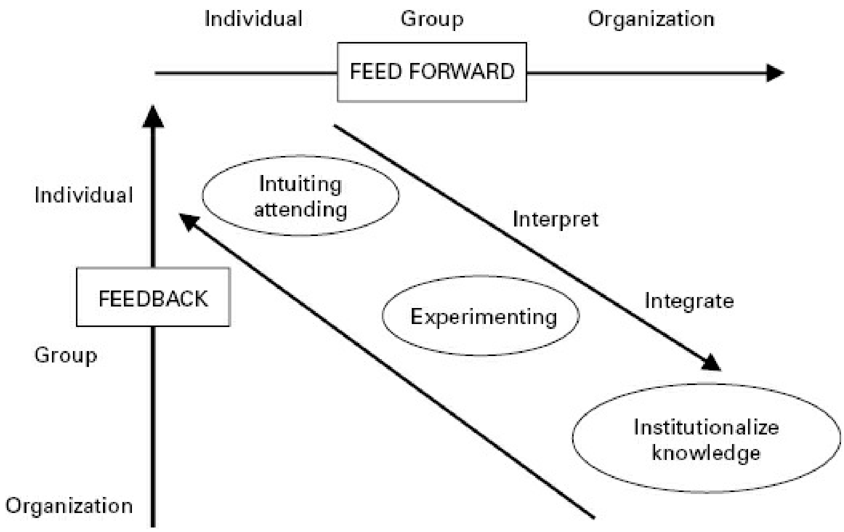


Figure 4.3 The 4I model of organizational learning (Crossan et al., 1999)

In KM, this knowledge creation or capture may be done by individuals who perform this role for the organization or a group within that organization, by all members of a community of practice (CoP), or a dedicated CoP individual—but it is really being done on a personal level as well. Almost everyone performs some knowledge creation, capture, and codification activities in carrying out their job. Cope (2000) refers to this as PKM (personalized KM). Within the firm, individuals share perceptions and jointly interpret information, events, and experiences (Cohen & Levinthal, 1990) and at some point, knowledge acquisition extends beyond the individuals and is coded into corporate memory (Inkpen, 1995; Spender, 1996; Nonaka & Takeuchi, 1995). Unless knowledge is embedded into corporate memory, the firm cannot leverage the knowledge held by individual members of the organization. Organizational knowledge acquisition is the "amplification and articulation of individual knowledge at the firm level so that it is internalized into the firm's knowledge base." (Malhotra, 2000, p. 334) The value of tacit knowledge sharing was discovered in a surprising way at Xerox (Roberts-Witt, 2002), as illustrated later in this chapter.

Many of the tacit knowledge capture techniques described in this chapter stem from techniques that were originally used in artificial intelligence, more specifically, in the development of expert systems. An expert system incorporates know-how gathered from experts and is designed to perform as experts do. The term knowledge acquisition was coined by the developers of such systems and referred to various techniques such as structured interviewing, protocol or talk aloud analysis, questionnaires, surveys, observation, and simulation. Some authors even use the term "digital cloning." Knowledge management in business settings is similarly concerned with knowledge capture, finding ways to make tacit knowledge explicit (e.g., documenting best practices), or creating expert directories to foster knowledge sharing through human–human collaboration (Smith, 2000). In 1989, for example, Feigenbaum contrasted traditional libraries as "warehouses of passive objects where books and journals wait for us to use our intelligence to find them, to interpret them, and cause them finally to divulge their stored knowledge" (p.122) with a library of the future where books would interact and collaborate with users.

Knowledge elicitation tends to refer to one part of the knowledge acquisition process, namely capturing knowledge that is tacit or in the heads of experts. There are of course other ways of acquiring knowledge (e.g., from books), but knowledge elicitation per se refers to the capture of knowledge from a human source, usually through some form of question-and-answer or interview method.

Tacit Knowledge Capture at the Individual and Group Levels

Knowledge acquisition from individuals or groups can be characterized as the transfer and transformation of valuable expertise from a knowledge source (e.g., human expert, documents) to a knowledge repository (e.g., corporate memory, intranet). This process involves reducing a vast volume of content from diverse domains into a precise, easily usable set of facts and rules.

> The idea of acquiring knowledge from an expert in a given field for the purpose of designing a specific presentation of the acquired information is not new. Reporters, journalists, writers, announcers, and instructional designers have been practicing knowledge acquisition for years … system analysts have functioned in a very similar role in the design and development of conventional software systems. (McGraw & Harrison-Briggs, 1989, pp .8–9)

The approach used to capture, describe, and subsequently code knowledge depends on the type of knowledge: explicit knowledge is already well described but we may need to abstract or summarize this content. Tacit knowledge, on the other hand, may require much more significant up-front analysis and organization before it can be suitably described and represented. The ways in which we can tackle tacit knowledge range from simple graphical representations to sophisticated mathematical formulations.

In the design and development of knowledge-based systems, or expert systems, knowledge engineers interviewed subject matter experts, produced a conceptual model of their critical knowledge, and then *translated* this model into a computer executable model such that an "expert on a diskette" resulted (e.g., Hayes-Roth et al., 1983). The global aim of such systems was to extract and render explicit the primarily procedural knowledge that comprised specialized know-how—typically in a very narrow field. Procedural knowledge is knowledge of how to do things, how to make decisions, how to diagnose and prescribe. The other type of knowledge, declarative knowledge, was used to denote descriptive knowledge or knowing *what* as opposed to knowing *how*. It soon became apparent that certain types of content were easily extracted and modeled in this manner—anything that was similar to an interactive online manual or help function in such fields as engineering, manufacturing, decision support, and medicine.

A wonderful by-product of the work in artificial intelligence was the array of innovative knowledge acquisition techniques that were created. The interactions with subject matter experts that were needed to render tacit knowledge explicit made up the knowledge engineer's toolkit. Quite a few of these techniques are imminently relevant and applicable to the process of tacit knowledge capture in knowledge management applications. The major tasks carried out by knowledge engineers included:

- Analyzing information and knowledge flow
- Working with experts to obtain information
- Designing and implementing an expert system

Only the last point would differ and it could be replaced by "designing and implementing a knowledge management system or knowledge repository." On the other side were the subject matter experts and they had to be able to:

- Explain important knowledge and know-how
- Be introspective and patient
- Have effective communication skills

Subject or domain experts were usually "sole sources of information whose expertise companies wish to preserve" (McGraw & Harrison-Briggs, 1989, p. 7). Today, many organizations face knowledge continuity concerns due to a wave of retiring baby boomers who represent knowledge walking out the door. The concerns are quite similar and the techniques used show a great deal of overlap. For example, multiple experts were often participants in knowledge engineering sessions in order to cover the range of expertise they represented, to validate the content, to provide different perspective, and so on. A number of group knowledge acquisition techniques were developed and used successfully with such groups. These approaches would be a perfect fit for knowledge acquisition at the community of practice level.

Another artificial intelligence researcher (Parsaye, 1988) outlined the following three major approaches to knowledge acquisition from individuals and groups:

1. Interviewing experts
2. Learning by being told
3. Learning by observation

All three approaches are applicable to tacit knowledge capture but it is critical to note that no single approach should be used to the total exclusion of the others. In many cases, a combination of these approaches will be required to capture tacit knowledge. The following section presents a toolkit and guidelines on the strengths and drawbacks of each tool in order to help select the best combination of techniques to use for a variety of different knowledge capture situations.

In addition to expert systems, tacit knowledge is also elicited from subject matter experts in instructional or pedagogical design. The course developers interviewed subject matter experts in order to design courses that will help nonexperts learn the material. Finally, the process of interviewing experts is at the core of qualitative research methods such as ethnographic studies (Savin-Baden & Major, 2013; Taylor & Bogdan, 1984). The primary data collection is to interview participants who are knowledgeable about the phenomenon under study, and then thematically organize this content in order to identify key themes and findings. Interviewing techniques are discussed in greater detail below.

Interviewing Experts

A number of techniques can be used to optimize the interviewing of experts. These include after action reviews, mentoring sessions, discussion forums, peer assists, knowledge communities or networks, journalistic interviewing and writing, appreciative inquiry methods, and storytelling (Pugh, 2011; Green, 2013). Two of the more popular means include structured interviewing and stories.

Structured Interviewing

Structured interviewing of subject matter experts is the most often used technique to render key tacit knowledge of an individual into more explicit forms. In many organizations, structured interviewing is done through exit interviews that are held when knowledgeable staff near retirement age. Content management systems are well suited to publishing their lessons learned and best practices accumulated over their years of experience at the organization. Structured interviewing techniques place great demands on being highly skilled at communicating and conceptualizing, as well as having a good grasp of the subject at hand. These sessions yield specific data that is often declarative in nature in response to focused questions. Structured interviews may also be used to clarify or refine knowledge originally elicited during unstructured interactions. The interviewer should outline specific goals and questions for the knowledge acquisition session. The interviewee should be provided with session goals and sample lines of questioning but usually not the specific questions to be asked.

Two major types of questions are used in interviewing: open and closed questions. Open questions tend to be broad and place few constraints on the expert. Open questions are not followed by choices as they are designed to encourage free response (Oppenheim, 1966). These types of questions allow interviewers to observe the expert's use of key vocabulary, concepts, and frames of reference. The expert can also offer information that was not specifically asked for. Some examples would be:

- "How does that work?"
- "What do you need to know before you decide?"
- "Why did you choose this one rather than that one?"
- "What do you know about ..."
- "How could ... be improved?"

- “What is your general reaction to …”

Closed questions set limits on the type, level, and amount of information an expert will provide. A choice of alternatives is always given. A moderately closed question would be something like: “which symptom led you to conclude that. …” A very strong closed question is one that can only be answered by yes or no.

The structured interviewing process is primarily a people-focused one and as such, techniques that serve to facilitate the interactions can greatly contribute to the successful outcome of such sessions. The four major techniques used in reflective listening include: paraphrasing, clarifying, summarizing, and reflecting feelings. Reflective listening helps in cases where words may have multiple meanings, the interview participants may hold very different mental models, and personal characteristics such as background, attitude, training, and level of comfort with current position in the organization. These factors may influence how an expert communicates his or her knowledge.

Paraphrasing is the restating of the perceived meaning of the speaker’s message but using your own words. The goal is to check the accuracy with which the message was conveyed and understood. Examples would include:

- “What I believe you said was …”
- “If I am wrong, please correct me but I understood you to say …”
- “In other words, …”
- “As I think I understand it …”

Clarifying lets the expert know that their message was not immediately understandable. These responses encourage the expert to elaborate or clarify the original message so that the interviewer gets a better idea of the intended message. Always focus on the message and not on the expert’s ability to communicate, and encourage them to elaborate or explain by using open questions wherever possible. Examples would include:

- “I don’t understand …”
- “Could you please explain …”
- “Please repeat that last part again …”
- “Could you give me an example of that?”

Summarizing helps the interviewer compile discrete pieces of information from a knowledge acquisition session into a meaningful whole. Summarizing helps confirm that the expert’s message was heard and understood correctly. The summary should be expressed in the words of the interviewer. Examples would be:

- “To sum up what you have been saying …”
- “What I have heard you say so far …”
- “I believe that we are in agreement that …”

Finally, reflecting feelings mirrors back to the speaker the feelings that seem to have been communicated. The main focus is on emotions, attitudes, and reactions, and not on the content itself. The purpose is to clear the air of some emotional reaction or negative impact of the message. Some examples are:

- “You seem frustrated about …”
- “You seem to feel that you were put on the spot …”
- “I sense that you are uncomfortable with …”

During interviews, a number of techniques can be used to help the expert transform their tacit knowledge into explicit knowledge. Cooke (1994) reviewed the major techniques used. These include descriptions of case studies (e.g., describe the worst case you ever had to deal with, now describe a routine case—what are the major differences between the two?), describing key milestones in careers, simulations, and role playing. Twenty questions is a technique where only yes/no questions are asked in order to simplify some of the complexity of the knowledge being elicited. A cloze experiment involves presenting a case and intentionally omitting some critical information. The expert is then asked to fill in the missing portions. Another technique involves presenting a series of statements about the task or expertise and asking the expert to rank them on a Likert scale (which has five values ranging from strongly disagree to strongly agree). An archeological or historical approach is to identify a key event that occurred in the past and ask a series of "why?" questions: why did you do this? Why did you select this tool? Why did you decide this and not that? Finally, at times, group interviews (much like focus groups) may be required, for example, with a team that worked together on a given project. In addition, as expertise is so subjective and contextual, it may be a good idea, time permitting, to seek out a second expert in order to obtain a second opinion or second perspective. A Delphi method can be used to conduct group knowledge elicitation and arrive at a group consensus (although some argue that participants feel the need more to conform than to reach a consensus).

The easiest place to begin is often with a survey of the roles, responsibilities, and tasks employees are responsible for, followed by their resources, references, contacts, and other supporting content, and the people they interact with to do their work (Leavitt & Trees, 2013). Another good question would be to ask them to list the major lessons they learned throughout their career. Bognar et al. (2009) recommend developing a flexible list of thematic guidelines or topics to address rather than specific questions to be answered for these initial interviews. This initial round of interviews could actually take a bit of time but it is time well spent as the knowledge elicited will help identify the context and the key parameters of their profession, break the ice, establish rapport with the interviewer, and even establish a certain "language" or jargon that is representative of the expert's domain. An added advantage of taking the time needed, which can be up to three months, is that the interviewer needs to ideally be a "quasi-expert" in order to successfully elicit expert knowledge. The more the interviewer and interviewee share common ground (a common terminology, an understanding of key concepts) and in fact the more similar they are in their backgrounds (education, training, and experience), the more effective knowledge elicitation will be (Bognar et al., 2009).

The next round of interviews will help establish the scope of the knowledge to be elicited and codified—the breadth and depth of knowledge. This also may require more than one interview as the full landscape has to be at least outlined in order to be able to focus. Subsequent interview questions will be developed based on the scoping interviews. Part of the scoping will consist of identifying other documents to be procured and studied as well as other people to be interviewed.

Transcripts of interviews are then analyzed in order to identify key concepts, common themes, and major methods or techniques that were mentioned. If multiple experts were interviewed for the same procedure or subject, then conflict resolution may be needed. Usually, each individual will be interviewed more than once. This allows interviewers to validate their understanding of the knowledge that has been elicited, to fill in any missing gaps, and to better conceptualize the content in an organized manner. Each interview will raise additional questions, whether these are aimed at clarifying, correcting, or expanding upon critical elements. A best practice is to always have the expert(s) review and validate each interview transcript. After a number of interviews and follow-up sessions, the interviewer will be able to start identifying key themes and have a preliminary framework for organizing these. Transcripts are typically coded by more than one person and then they look at any differences and try to arrive at a consensus. Themes are a way of abstracting the elicited knowledge to make it more generalizable and therefore more reusable by other employees (Bognar et al., 2009). Themes allow captured knowledge to be codified—to be tagged or classified for easier storage and retrieval. Leavitt and Trees (2013) recommend using a visual model to represent the preliminary set of knowledge elicited. Unlike the initial interview sessions, where new content is generated and captured, subsequent interviews are more focused and target a more detailed level.

A good test of whether enough content has been captured is to switch roles: the interviewer can take on the role of a novice practitioner and verbally or physically go through the key tasks that have been discussed to date. The interviewee can then validate until such time that both are satisfied that the knowledge has been understood and captured in as complete and valid a manner as possible. We can also borrow the notion of data saturation from qualitative research to determine whether or not we have conducted enough interviews (Bowen, 2008). Data saturation refers to the point where one is no longer eliciting significantly different new knowledge in each interview. The best test of how easy or difficult it will be to share, disseminate, and have someone else understand and use this knowledge is to test it out with a representative recipient (Leavitt and Trees, 2013) and then revise, as needed, with the expert.

Interviews are widely used to elicit knowledge as they tend to be more efficient and less time-consuming than other methods such as observations (following employees around as they work) and questionnaires (paper or electronic) which often require interviews to follow up in order to be able to properly interpret responses (Bognar et al., 2009). Some problems include identifying who the experts are, gaining access to experts (who, by definition, do not have a lot of spare time), validating highly subjective and contextual knowledge, the level of interviewing skills the interviewer has, the difference in status (real or perceived) between the expert and the interviewer, and how well the expert is able to articulate his or her expertise (explain, provide examples, define, answer questions, and be motivated to participate in the interview). The use of technology-mediated interviews is also challenging. While at times a telephone or Skype interview may put the expert more at ease, especially if answering sensitive questions, most studies show that face-to-face interviews provide the widest bandwidth and lead to more effective knowledge elicitation (Bognar et al., 2009). In-person interviews allow the interviewer (and expert) to pick up on nonverbal cues, and the degree of interaction is the much more natural, giving the impression of engaging in a conversation with a person rather than providing answers to a list of questions.

Box 4.1

A vignette: Excerpts of an expert interview

Interviewee 37 (name coded in order to protect anonymity) works in a large government department and has been responsible for the implementation of knowledge management in the past five years. His own area of expertise lies in project management—he has over twenty years' experience managing large-scale (over $10 million) infrastructure projects that typically required on average ten years to complete. One of the major catalysts for implementing KM was the lack of a good handover process—"the passing of the baton" when one project manager (PM) left and another took his or her place. Some turnover was reasonable in such long-term and complex projects. The trouble was that while each PM had the necessary training and skills, there was often little time to overlap with the incumbent PM in order to get rapidly up to speed on the specifics of that particular project.

The purpose of the structured knowledge elicitation interviews with senior PMs was to identify the types of tools and techniques they used to ensure that there was solid continuity in the management of these large infrastructure projects. Some PMs were scrupulous and disciplined and kept detailed records (primarily paper-based) while others found ways of embedding the knowledge about the project within the project itself (primarily digital annotations). The departmental KM team had recently introduced facilitators to carry out project debriefs and KM journalists to convert paper narratives into digital annotations, and they were in the process of setting up videotaping sessions to accommodate those PMs who were more comfortable with verbal rather than textual communications.

An excerpt of the interview with PM #37 follows:

Q:

How many project handovers have you been involved with to date? (a*n icebreaker question to help the interviewee feel comfortable and to begin talking*)

A:

Over 20 at least—it seems to be getting worse actually—when I first joined the department as a PM we were careerists—we made sure to hang around until the job got done—not like these younger mavericks—jumping from one project to another—even jumping ship and going to work for another department! (*subject getting off topic—starting to get a few things off his chest—prepare to cut in with next question*)

Q:

What were some of the hardest challenges you faced in doing a handover?

A:

The stuff you can't write down! I mean everyone spouts the same stuff—budget overrun, risk assessment figures off, and on and on and on. ... the real stuff—we all know it in our gut but ****ed if I'm signing my name to it! (*he has quickly started discussing tacit knowledge to be transferred during a handover and his lack of comfort in documenting this in any way—the best way to dig deeper without increasing his level of discomfort is to reassure re. anonymity of interview at this point and ask for an example in order to elicit substantive knowledge*)

Q:

Absolutely—it is certainly not the place to start assigning blame or signing names to statements—and yet, as you say, this is the content that is important for the next PM to know. What would be an example?

A:

Well ... in one infamous case ... the team just dissolved ... everyone went their own merry way ... and the supervisor was so concerned about not losing face with the PM that he just waited too long before saying anything ... the disasters just snowballed from there. ... (*at this point, true tacit knowledge is beginning to surface and this part is particularly important to document as the type of PM handover knowledge to capture—next, we need to know* *how it was handed over*)

Q:
How did you manage to talk about this situation with the incoming PM?

A:
I shared my hard-earned wisdom and grey hairs with him! (Laughing)—I told him to forgot about "no news is good news"—no news is unacceptable—don't wait for the formal briefings—keep your nose in it at all times—talk to everyone—walk around—get a feel for the morale and ask questions—just keep asking everyone the same question and you call the shots—get them in for a meeting the minute you sense there that something is off. … (*interviewee is not in full-blown tacit mode—a number of terms will need to be pinned down in later follow-up interviews—need to capture good memorable sounds bites such as "no news is disastrous news!!" and define feelings such as "feel the morale" and "get a sense that something is off"—next in the interview template is a set of questions to assess how open the person is to new methods of doing handovers, e.g., videotaping*)

Q:
Sounds like the sorts of things that have to be learned the hard way—what is the best way of getting the new PMs up to speed? Do you prefer to leave them some documentation or to meet with them face-to-face? How about this new initiative of videotaping PMs and leaving the clips on the intranet? (*up to this point in the interview, the subject was very relaxed, intent, and engaged, and appeared to be very comfortable; upon hearing this question, his level of agitation increased—he leaned forward, appeared to scowl*)

A:
Those oddballs—listen some people have too much free time on their hands—this isn't the place for paparazzi—we are serious folks and we don't need a bunch of tekkies pestering us—they don't know what we do—all I need is a good heart to heart to put the fear of … to get my points across—that's it that's all—we don't need anything fancy here. … (*definitely not open to new ways of transferring this knowledge*)

Q:
Of course the best way is to meet face to face—but do you have the time to go over everything? You must have to refer to some documentation as the projects span so many years.

A:
Well yeah—I also give them my notes and all that—they can sift through and find out about all the details—but the real stuff is what I need to say to them—and that won't be shown on YouTube any time soon!!!

Stories

Stories are another excellent vehicle both for capturing and then subsequently coding tacit knowledge. An organizational story is a detailed narrative of management actions, employee interactions, and other intraorganizational events that are communicated informally within the organization. A story can be defined as the telling of a happening or a connected series of happenings, whether true or fictitious (Denning, 2001). An organizational story can be defined as a detailed narrative of past management actions, employee interactions, or other key events that have occurred and that have been communicated informally (Swap et al., 2001). Conveying information in a story provides a rich context, remaining in the conscious memory longer and creating more memory traces than information not in context. Stories can greatly increase organizational learning and communicate common values and rule sets, and they remain an excellent vehicle for capturing, coding, and transmitting valuable tacit knowledge.

However, there are a number of conditions that must be in place in order to ensure that storytelling in its various enacted forms creates value in a particular organization. Sole and Wilson (1999) argue that while all stories are narratives, not all narratives are good knowledge-sharing stories. They use the example of movies that tell stories that are designed primarily to entertain and therefore need not necessarily be authentic—nor even believable. In contrast, in organizational storytelling, stories are often used to promote knowledge sharing, inform and/or prompt a change in behavior, as well as communicate the organizational culture and create a sense of belonging. In order to achieve these organizational objectives, knowledge-sharing stories need to be authentic, believable, and compelling. Stories need to evoke some type of response and, above all, be concise (Denning 2001) so that the morale of the story or the organizational lesson to be learned can be easily understood, remembered, and acted upon. In other words, organizational stories should have an impact: they should prevent similar mistakes from being repeated, or they should promote organizational learning and adoption of best practices stemming from the collective organizational memory.

Denning (2001) describes the power of a springboard story, knowledge that has been captured in the form of a brief story that has the ability to create a strong impact. He outlines a number of key elements required to use stories to encapsulate valuable knowledge, such as:

- The explicit story should be relatively brief and just detailed enough so the audience can understand it.
- The story must be intelligible to the specific audience so they are “hooked.”
- The story should be inherently interesting.
- The story should spring the listener to a new level of understanding.
- The story should have a happy ending.
- The story should embody the change message.
- The change message should be implicit.
- The listeners should be encouraged to identify with the protagonist.
- The story should deal with a specific individual or organization.
- The protagonist should be prototypical of the organization’s main business.
- Other things being equal, true is better than invented.
- Test, test, and test again.

The use of fables such as those found in Aesop (1968) is often quite helpful in tacit knowledge capture. A simple approach is to invite participants to a workshop where they are given several classic fables to read, asked to recollect some they had heard, and to identify the lesson to be learned in each. Fables are particularly useful with multicultural groups since fables are ubiquitous in all cultures but they definitely differ from one to another. Next, participants are given a fable minus the punch line and asked to fill in the morale of the story. Asking for a punch line is a highly effective way of acquainting participants with the objectives behind stories—the purpose of organizational storytelling—that is to have the reader learn from it. Secondly, participants also became sensitized to the fact that stories, like fables, need to be concise. A fable can consolidate multiple viewpoints and recollections of different individuals since it is not dependent on a single story to deliver its message (Snowden, 2001). Finally the best way to end a fable—the punch line—is to have an ironic ending in which the reader realizes how a happy ending could have come about without the narrative actually stating this in any form.

Two illustrations of the value of storytelling in the capture of tacit knowledge are described in box 4.2.

Box 4.2
IBM and Xerox

IBM
Knowledge disclosure is a key way of identifying the organizational culture. Knowledge disclosure techniques such as storytelling allow us to uncover knowledge in the context of its use. IBM views stories as a powerful means of knowledge discovery and knowledge transfer. They are very good for conveying complex messages simply. Storytelling is a uniting and defining component of all communities. Stories exist in all organizations; managed and purposeful storytelling provides a powerful mechanism for the disclosure of intellectual or knowledge assets in companies. It can also provide a nonintrusive, organic means of producing sustainable cultural change. Storytelling is an excellent means of conveying values and other complex tacit company knowledge.

Stories are endemic within each and every organization. They should be fostered, leveraged, and managed. We all tell stories in our daily work to share our experience and knowledge. Tacit knowledge is the most powerful means of sharing knowledge and this knowledge is usually shared through informal networks. Organizations need to accept that stories exist in their organization, identify the stories that persist, leverage these stories to effect cultural change, and foster an environment conducive to sharing knowledge and learning through stories. The best teachers, presenters, and knowledge sharers tell stories naturally to convey learning points and share their experiences. Stories put the knowledge in context, the make the learning memorable, and the learning experience more compelling. Failure stories, or lessons learned, help a community to learn from its mistakes.

IBM has a four-stage storytelling approach: the first stage is anecdote elicitation through interviews, observation, and story circles; the second is anecdote deconstruction to analyze cultural issues, ways of working, values, rules, and beliefs to yield the story's key messages; the third phase is intervention/communication design with a story constructed or enhanced; the final phase is story deployment. Storytelling workshops can be run to elicit the knowledge and cultural values of an organization as well as both its best and worst practices. The value of capturing anecdotal or tacit knowledge is that it builds an accurate picture of the existing culture, discloses enablers and inhibitors to sharing, and identifies business issues. Values are identified: moral principles or standards. Rules are identified: the code of discipline that drives or conforms behavior. Finally, beliefs are elicited: the collection of ideas that a community regards as true or shares faith in.

Storytelling is a cathartic process where employees can share experiences and build social capital and networks. Perhaps most importantly of all, it achieves buy-in of participants.

Once anecdotes are captured, they can be stored in a repository and aligned with communities, processes, and subject areas. They can then be used to trigger and support discussion forums (e.g., lunch and learn), databases, intellectual capital management systems (e.g., training), document management systems, bulletin boards, online chats, portals (e.g., community kickoff days), and intranets (e.g., competency/skill profiling).

In the end, it is the people who make communities and effective communities have valuable stories. In order to help support effective communities, you need to understand what their issues are, what they need and what facilities and solutions would best suit them.

Xerox
It is, of course, not enough to create rich environments where people can share. Xerox has lots of these: online Knowledge Universe with a catalog of best practices, chat rooms for CoPs, a company Yellow Pages, and a section of the public website, Knowledge Street, devoted to promoting knowledge sharing. What are also required are good ideas, leadership, and motivated people. A few years ago, Jack Whalen, a sociologist, spent some time in a Xerox customer service call center outside Dallas studying how people used Eureka. The trouble was, employees were not using it. Management decided workers needed an incentive to change. To this end, they held a contest: workers could win points (convertible into cash) each time they solved a customer problem, by whatever means. The winner was an eight-year veteran named Carlos, who had more than 900 points. Carlos really knew his stuff and everyone else knew this too. Carlos never used the software.

The runner-up however was a shock to everyone. Trish had been with the company only a few months, had no previous experience with copiers, and didn't even have the software on her machine. Yet her 600 points doubled the score of the third-place winner. Her secret: she sat right across from Carlos. She overheard him as he talked and she persuaded him to show her the inner workings of copiers during lunch breaks. She asked other colleagues for tips as well. This story illustrates how knowledge gets shared. The point is not the software but how many people can sit next to Carlos? There is no single best practice for sharing knowledge—both technology and subject matter experts are needed. And sometimes storytelling is the best way to transfer knowledge. Most managers see this as a waste of time but instead of breaking up the coffee machine cliques, companies should make opportunities for storytelling at informal get-togethers that are loosely organized as off-site meetings, and through videotapes and bragging sessions.

Learning by Being Told

In learning by being told, the interviewee expresses and refines his or her knowledge, and the knowledge manager clarifies and validates the knowledge artifact that renders this knowledge in explicit form. This form of knowledge acquisition typically involves domain and task analysis, process tracing, and protocol analysis and simulations. Task analysis is an approach that looks at each of the key tasks an expert performs and characterizes them in terms of prerequisite knowledge/skills required, criticality, consequences of error, frequency, difficulty, interrelationships with other tasks and individuals, as well as how the task is perceived by the person (routine, dreaded, or looked forward to).

Process tracing and protocol analysis are adapted from psychological techniques. It involves asking the subject matter expert to think aloud as he or she solves a problem or undertakes a task. The information used, questions asked, actions taken, alternatives considered, and decisions taken are the types of knowledge that are acquired in such sessions (e.g., Svenson, 1979; McGraw & Seale, 1987; Gammack & Young, 1985). Simulations are especially effective for later stages of knowledge acquisitio—to validate, refine, and complete the knowledge capture process. Tools may include software programs and props such as models, schematics, and maps.

Learning by Observation

There are at least two types of discernible expertise: skill- or motor-based (e.g., operating a piece of machinery or riding a bike) and cognitive expertise (e.g., making a medical diagnosis). Expertise is a demonstration of the application of knowledge. The learning-by-observation approach involves presenting the expert with a sample problem, scenario, or case study that the expert then solves. Although we cannot observe someone's knowledge, we can observe and identify expertise. The key is to use audio or video to record what the expert knows. People think of video mainly as a presentation device. However, experience has shown again and again that video recordings of informal and unrehearsed expert demonstrations form a permanent record of task knowledge—one that can be mined repeatedly. However, one should always accommodate the particular expert or interviewee at all times—many individuals end up feeling much less comfortable if they know they are being recorded. The happy medium is to bring along recording equipment but allow the subject the choice and handover the controls to them—so they can mute whenever they wish to speak off the record. For physical demonstrations, inexpensive digital camcorders are recommended. For software demonstrations, screen capture movie software that records the action directly from the desktop is recommended. Together, simple equipment and simple techniques can capture an amazing range of information and demonstrations.

Other Methods of Tacit Knowledge Capture

A number of other techniques may be used to capture tacit knowledge from individuals and from groups including:

- Ad hoc sessions
- Roadmaps;
- Learning histories
- Action learning

- E-learning
- Learning from others through business guest speakers and benchmarking against best practices
- Peer assists
- Knowledge and innovation jams
- Knowledge continuity processes
- Critical knowledge transfer
- Master class

Most of these approaches can be used on an individual or group basis to elicit valuable tacit knowledge.

Ad hoc sessions are a means of rapidly mobilizing a community of practice or informal professional network to a member's call for help. These are usually brainstorming sessions of no more than thirty minutes and can take place as face-to-face meetings or make use of technologies such as instant messaging, email, teleconference, and chat rooms.

Roadmaps are more formal in nature. They tend to be facilitated problem-solving meetings that are scheduled and convened and that follow an agenda. The objective is to solve day-to-day problems in a public from which often leads to the development of guidelines and even standards for continuous process improvement within the company. These sessions may also be "registered" so that they can also be used for internal benchmarking initiatives. Internal benchmarking consists of monitoring progress against goals over time (comparing snapshots to an initial baseline) and/or comparing the performance of one unit against another within the same company.

Learning histories (Roth and Kleiner, 2000) are a very useful means of capturing tacit knowledge within group settings. They represent a retrospective history of significant events that occurred in the organization's recent past, as described in the voice of the people who took part in them and are often referred to as project post mortems, post-project reviews, or after action reviews (described in greater detail in chapter 12). Organizational history is often researched through a series of initial individual interviews where participants are asked to remember and reflect upon the event, followed by a facilitated workshop with all participants in order to capture that group's memory.

The learning history process consists of:

1. Planning
2. Reflective interviews
3. Distillation
4. Writing
5. Validation
6. Dissemination (McIntyre et al., 2015)

Planning establishes the scope of the learning history to be captured. The scope will be a function of the business objective that the learning history targets. Each learning history exercise should be well founded on a problem or challenge that was overcome by the organization. The learning history serves to describe what happened, why it happened, how the organization reacted, and what current organizational members should learn from this experience. The second phase, reflective interviews, consists of asking participants to talk about what happened from their own point of view. By asking them about their analysis, evaluation, and the judgment they used, insights will emerge. The capture and codification of these insights will contribute to increasing the reflective capacity of the organization.

The final phase, distillation, consists of synthesizing the information that was for others to access, read, and understand. The interview transcripts, along with notes from the facilitated learning history workshop, can then be analyzed to identify key themes and sub themes as well as specific quotes to be used. They key themes are documented at a more abstract level (e.g., need not have specific dates or other details in order to convey the major points to be made) and the quotes are verified and authorization obtained in order to print them with an attribution. The content is then coded, summarized, and published as part of the organizational memory. The results are often transcribed in a Q/A format as shown in table 4.1. A learning history is thus a systematic review of successes and failures in order to capture best practices and lessons learned as they pertain to a significant organizational event or project. Some typical questions posed in learning history knowledge capture would include:

Table 4.1 Sample learning history template

Theme title	For example, "Repurposing of objectives for the ACME Division in 1995 in response to new environmental regulations"
Part 1: Overview of theme	Brief overview of the event, emphasizing why it was a significant event in the organization's history, why it needs to be well understood in order to better meet today's objectives, who was involved, what triggered the event, etc.
Part 2: Description	Chronological commentary, conclusions, and the questions that were asked together with the responses; quotes representing key responses to questions should appear as separate right-hand side column and be aligned with the content the quote refers to.
Part 3: Summary	Brief summary of quotes, additional questions to provide more clarity to the theme; a standalone section that can be made available and be understood by those who were not participants in the original event.
Part 4: Best practices	Describe any best practices that group consensus identified. Include the following information: • Date prepared • Point of contact (name, contact information) • Members who contributed to the development of the best practice • Problem statement (what does best practice address) • Background (enough context to understand the problem and the proposed solution) • Best practice description (model, business rules—use graphics where appropriate).
Part 5:Lessons learned	Describe any lessons learned identified by the group. Include the following information: • Date prepared • Point of contact (name, contact information) • Members who contributed to the development of the best practice • Problem statement (what does best practice address) • Background (enough context to what happened, what went wrong, and how to prevent a recurrence) • Lesson learned description (model, business rules—use graphics where appropriate).

- What was your role in the project/initiative?
- How would you judge its success or failure?
- What would you do differently if you could?
- What recommendations do you have for other people who may face a similar situation?
- What innovative things were done along the way?

Learning histories are typically presented in two side-by-side columns with a narrative in one and evaluative comments in the other. This allows readers to arrive at their own conclusions. The original participants must always validate the learning history before it is finally disseminated throughout the organization. Dissemination works best when it is an organized activity. Action learning is based on the fact that people tend to learn by doing. Small groups can be formed with participants who share common issues, goals, or learning needs. They can meet regularly, report on progress, brainstorm alternatives, try out new things, and evaluate the results. This is a form of task-oriented group work and learning that is well suited for narrow, specialized domains and specific issues. One good theme for such small groups would be to analyze a learning history and discuss what they would have done differently and why, in order to promote a better understanding of the event in question.

E-learning solutions typically involve the capture of valuable procedural knowledge and documenting a history of all procedural changes together with an explanation or justification for the change that was made (George & Kolbasuk, 2003). In this way, a historical thread is maintained and the context within which changes were deemed to be necessary does not become lost. In addition to a repository for such knowledge, a process needs to be put into place whereby employees who are planning to leave have the time and the necessary support to organize and store their reference materials, procedural experience accumulated throughout the years, and valuable knowledge that would be of great benefit to others in the future. For example, how they solve problems would be a very valuable thing to capture. Next, online courses could be created based on the information from threaded discussion archives. In this way, traditional and computer-based training systems can be combined to both capture and subsequently make available previously uncodified, typically tacit knowledge and know-how. The knowledge capture approach is very similar to how a subject matter expert would work with an instructional designer to design course content and accompanying hands-on activities.

An example is NASA, where 60 percent of aerospace workers were slated to reach retirement age all within a few years of each other. These impending retirements meant that valuable knowledge of the Apollo-era missions would be lost unless they could be transferred to remaining and future workers in an effective manner. NASA began a mentoring program that makes use of e-learning and virtual collaboration to capture valuable knowledge and know-how and to keep this content online. The solution included a mix of email, threaded discussions, and live collaborative sessions. A similar situation is faced by almost all major organizations around the world. The demographic pressure created by the baby boomers, who have always led by their sheer numbers, has created a growing need for knowledge continuity applications to make sure that valuable knowledge does not walk out the door.

Learning from others can consist of a number of activities such as external benchmarking, which involves learning about what the leaders are doing in terms of their best practices, either through publications or site visits, and then adapting and adopting their best practices. Benchmarking is a way of identifying better ways of doing business. Other sources would be through attending conferences and expositions and commissioning specific studies. Inviting guest speakers to an organization is another opportunity to bring a fresh perspective or point of view. Speakers may be selected on the basis of targeted interests and they may be internal or external to the organization. Typically, they would give a seminar or workshop and leave behind a set of reference materials.

Peer assists are defined by the FAO/European Union[1] as:

> a tool which supports a “learning before doing” processes in which advice is sought from someone else, or a group that has/have done something similar. This tool encourages participatory learning, by asking those with experience in certain activities to assist those wishing to benefit from their knowledge, through a systematic process, towards strengthened mutual learning.

Peer assists are a form of peer-to-peer learning that can be used to elicit and share tacit knowledge in organizations. Yahya and Goh (2002) describe how BP made use of peer assists to leverage KM and HR to promote organizational learning. They found that they could often get help and insights from people who were not part of their team. This is sometimes referred to as “thinking outside of the box,” and there was an additional benefit in that participants developed connections with one another. Effective peer assist meetings should be structured in order to ensure that effective knowledge creation and capture takes place. Typically, these meetings will have six phases:

1. The team presents the background and the problem they are there to solve.
2. Participants are then asked to consider the problem so that they understand it well.
3. Participants then start attempting to solve the problem. They often begin by identifying what additional information is needed.
4. Next, participants are asked to remember whether they faced any similar problems.
5. The participants present their initial thoughts informally and outline their list of options, based on their collective experience.
6. The team who requested the peer assist should then take the time to thank all the participants for their inputs. The final phase consists of all participants discussing what they learned and planning the next steps to tackle the problem at hand.

Knowledge jams (Pugh, 2011) and innovation jams (Di Fiore, 2013) are also very effective for tacit knowledge elicitation. As discussed in the previous section, jamming is a more structured approach to purposefully bringing together people from different business units in order to address difficult problems. Innovation jams, such as those at IBM, are specifically structured to elicit new ideas from the participants that can ultimately lead to new products and/or services. Critical success factors for all jams include:

1. Work in small well-defined teams. Not everyone needs to participate. A parallel objective is to let participants establish new networks; this works better in smaller teams.
2. Define the problem to be addressed very explicitly and very clearly. Jams often fail because of vague or overly ambitious goals. Avoid using jargon and define all terms to ensure that everyone is on the same page.
3. Provide some initial training before starting the actual jam session. Give participants some sample (simpler) problems to work on so that they can practice the process. This has the added benefit of getting peoples' creativity "warmed up" with some easy brainstorming and breaking the ice so that people are comfortable speaking out and working with the other participants. If you are using specific methodologies you should have them practice this too (e.g., creativity promoting methodologies such as Blue Ocean[2] or TRIZ[3]).
4. Make it fun. Often jams are held at an off-site location so that participants know it is okay to to have a good time (depending on their company's culture of course—there may not be a need to do this).

For example, Bjelland and Wood (2008) describe IBM's jams as a form of jazz improvisation. They are extremely open and democratic so that employees don't have to worry about status or job title during the jam. IBM's innovation jams often included non-IBM participants so that the scope extended beyond the company and beyond the employees' own networks. Following one 72-hour InnovationJam, there were 46,000 posts and of these, 31 promising ideas were selected for further consideration. IBM continues to conduct jams and even started offering it as service to its clients.

Muras and Hovell (2014) discuss a knowledge continuity approach to tacit knowledge elicitation. Knowledge continuity (described in greater detail in chapter 12) typically involves capturing knowledge from senior employees who are retiring (or leaving for other reasons) so that this knowledge can be made available to less-experienced employees. Most make use of interviews (some use video interviews) to document this knowledge. The challenge, of course, is that it would take a significant amount of time to identify let alone capture and document the large amount of tacit knowledge that an experienced employee has accumulated (usually over several decades). There are three major phases involved: identify valuable or critical knowledge, determine how to share it with existing employees and how to preserve it for future employees, and then apply or reuse this knowledge. Critical knowledge transfer is a similar process that focuses on how to pass along experiential knowledge (Leonard et al., 2014. Most experiential knowledge will consist of tacit knowledge so these techniques can also be used to elicit tacit knowledge. Experienced employees will have specialized knowledge, but also a less-experienced employee may be the only possessor of this knowledge. Typically, the sharing of this tacit knowledge would be through communities or networks, while technologies such as SharePoint would be used to store the knowledge for future access and reuse.

Ideally, these knowledge transfer processes should be built into succession planning, onboarding, and even routine evaluations, if an organization is to become a true learning environment. Leonard et al. (2014) coined the term Deep Smarts to refer to the collective experiential tacit knowledge of an organization. They noted that the knowledge most important to a given organization was the practical accumulated know-how gained directly from experience and, at the same time, aligned with the organizational goals. They recommend making individual knowledge institutionally available rather than conducting a series of interviews with individual experts. This is more difficult to do and will require resources, especially time, but will provide more benefits in the long term. In other words, every employee continuously contributes their experiential learning to an organizational memory system.

Finally, the master class (van Winkelen & McDermott, 2010) is another planned, systematic approach to elicit tacit knowledge. A master class is a form of coaching that first conducts or consults a knowledge audit in order to identify the critical areas of expertise. Knowledge criticality is an index of knowledge vulnerability or risk. If, for example, the audit shows that important knowledge or skills are possessed by only a few or even just one employee, then this knowledge is at risk. Next, individuals with this type of important and vulnerable knowledge are identified (e.g., using expertise locator systems or communities). These employees are then paired with coaches who mediate the tacit knowledge elicitation of experts and their subsequent appropriation by competent employees who have the potential to become experts eventually.

Figure 4.4 summarizes the key steps involved in knowledge acquisition at the individual and group levels. Identification refers to the process of characterizing key problem aspects such as participants, resources, goals, and existing reference materials. Conceptualization involves specifying the key concepts and key relationships among them in the form of a concept or knowledge map. Codification renders this validated content into an explicit form that can then be more readily disseminated throughout the organization.

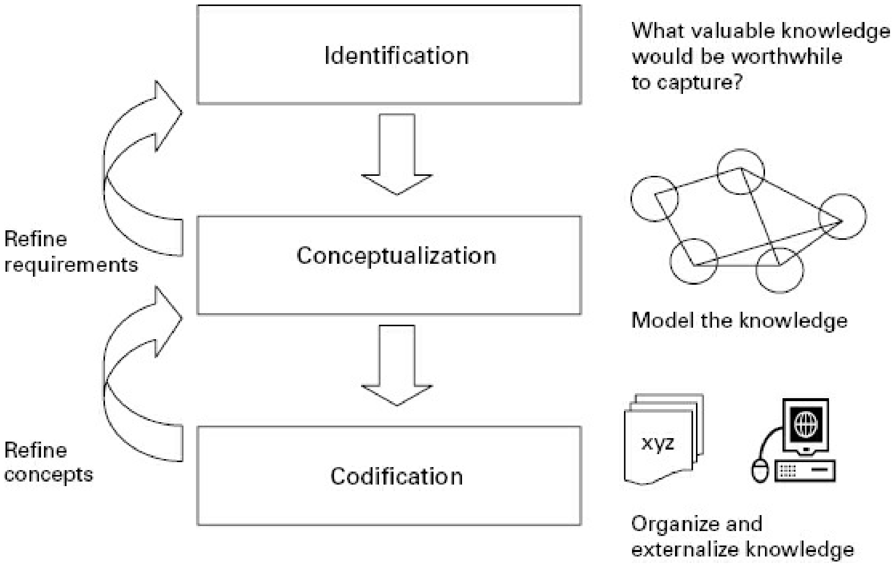
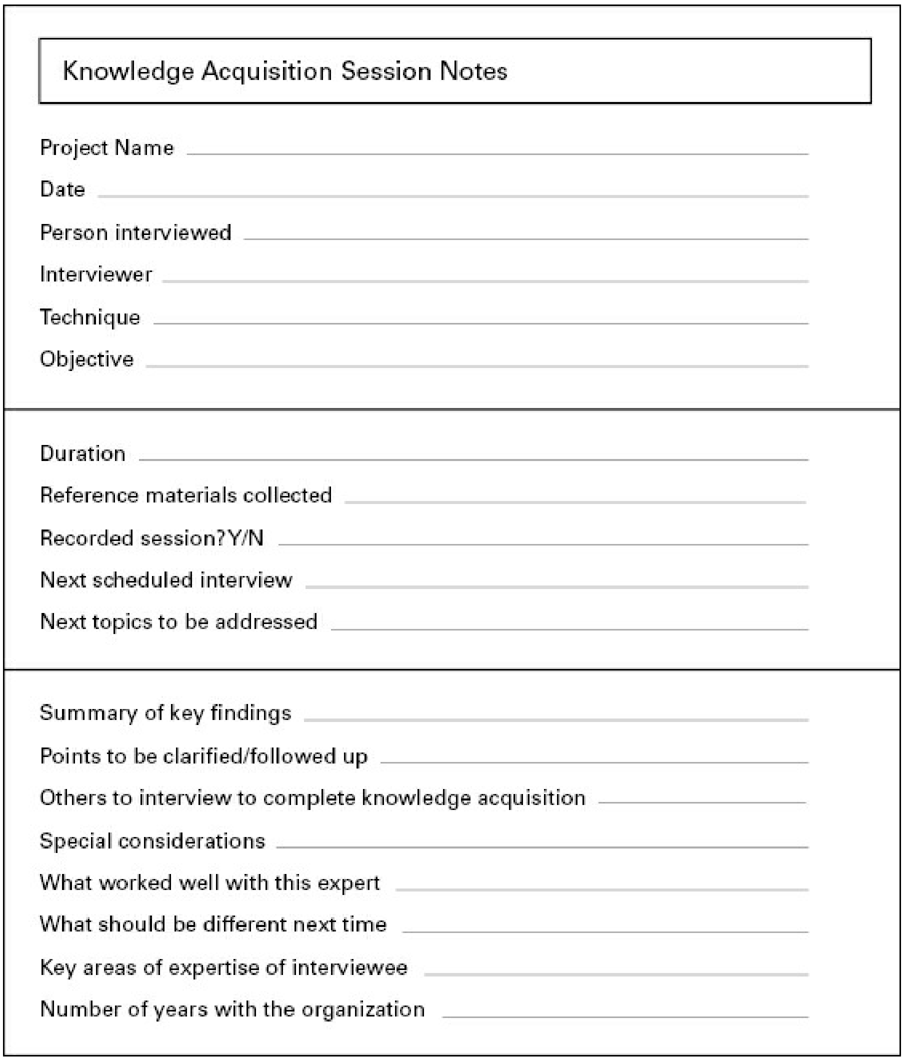


Figure 4.4 Key knowledge acquisition phases

The importance of record keeping during knowledge capture, especially tacit knowledge capture, cannot be emphasized enough. Original transcripts, recordings, and reference materials need to be carefully organized in a knowledge acquisition database. The source of each piece of key knowledge must be carefully recorded for future reference. The key findings should also be systematically captured. Templates are often used to structure and standardize knowledge acquisition processes. A sample knowledge acquisition session template is shown in figure 4.5. It is important to always send back transcripts and summary forms to the people interviewed. This serves to validate and complete the content but also gives the interviewee the chance to edit comments so they are not taken out of context.


Knowledge Acquisition Session Notes

Project Name
Date
Person interviewed
Interviewer
Technique
Objective

Duration
Reference materials collected
Recorded session? Y/N
Next scheduled interview
Next topics to be addressed

Summary of key findings
Points to be clarified/followed up
Others to interview to complete knowledge acquisition
Special considerations
What worked well with this expert
What should be different next time
Key areas of expertise of interviewee
Number of years with the organization

Figure 4.5 Sample knowledge acquisition session template

Tacit Knowledge Capture at the Organizational Level

Organizational knowledge acquisition is a qualitatively different process from processes that occur at the individual and group levels. Whereas in the latter we are primarily concerned with identifying and coding valuable knowledge, which is mostly tacit in nature, organizational knowledge capture takes place more on a macro level. Malhotra (2000) proposes a good approach by outlining four major organizational knowledge acquisition processes:

1. Grafting
2. Vicarious learning
3. Experiential learning
4. Inferential processes

Grafting involves the migration of knowledge between firms—a learning process whereby the firm gains access to task or process-specific knowledge that was not previously available within the firm. This is typically achieved through mergers, acquisitions, or alliances in that there is a direct passing of knowledge between firms (Huber, 1991). An example would be technology transfer or other forms of explicit knowledge.

Vicarious learning processes occur through one firm observing other firms' demonstrations of techniques or procedures. For example, benchmarking studies where companies can adopt the best practices of other industry leaders. This knowledge is more tacit than that obtained through grafting (Inkpen & Beamish, 1997) as it involves learning how to do something or know-how.

Experiential knowledge acquisition involves knowledge acquisition within a given firm—knowledge that is created by doing and practicing. Repetition-based experience relies on the learning curve to establish routines and procedures. This type of knowledge is initially tacit but can be easily codified and transferred (Pennings et al., 1994; Starbuck, 1992). Argyris & Schon (1978) refer to the processes of single and double-loop learning. Single loop learning involves the refinement and improvement of existing procedures and technologies as opposed to developing new ones (adapting for efficiency). In inferential knowledge acquisition processes (e.g., Mintzberg, 1990), learning is within the firm and occurs by doing; however, knowledge acquisition occurs primarily through interpretation of events, states, changes, and outcomes relative to the activities undertaken and decisions that were made. Learning is experimental, deductive learning that seeks to make sense of occurrences and to establish causal links between actions and outcomes. This type of learning is sometimes referred to as double-loop learning, as it involves changing underlying assumptions and frameworks (adapting for effectiveness).

The results of all four types of organizational knowledge capture will ultimately reside in some type of knowledge repository. This is the recipient of organizational memory and containers are usually some form of database on an intranet or extranet. The capture of such knowledge has, in large part, already occurred which means we can proceed directly to the codification of this content.

Explicit Knowledge Codification

Knowledge can be shared through the process of personal communication and interaction. We saw this in the first quadrant, socialization, of the Nonaka and Takeuchi KM model. This occurs naturally all the time. While this process is very effective, it is rarely very cost effective. Knowledge codification is the next stage of leveraging knowledge. By converting knowledge into a tangible, explicit form such as a document, that knowledge can then be communicated much more widely and with less cost. Interaction is limited in scope to those within hearing or able to have face-to-face contact. Documents can be disseminated widely over a corporate intranet and they persist over time, which makes them available for reference as and when they are needed, both by existing and by future staff. They constitute the only "real" corporate memory of the organization.

There are, of course, costs and difficulties associated with knowledge codification. The first issue is that of quality, which encompasses:

- Accuracy
- Readability/understandability
- Accessibility
- Currency
- Authority/credibility

The pivotal role of knowledge codification is that it allows the sharing and use of what is collectively known. Knowledge held by a particular person enables that person to be more effective. If people interact to share their knowledge within a community of practice or work team, then that practice becomes more effective. If knowledge is codified in a material way (i.e., rendered explicit), then it can be shared more widely both in terms of audience and time duration. In order to understand, maintain, and improve knowledge as part of corporate memory, knowledge must be codified. The codification of explicit knowledge can be achieved through a variety of techniques such as cognitive mapping, decision trees, knowledge taxonomies, and task analysis.

Cognitive Maps

Once expertise, experience, and know-how have been rendered explicit, typically through some form of interviewing, the resulting content can be represented as a cognitive map. A cognitive or knowledge map is a representation of the "mental model" of a person's knowledge and provides a good form of codified knowledge. A mental model is a symbolic or qualitative representation of something in the real world. It is how human minds make sense of their complex environments. A cognitive map is a powerful way of coding this captured knowledge because it also captures the context and the complex interrelationships among the different key concepts. It is in fact also very important to include individual views, perceptions, judgments, hypotheses, and beliefs as they form part of the subjective worldview of the interviewee. The nodes in a map are the key concepts and the links represent the interrelationships among the concepts. These may be drawn manually, by taping small note pages on a wall or a whiteboard, or through visualization software (ranging from simple brainstorming mapping tools to 3-D depictions). Figure 4.6 shows an example of a cognitive map in response to the question: "describe the major differences between tacit and explicit knowledge objects."

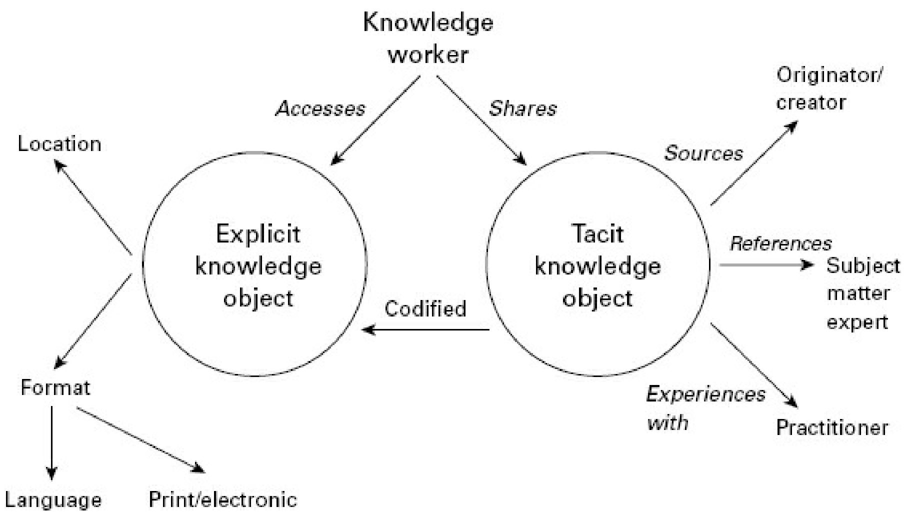


Figure 4.6 Example of a concept map

Cognitive mapping is based on concept mapping (Leake et al., 2003), which allows experts to directly construct knowledge models. Concept maps represent concepts and relations in a two-dimensional graphical form with nodes representing key concepts connected by links representing propositions. These are quite similar to semantic networks used by such diverse disciplines as linguistics, education, and knowledge-based systems. The goal of such systems is to better organize explicit knowledge and to store it in corporate memory for long-term retention.

Another widely used tool for explicit knowledge coding is the CommonKADS methodology (Schreiber et al., 2000; Shadbolt et al., 1999), which is a knowledge engineering methodology centered on five models of an organization:

1. Task model of the business processes of the organization
2. Agent model of the use of knowledge by executors, both human and artificial, to carry out the various tasks in the organization
3. Knowledge model that explains in detail the knowledge structures and types required for performing tasks
4. Communication model that models the communicative transactions between agents
5. Design model that specifies the architectures and technical requirements needed to implement a system that embodies the functions detailed by the knowledge and communication models.

In order to implement KADS, the organization is analyzed to identify knowledge-oriented problems, describe the organizational aspects that may affect knowledge solutions (e.g., culture, resources), describe the business processes in terms of agents required, location, knowledge assets deployed, and measures of knowledge intensiveness and significance (e.g., mission criticality). Next, the knowledge used in the organization is described in terms of possessors, processes used in, and whether or not it is in the right form and location, of right quality, and available at the right times. The feasibility of suggested solutions is then checked against the knowledge problems identified in the first step. This approach allows a systematic cost–benefit analysis to be carried out for the processes of knowledge capture.

Decision Trees

Decision trees are another widely used method to codify explicit knowledge. This representation is both compact and efficient. The decision tree is typically in the form of a flowchart, with alternate paths indicating the impact of different decisions being made at that juncture point. A decision tree can represent many rules and when you execute the logic by following a path down it, you are effectively bypassing rules that are not relevant to the case in hand. You do not have to look at every rule to see if it “fires,” and you also take the shortest route to the correct outcome. Their graphical nature makes them very easy to understand and they are obviously very well suited for the coding of process knowledge. An example would be a preventive maintenance process for factory equipment. The captured knowledge from maintenance workers could be coded in a decision tree to help future maintenance workers carry out parts replacement and other work on a schedule-based decision rather than reacting to parts becoming worn out. Another example, shown in figure 4.7, helps guide the decision to consolidate or to develop a new product as a risk management decision tree.

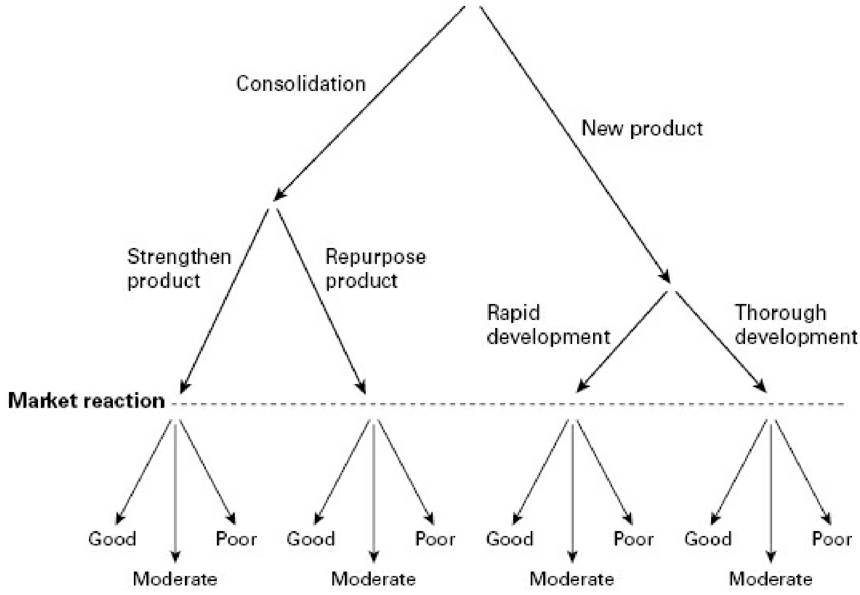


Figure 4.7 Example of a decision tree

Knowledge Taxonomies

Concepts can be thought of as the building blocks of knowledge and expertise. We each have our own internal definitions of concepts we use to make sense of the world around us. Once key concepts have been identified and captured, they can be arranged in a hierarchy that is often referred to as structural knowledge taxonomy. Knowledge taxonomies allow knowledge to be graphically represented in such a way that it reflects the logical organization of concepts within a particular field of expertise or for the organization at large. A knowledge dictionary is a good way to keep track of key concepts and terms that are used. This may be compiled as you acquire and code knowledge. It should clearly define and clarify the professional jargon of the subject matter domain.

Taxonomies are basic classification systems that enable us to describe concepts and their dependencies—typically in a hierarchical fashion. The higher up the concept is placed, the more general or generic the concept is. The lower the concept is placed, the more specific an instance it is of higher-level categories. An example is shown in figure 4.8.

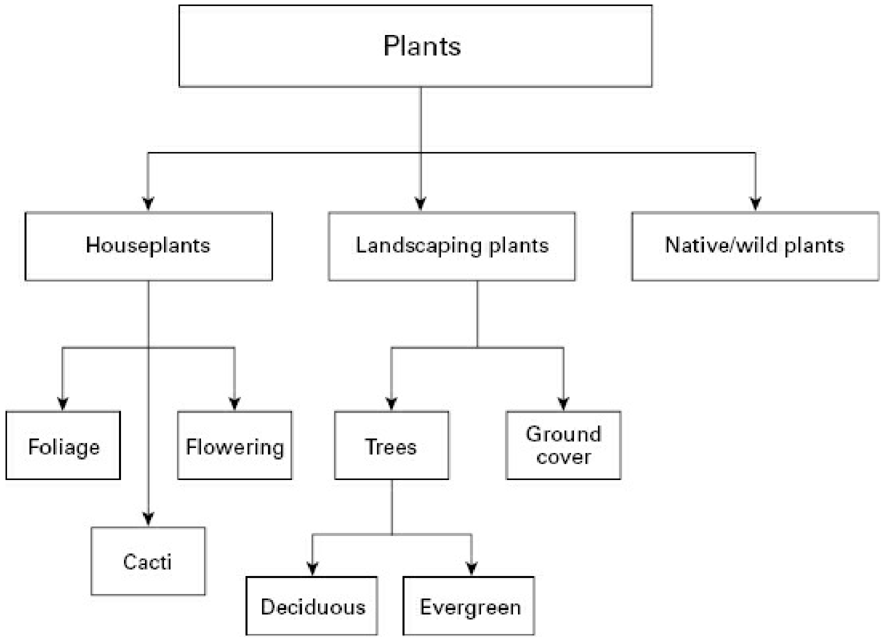


Figure 4.8 Example of a knowledge taxonomy

An important concept that underlies taxonomies is the notion of inheritance. Each node is a subgroup of the node above it that means that all of the properties of the higher-level node are automatically transferred from "parent" to "child." As shown in figure 4.8, if the higher-level node is a houseplant and the lower level nodes are foliage and flowering plants, both of these two subgroups possess all the characteristics of houseplants. In fact, taxonomies originated as biological classification schemes.

The construction of taxonomy involves identifying, defining, comparing, and grouping elements (Lambe, 2007). Organizational knowledge taxonomies, however, are not driven by basic first principles or "real" attributes but by consensus. All the organizational stakeholders need to agree on the classification scheme to be used to derive the taxonomy—it cannot be theoretical but must be empirical—this is how we code this type of knowledge in our work. The reason for this is because unlike traditional taxonomies, such as the first comprehensive biological species taxonomy developed by Linnaeus (1767), the purpose of an organizational taxonomy is not to come up with a universally accepted way of describing reality. Rather, an organizational taxonomy is a mixture of a depiction of concrete components and abstract concepts that together make up the context of that particular company. Consensus is vital because the taxonomy serves to help achieve the goals of the organization and it does this by helping knowledge workers communicate better, code knowledge better, and organize this coded knowledge in such a way that it can be used by everyone today and by workers of the future when they need to retrieve and make use of this knowledge.

A taxonomy is a classification scheme that groups related items together, often names the types of relationships concepts have to one another, and provides some notion of more general categories versus examples or specific instances of a category. Classification schemes can be very personalized, such as the names we give our personal email folders or desktop files. There is no problem as there is typically only one user—you (and hopefully you can remember how you named your folders!) But what happens if we are working with someone else? We usually reflect a bit more before typing in the email subject heading and before naming a file to be sent as an attachment. Why? The names must make sense to you but also to them. We have no choice but to standardize a bit more and to achieve some sort of consensus if there are a number of people working with the same content. At the very basic level, a consensus on naming different versions of a document that has multiple authors will be needed. The organizational level will required the highest level of standardization and consensus. Perfect consensus is of course rarely feasible (nor very cost-effective), so we are fortunate to have a way of "cheating": together with the knowledge dictionary, it is often a good idea to develop an organizational thesaurus. The thesaurus will contain all the synonyms and cross-references prevalent in the organization, for example, one group may have decided against using the term "knowledge management" and prefers "knowledge sharing," and yet another division has adopted "knowledge networks." All three would appear in the thesaurus, with KM highlighted as the formally accepted term for the organization as a whole, while allowing for some customization at the level of the different groups. Another benefit of a good thesaurus is that a keyword search engine can use each term to retrieve all relevant content (see chapter 8).

A number of concept-sorting techniques may be used in coding organizational knowledge, ranging from manual to completely automated processes. An example of a manual process would be to have participants sort cards into groupings. An automated example would be something like the RepGrid technique developed by Shaw (1981), based on Kelly's (1955) personal construct theory. Most automated systems use a form of cluster analysis to identify groupings in a set of data (e.g., hierarchical cluster analysis, Johnson, 1967), multidimensional scaling (e.g., Kruskal, 1977), or network scaling (e.g., Schvaneveldt et al., 1985). Cluster analysis is a method of producing classifications from data that is initially unclassified. In hierarchical cluster analysis, the groupings are arranged in the form of a hierarchical tree. Repertory grid analysis is a technique based on a theory that states each person functions as a scientist who classifies or organizes his or her world. Based on these classifications, the individual is able to construct theories and act based on these theories. A repertory grid depicts this theoretical framework for a given individual. The different taxonomic approaches to the codification of explicit knowledge are summarized in table 4.2.

Table 4.2 Major taxonomic approaches to knowledge codification

Taxonomic approach	Key features
Cognitive or concept map	• Each key content is represented as a node in a graph and the relationships between these key concepts are explicitly defined. • Can show multiple perspectives or views on the same content. • Fairly easy to produce and intuitively simple to understand but difficult to use for

	knowledge related procedures.
Decision tree	• Hierarchical or flowchart type of representation of a decision process. • Very well suited to procedural knowledge—less able to capture conceptual interrelationships. • Easy to produce and easy to understand.
Manual knowledge taxonomy	• Object-oriented approach that allows lower or more specific knowledge to automatically incorporate all attributes of higher-level or parent content they are related to. • Very flexible—can be viewed as a concept map or as a hierarchy. • More complex, therefore will require more time to develop, as they must reflect user consensus.
Automated knowledge taxonomy	• A number of tools are now commercially available for taxonomy construction. • Most are based on statistical techniques such as cluster analysis to determine which types of content are more similar to each other and can constitute subgroups or thematic sets. • Good solution if there is large amount of legacy content to sort through. • More expensive and still not completely accurate—will need to validate and refine for maximum usefulness.

In addition to the hierarchy, taxonomies can organize knowledge as lists, trees, poly-hierarchies, matrices, facets or system maps (Lambe, 2007) Organizational knowledge is often best represented using a multifaceted taxonomy or polyhierarchy that makes use of more than one classification rule (or "facet"). The general guideline is that each facet be clearly distinguishable from the others (e.g., shape, color, and cost are three facets that do not overlap in any way). Another guideline is that each facet be clearly understood by all users (and if not, then a thesaurus should keep track of equivalent terms). Good examples of a faceted taxonomy may be found at http://wine.com, where wine can classified according to region, taste, price, and so on, and http://www.epicurious.com, where recipes can be classified according to type of event, type of cuisine, time to prepare, and so on. A multifaceted taxonomy is often used for business content, as it is the most flexible and can deal with the often messy, overlapping, ill-defined nature of knowledge used in a company. Facets are relatively easy to add, remove, or modify in order to accommodate changes in the organization, changes in user types, and changes in tasks. Finally, from a user perspective, each facet can serve as a search term to locate and retrieve content.

Most small- and medium-sized organizations will primarily use manuals as means of developing taxonomy, while larger organizations may be better positioned to purchase the fairly expensive automated software tools available. In all cases, however, a hybrid approach is best. While automated systems can help provide a good head start, especially in cases where there is a significant volume of existing legacy content, human intervention is almost always needed to correct and refine the classification—and, of course, to ensure consensus. A number of manual taxonomy techniques can be used to help groups work together to create the categories, decide on the facets, and develop a thesaurus. The most popular techniques used are card sorting (Nielsen, 1994; Warfel, 2001;) and affinity diagramming (Farnum, 2002; Gaffney, 2000.)

Card sorting is a very low-tech method of understanding users' mental models of how knowledge should be organized. The best tools to use are post-it cards preprinted with key concepts already known (typically derived from a survey of documents and of intranet content). There should be some blank cards so users can add terms. There are two general types of card sorting: open and closed. In open card sorting, there are no preestablished groupings, whereas in closed card sorting, there is already a preliminary taxonomy in place. Open card sorting is useful to better understand participants' perceptions while closed card sorting is useful to validate an existing taxonomy (e.g., document classification scheme or web navigation design).

The general steps involved are to distribute the cards to each participant and ask them to group together those cards in a way that makes sense to them and to name each grouping The piles can be of different sizes and users can elect not to use some of the cards (as long as they jot down why they were rejected.) The user groups should be representative and they can be homogenous (if we are looking at a consensus) and heterogeneous (in order to have a taxonomy that is broader in scope and to create a thesaurus.). Both types of groups are recommended if time permits. The recommended number of participants is a minimum of six and the recommended time is a minimum of thirty minutes to sort fifty cards.

Users can stop when they feel they have exhausted all the possibilities. The facilitator may ask them to try to aggregate into bigger groups if there are too many groups (a good rule of thumb is

Miller's magic number of seven plus or minus two, which appears to be the number of items our cognitive abilities are best able to handle). Once everyone has finished, the facilitator enters everyone's results onto a spreadsheet. There will be some agreement right at the outset about groupings, while others will differ. A statistical analysis called cluster analysis can be used to obtain a visual representation of the results. For those groupings that were different, it may be due to using different labels to denote the same concept or additional subcategories may be required. Once the resulting preliminary taxonomy has been completed, the same participants may be asked to validate this classification scheme through a closed card sorting exercise.

Jiro Kawakita, an anthropologist, created the affinity diagramming method in the 1960s (Kawakita, 1991) as a means of grouping large numbers of brainstormed ideas into groups. The resulting groupings were represented visually as boxes. The general process is to conduct a brainstorming meeting and record all the generated ideas on post-it notes or index cards. The group of users sort the notes/cards based on what items they feel are related. Each group is then given a name. The group is then asked to explain both their grouping and their naming. The same idea may belong to more than one group. Again, small numbers of groups is most efficient (seven plus or minus two groupings).

It is vitally important to identify content owners when creating the knowledge taxonomy of the organization to help ensure that content will always be kept up to date. The organization will also have a clear idea of which of the staff are holders of specialized knowledge. This knowledge taxonomy (also referred to as a knowledge map or corporate organizational memory) should also make use of metadata tagging on "information about information." For example, tagging content with content owners, "best before dates," classification information such as key words, business specific information such as intended audience, and vertical industry should all be addressed. An illustration appears in box 4.3.

Box 4.3
Siemens

The Siemens AG ShareNet system[1] is essentially an intranet covering both codified and personalized knowledge. The ShareNet organization consists of a global editor, contributors, a decision committee for the evolution of ShareNet, and about 100 ShareNet managers, one in each country, who support contributors in capturing project experiences and marketing know-how. These managers drive the development of re-usable knowledge. They spend 50 percent of their time on this and are supported by an 18-strong central team. Siemans rates the taxonomy as being very important. They came up with a shared taxonomy for business processes. The incentive system is also quite interesting: ShareNet shares are given for urgent responses, discussion group responses, objects published, reuse feedback, and so on. An individual who garners 3,500 shares wins an invitation to a conference. Siemans continues to have a KM department whose main responsibilities are to set up communities and provide a central support service to these communities. For example, there are corporate-funded CoP kickoff workshops. Their initial budget was US$600,000 and is now US$10m, mainly in the form of ShareNet Managers' time.

Information professionals are the ideal candidates to carry out knowledge creation, capture, codification, and organization. Information professionals have a solid foundation in library and information science skills and are already very adept at skills such as structured interviewing (as they conduct reference interviews) and the development of classification frameworks. The process of analyzing and reworking the tacit and explicit information will help clarify what the organization knows and what it needs to know. It is neither necessarily cheap nor easy but it will capture key knowledge, improve consistency, and generalizability throughout the organization. Writing good content is the best way of creating knowledge assets within an organization. An example showing two facets of good knowledge creation is shown in figure 4.9.

Box 4.4
A vignette: University blue book

A large North American university contacted its library school to help in developing a blue book—a database of research expertise present at the university. The objective was to provide the donor relations group, the media group, and the technology transfer group with a good central reference tool that would enable them to contact the most appropriate researcher quickly with respect to each of their needs: to present their research to a group of potential philanthropists, to find someone who can answer questions from the media regarding a current event, and to meet with prospect companies interested in commercializing some of the results of their research, respectively. While a number of researcher profiles existed, they tended to be scattered over personal websites, university departmental web pages, and other standalone applications. The challenge was how to present the same research but to three different target audiences, each with their own preferred terminology.

The library science students quickly set up meetings with representative users from each of the three groups and conducted card sorting and affinity diagramming workshops with each. Existing research profiles and existing commercial taxonomies provided the terms to be placed on the preprinted cards. The multifaceted taxonomy was the result with an extensive thesaurus. The database captured the three different perspectives (four really, counting the researcher's preferred terminology and groupings). Each user group became a facet and could search the database using their own specific perspective and their own specialized language.

For example, educational researchers work on social cognition and emotional intelligence (terms used by the researchers themselves) issues to better understand the antecedents of peer pressure and bullying. A cyberbullying incident brings reporters to call the education department to find someone to speak on the topic (Kowalski et al., 2008). Cyberbullying is a term that has been popularized by the media. The donor relations group showcases some of the research being done to target adolescents to garner the interest of potential philanthropists who have expressed specific interest in this age group. Finally, a computational linguistics company that has already done some work in identifying online hate literature is interested in adapting their software to identify instances of cyberbullying. This small specialized field of research has rapidly generated at least eight different but related tags: social cognition, emotional intelligence, peer pressure, bullying (a subgroup of peer pressure), cyberbullying (a subgroup of bullying), adolescent behaviors, online hate literature, and computational linguistics. The database can easily substitute equivalent terms to better respond to the information seeker's needs and to better adapt to the terms they are more familiar with.

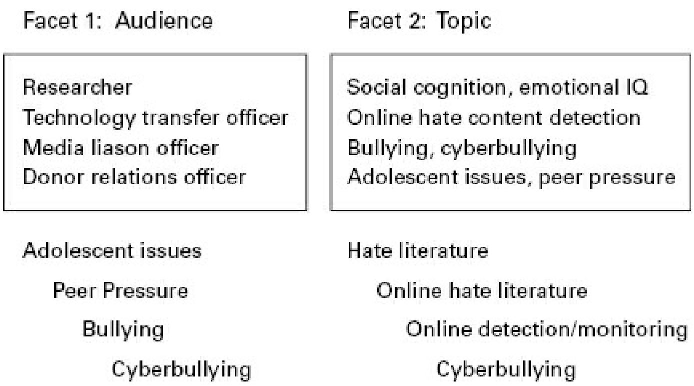


Figure 4.9 Example of multifaceted taxonomy for cyberbullying

Strategic Implications of Knowledge Capture and Codification

Knowledge capture and codification are particularly critical when there is an issue of knowledge continuity (e.g., Field, 2003; Beazley et al., 2003). Whereas knowledge management is concerned with capturing and sharing know-how valuable to colleagues performing similar jobs throughout a company, knowledge continuity management focuses on passing critical knowledge from exiting employees to their replacements. Whereas most of the literature focuses on a departing individual's knowledge transfer to their successor, the problem is not so localized. Knowledge continuity should focus on not only the specific knowledge to be transferred between individuals but it should also address strategic concerns at the group and organizational levels. The organization needs to be aware of its critical knowledge assets—these are captured and codified in the form of a knowledge map or taxonomy. Organizations also need to take into account the impact of departures, whether due to a baby boomer retiring or other reasons, on the communities that leaving workers are members of. Their leaving may literally leave a serious gap in the fabric of the community network.

At its core, knowledge continuity management is about communication (Field, 2003)—employees need to understand just what it is that they know that others need to know, and why this content needs to be shared with their peers. The more critical a job is to the company, the more important it is that it be part of a continuity management system. The more sophisticated, complex, and tacit the knowledge a worker possesses, the more difficult it will be to pass on—and even more important that it be passed on. These raise important questions concerning security and access in addition to a code of ethics that ensures that all concerned are treated in a professional manner.

Some recommendations from Field (2003) include:

- Set up a knowledge profile for all critical workers
- Foster mentoring relationships
- Encourage communities of practice
- Ensure that knowledge sharing is rewarded
- Protect people's privacy
- Create a bridge to organizational memory for long-term retention of the valuable content

Practical Implications of Knowledge Capture and Codification

While the benefits of capturing tacit knowledge and codifying explicit knowledge are obvious to organizations, they are more often than not fairly vague at the level of the individual knowledge worker. The prevalence of the "knowledge is power" paradigm that still continues to date makes it difficult to "sell" employees on the importance of having their knowledge retained by the organization as a future hedge for when they are no longer working there. Knowledge is a curious asset—one that cannot be owned but merely borrowed or rented. Some knowledge remains within the organization when employees leave but this needs to be the *right* kind of knowledge and workers will need to be able to access and make use of it.

A number of recommendations include:

1. *Acknowledge knowledge contributors:* Turning tacit knowledge into explicit knowledge is difficult for many users and often faces resistance, despite the obvious benefits. Acknowledge workers who not only create original content, but also help improve the content over time by adding additional context from customer interactions. KM software should offer reports to identify those who are contributing, or help to tap the tacit knowledge by building profiles of experts based on their contributions.
2. *Remember to forget:* The role of unlearning or reframing cannot be emphasized enough (e.g., Fiol & Lyles, 1985). The organizational knowledge base should not be viewed as unlimited storage space to be filled. While there may not be any technological constraints, there are certainly conceptual constraints to take into consideration. Unlearning involves disposing of old frameworks and breaking away from the status quo—a form of double-loop learning. Van de Ven and Polley (1992) suggest that unlearning involving responses to mistakes, and failures can play an important role in knowledge acquisition and deployment—if they are viewed as learning opportunities. As Edison put it: "I have not failed. I've just found 10,000 ways that won't work." (Thomas A. Edison, 1847–1931).
3. *Don't spill any knowledge during transfer:* Conversion of tacit knowledge to explicit knowledge must be accomplished without significant loss of knowledge (e.g., Brown & Duguid, 2000). The advantages of communicability do not always outweigh the disadvantages of "knowledge leakage." It is crucial to maintain links to knowers—individuals within the organization who are adept at making use of complex knowledge. The goal is to carry out the *right* amount of knowledge acquisition and codification.
4. *Remember the paradox of knowledge value:* The more tacit knowledge is, the more value it holds. Tacit knowledge is generally of greater value and of greater competitive advantage to a firm—it may be in the firm's interest to maintain that content at a certain minimal level of tacitness so that it is not easily acquired or imitated by others.

Key Points

- Firms need to adapt and adjust to some degree if they are to survive.
- Firms need to learn—the question is whether they do so in an ad hoc informal manner or whether there is deliberate intention to learn.
- Emergent knowledge acquisition (Malhotra, 2000) is spontaneous and unplanned—because it is haphazard, there is no guarantee that anything will be retained in the organization's corporate memory.
- Methodical, systematic, intentional knowledge acquisition is of greater strategic value to a firm.
- Interviewing is the major approach used to elicit tacit knowledge from experts but a variety of other methods can be used to capture this knowledge.
- Knowledge bases must be populated and contents deployed in order to maximize efficiency and effectiveness of reuse of explicit knowledge throughout the organization.

Discussion Points

1. What are some of the pitfalls that may be encountered in capturing tacit knowledge? How would you address these?
2. When would you need to interview more than one expert? Why?
3. What is the purpose of a learning history? What are its key components?
4. Why is it difficult to directly codify tacit knowledge?
5. What are the major taxonomic approaches to codifying knowledge that has been captured? What sorts of criteria would help you decide which one(s) to use in a given organization? How would you maintain the taxonomy?
6. What are the advantages of using a knowledge map to visualize valuable knowledge that has been captured and codified?
7. Define knowledge continuity management and discuss its strategic implications for knowledge capture and codification.

Notes

1. See http://www.fao.org/elearning/course/FK/en/pdf/trainerresources/PG_PeerAssist.pdf.

2. See https://www.blueoceanstrategy.com.

3. See https://triz-journal.com/triz-what-is-triz.

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5 Knowledge Sharing

> Knowledge exists to be imparted.
>
> —Ralph Waldo Emerson (1803–1882)

This chapter addresses the social nature of knowledge, knowledge networks, and communities of practice (COP), and other ways of sharing knowledge. A number of important conceptual frameworks are presented to study the social construction of meaning. Knowledge-sharing groups are situated in a historical context and their evolution in organizations is described with particular emphasis on the development of social capital. Techniques and technologies such as social networks are presented as means of visualizing and analyzing knowledge flows during knowledge-sharing activities, and some common barriers to knowledge sharing are described. The dimensions of social presence and media richness are introduced as a means of characterizing knowledge-sharing channels.

Learning Objectives

1. Describe the key components of a community of practice.
2. What are the major differences between a team, a knowledge network, and a community of practice?
3. Outline the major phases in the life cycle of a community and the corresponding information and knowledge management needs for each.
4. Define the major roles and responsibilities in a community of practice.
5. Characterize knowledge sharing channels with respect to the dimensions of social presence and media richness.
6. Analyze the flow of knowledge in a community of practice using appropriate tools and techniques to identify enablers and obstacles to knowledge sharing.
7. Discuss how communities can be linked to organizational memory in order to foster organizational learning and innovation.
8. What tools and technologies are used in collaboration? Provide an example of each (e.g., blog, portal, Skype, wikis, social bookmarking, etc.).

Introduction

Once knowledge has been captured and codified, knowledge needs to be shared and disseminated throughout the organization (see figure 5.1).

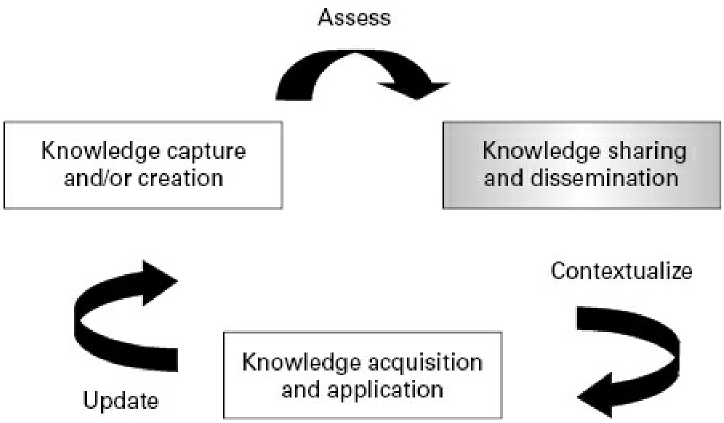

Figure 5.1 An integrated KM cycle

With the advent of personal computers and the World Wide Web, it seems to be implicitly assumed that web users are all good researchers or searchers. Unfortunately, this has not been accompanied by any type of training or what is sometimes referred to as "information literacy," defined as "a set of abilities requiring individuals to recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information" (ALA, 1989). "Information seeking" rarely appears as a requirement in job descriptions and yet, IDC (Feldman, 2004) estimates that knowledge workers spend from 15 to 35 percent of their time searching for information. These workers typically succeed in finding what they seek less than 50 percent of the time. In parallel, economists raised the alarm about the "productivity paradox," which refers to a surprising decline in productivity (as measured by standard indices) despite massive investment in computers (Harris, 1994).

This means that although 80 to 85 percent of a company's information is hard-to-access tacit knowledge, it does not appear that explicit knowledge is any easier to find and use. One IDC estimate (Feldman, 2004) found that 90 percent of a company's accessible information is used only once. The amount of time spent reworking or recreating information because it has not been found or, worse, going ahead and making decisions based on incomplete information is increasing at an alarming rate. The IDC study estimates that an organization with 1,000 knowledge workers loses a minimum of $6 million per year in time spent just searching for information. The cost of reworking information because it has not been found costs that organization a further $12 million a year. We can only imagine but not yet calculate the increase in creativity and original thinking that might be unleashed if knowledge workers had more time to think instead of futilely trying to find existing information.

Box 5.1
An example: The cost of not finding information

The annual cost of a poorly designed knowledge base interface such as an intranet can be easily calculated using the Excellent Intranet Cost Analyzer (available from http://www.dack.com/web/cost_analyzer.html). There is a cost to not finding information. Although it is impossible to measure the exact cost of employees not finding information on a company's intranet, the tool below gives a ballpark figure.

Instructions:

2. Enter the number of a company's employees.
3. Enter the average number of intranet pages each employee visits per day.
4. Enter the average number of seconds of confusion per page a company's intranet users will experience. That is, the number of seconds a user says "This isn't what I'm looking for." or "Damn! I'm lost!" A typical range is between five and twenty seconds.
5. Enter the average employee's annual salary.
6. Push the Calculate button.

In 2000, the IBM Institute conducted a survey of forty managers at large accounting organization to identify the sources of information people used in organizations that had a well-developed knowledge management system or infrastructure (Bartlett, 2000). The results showed that people still first turned to people in order to find information, solve problems, and make decisions. In fact, the company knowledge base was ranked only fourth among the five choices for preferred sources of information, as shown in table 5.1.

Table 5.1 Results of the IBM Institute survey

Information source	Number of respondents who chose this source	Percentage of respondents who chose this source
People	34	85
Prior material	16	40
Web	10	25
Knowledge base	4	12
Other	4	12

Cross and Parker (2004) found that people are the most critical conduits of information and knowledge. Knowledge workers typically spend a third of their time looking for information and helping their colleagues do the same. A knowledge worker is five times more likely to turn to another person rather than an impersonal source such as a database or knowledge management systems. Only one in five knowledge workers consistently finds the information needed to do their jobs, and Cross and Parker (2004) have found that knowledge workers spend more time recreating existing information they were unaware of than they spend creating original material.

A similar type of study was undertaken with a large aviation company in the United States. This was a longitudinal study that took place over seven years and studied the ways in which individuals in this large organization sought out and found information. The research team actually sat down with and observed highly skilled professionals as they went about their daily work. Not only did these workers prefer to contact other people in order to find retrieve and make use of information, but this also turned out to be a more successful strategy to use.

It turns out that, not only are other people the preferred source of information, but that there are a number of reasons for this. One is, of course, that it is often faster, but this is not the only reason. When we turn to another person, we not only end up with the information we were looking, for but we also help learn where it was to be found. The other person may help us to reformulate our question or query, tell us where we were on the right track and where we strayed, and, last but not least, that the information is coming to us from a known and usually trusted, credible source. In other words, people are the best means of getting not only a direct answer but also “metaknowledge” about our search target and our search capabilities. Talking to other people provides a highly valuable learning activity that is primarily a tacit-tacit knowledge transfer, as this type of knowledge is seldom rendered explicit or captured in any form of document.

These studies all point to one key dimension and that is that learning is a predominantly social event (Cohen & Prusak, 2001). Present day organizations have difficulty providing opportunities for such social one-to-one knowledge exchanges to continue to exist in their traditional form, that is, as informal hallway, water cooler, coffee machine, or even designated smoking area chats due to the large number of employees and/or the fact that they may not all be in close proximity to one another. Technology offers a new medium through which employees who share similar professional interests, problems, and responsibilities can share knowledge. This is typically through email groups, discussion groups, and other interactions in some sort of virtual shared workspace that is typically hosted by the organization’s intranet, and they are often referred to as “communities of practice” (CoPs).

A community of practice refers to “a group of people having common identity, professional interests and that undertake to share, participate, and establish a fellowship” (American Heritage Dictionary, 1996). Communities of practice can be defined as a group of people, along with their shared resources and dynamic relationships, who assemble to make use of shared knowledge, in order to enhance learning and create a shared value for the group (Seufert et al., 1999; Adams and Freeman, 2000). The term “community” suggests that these groups are not constrained by typical geographic, business unit, or functional boundaries but rather by common tasks, contexts, and interests. The word “practice” implies knowledge in action—how individuals actually perform their jobs on a day-to-day basis as opposed to more formal policies and procedures that reflect how work should be performed. The concept of a community of practice as a knowledge-sharing community within organizational settings originated with Lave and Wenger (1991). Many organizations have implemented communities of practice, as illustrated in boxes 5.2 and 5.3.

Box 5.2

An example: Ericsson

Jumping straight into deploying knowledge-management technology was a temptation for telecommunications supplier Ericsson Canada Inc. “We have a tendency to grab technology first,” says Anders Hemre, director of enterprise performance at the company’s Montreal research unit. But Ericsson officials wisely took a step back to look at the company’s culture, values, and people before doing so.

Through surveys, Hemre found that the research group’s growth (doubling to 1,700 workers in four years by 1999) had undercut the sense of community. So Ericsson identified informal groups that had formed around work-related topics, such as Java programming or the mobile Internet, and worked to help those cliques expand and form new groups to further disseminate ideas and information. People gather informally to discuss work outside their cubicles every day, but “to capture that and put a little bit of structure to it to help it along, without overengineering or overmanaging it, is the trick.”

Once the groups were identified by talking to employees in the various research divisions, Ericsson appointed a community leader for each group and gave workers time to meet on a regular basis; there was no agenda for these meetings, which still take place. A community is formed for learning, but it’s not necessarily organized or managed in a heavy-handed way.

Organik requires employees to create profiles by filling out a form that Ericsson stores in an Oracle database. When a person searching for an expert finds a match in the database, Organik will send an email notification to that person that his help is being requested.

Box 5.3
An example: ICL

ICL Ltd. has changed its entire organization into communities. These fall into two types: professional and interest. All employees belong to a professional community dependent on their function (sales, project management, consultancy, etc.) and any employee can belong to one or more communities of interest (KM, quality improvement, etc.). For example, a consultant will belong to the professional community of consultants and work and develop within this framework. The consultant can also specialize in KM and therefore belong to the KM community of interest where members share, discuss, and develop in the KM field. The KM community meets at regular intervals, guest speakers are invited to meetings, and lots of tacit knowledge exchange takes place. It develops into a true community spirit. The interest community will typically regulate itself and have an administrator to facilitate the web space and other coordination activities.

Demarest (1997) distinguished two basic orientations to KM: information-based (codifying and storing content) and people- or interaction-based KM (connecting knowers). This mirrors the personalization versus codification KM strategies discussed in chapter 3. Information-based approaches focus primarily on knowledge capture and codification, as we saw in chapter 4. The information-based approach tends to emphasize explicit knowledge over tacit and favors the externalization objective. The learner is viewed as a tabula rasa or blank slate, and into this container content is simply poured in. Rodin's *The Thinker* is an image that captures this notion well—an individual, alone, deep in thought. This narrow focus or "tunnel vision" neglects context, background, history, common knowledge, and social resources. As Seely Brown and Duguid (2000, p. xxv) note: "information and individual are inevitably and always part of rich social networks." Critics maintain that this oversimplifies knowledge and, in particular, ignores the social context of knowledge (e.g., Seely Brown & Duguid, 2000; Conrad & Poole, 2002).

People or interaction-based approaches, on the other hand, place a great deal of emphasis on knowledge-sharing interactions, which in today's organizations tend to be associated with communities of practice (Thomas et al., 2001). This social constructivist approach to learning and knowledge transfer seems to be much better suited to the discipline of knowledge management.

Box 5.4

An example: JPL information providers network (Bailey & Hendrickson, 2004)

The Special Library at the Jet Propulsion Lab of the California Institute of Technology took the lead in forming a community of practice for information professionals. The purpose of this CoP was to promote knowledge sharing and networking to help connect JPL employees. The CoP adopted an inclusive approach—a "the more the merrier" mentality with respect to membership. Everyone deemed to play a role in moving information along were invited to the first meeting. Invitees were encouraged to identify others like themselves who might want to participate. No one was excluded and the first meeting included people with a variety of titles, affiliations, and responsibilities within JPL. Next, a referral directory was developed to identify members of the network as well as organizations containing relevant information who did not have a network representative. The referral directory is a form of corporate yellow pages, or expertise location system (ELS) and included the following information for each member or organization:

- Name
- Information collected/provided
- Contact person, phone, email address, fax number
- Hours of operation
- URL, if applicable

Some of the member organizations included the JPL AV Library, document management unit, KM program office, project libraries (project document repositories), Engineering Standards Library, IT services, Engineering Document Services, Infrared Processing and Analysis Centre (IPAC) Library, the Oceanic and Remote Sensing Library (ORSL), Photography Lab, Planetary Data System (PDS) that distributes data from missions, the NASA image collection unit, and internal communications. Members had access to an email distribution list but the main CoP channel used was a face-to-face meeting that was held quarterly. At these meetings, the referral database was updated, new projects were reviewed, and news was exchanged with other attendees. At some meetings, speakers presented new tools (e.g., the KM team presented a new knowledge capture template). While there were only six people present at the inaugural meeting, the network gradually grew to about thirty members who regularly attend all the meetings.

Over time, the Library-led initiative became a part of the organization. The JPL Information Professionals CoP is a good example of an informal network that self-organizes or evolves without directives from management sponsors. The Library continues to play the lead role that consists of coordinating and not actively managing the CoP. This type of CoP is often referred to as an organic entity—one that is free from strict rules (e.g., membership eligibility), nonhierarchical, informal, participatory, and primarily face-to-face. The JPL CoP has helped break down organizational silos through its interdisciplinary participation. When you think about it, there are very few if any other such opportunities for people from different departments to meet and discuss their mutual work (other than smoking areas and the cafeteria!). During the CoP meetings, participants are comfortable as they are not reporting to anyone in a supervisory fashion—they are among their peers and they are therefore quite open to sharing their knowledge in a mutually beneficial manner.

The Social Nature of Knowledge

Knowledge management needs to view knowledge as something that is actively constructed in a social setting (McDermott, 2009). Group members produce knowledge by their interactions and a group memory is created. Social constructivism views knowledge not as an objective entity but as a subjective, social artifact (Berger & Luckmann, 1966). Social constructivists argue that knowledge is produced through the shared understandings that emerge through social interactions. As individuals and groups of people communicate, they mutually influence each other's views and create or change shared constructions of reality (Klimecki & Lassleben, 1999). The social constructivist perspective views knowledge as context dependent and thus as something that cannot be completely separated from "knowers" (Lave & Wenger, 1991). Context helps distinguish between knowledge management and document management: whereas the latter can be carried out in a more-or-less automated manner, the former cannot be accomplished without involving people as well as tangible content.

Huysman and DeWit (2002) describe a collective acceptance of shared knowledge as being the key method of generating value to the organization. Until knowledge is collectively accepted and institutionalized across the organization, organizational-level learning cannot occur and organizational memory cannot be developed. Ortenblad (2002) explained that unlike the functionalist paradigm in which learning starts in the individual, the interpretive paradigm suggests that learning begins in the relationships between individuals. As the community grows and its knowledge base is more broadly shared across the organization, the community's practices become regularly, widely, and sufficiently adopted so as to be described as institutionalized knowledge (Huysman & DeWit, 2002).

Since individual memory is limited, we need to embed this knowledge in useful, more permanent forms, such as documents, emails, and so on. This institutionalized knowledge then becomes an organizational legacy that remains in the corporate memory for subsequent generations to learn from. What is critical to keep in mind is that the context of each item of knowledge must also be captured: when it occurred, who is knowledgeable about it, who submitted it, and so on. Without this context, the knowledge product is not complete and cannot be successfully used, applied, nor even understood.

Box 5.5

An example: Thomas & Betts

Networks, by definition, connect everyone to everyone. Hierarchies, by definition, don't: they create formal channels of communication and authority. When a network becomes the main means by which information is conveyed and work gets done in an organization, our hierarchical crutches are knocked down. Rank is unclear. Networks operate informally with few rules. They depend on trust. The first dimension of trust is competence: "I can trust you if you're good at what you do." Second, trust needs a community. Networks naturally spawn internal groups of like-minded individuals. When these emerge around a common discipline, they are communities of practice. Communities of practice create and validate competence. The boss may not know who the best is but the community will always know.

At Thomas & Betts Corp., a $2.2 billion electrical parts maker in Memphis, Tennessee, motivation is decidedly nontechnical. Board games in which teams compete on solving business problems teach managers the importance of sharing ideas and information. "It gives employees a good sense of the roles and functions other people play in the company," says Gary Bodam, director of training and development. Once they realize that their willingness to share knowledge affects the bottom line in games, they're more open to making changes in how they operate in the real world, he says. But Thomas & Betts is also using technology to foster knowledge sharing. The company runs an e-learning management system from ThoughtWare Technologies Inc. that tracks employees' continuing education, such as public speaking or engineering. The data is logged in an SAP human-resources system and can be used by managers looking for the best candidates for jobs. Says Bodam, "It's all become part of the overall knowledge base by which we'll try to move the organization forward."

Knowledge Networks

In some organizations (e.g., engineering firms) and in some universities, the term "community of practice" (CoP) is being replaced by the label "knowledge network" (KN). Many organizations use the terms interchangeably although there is a preference for the term knowledge network in the private sector, while the term CoP is still in use in the nonprofit sector. The reason is due partly to the rather restrictive definition of a community of practice and partly to unfamiliarity with some of the terminology associated with CoPs, including the label itself. Knowledge networks appear to be more readily understood. Is there a difference between the two? Perhaps the best analysis is provided by the originator of the CoP term, Etienne Wenger:

> The network aspect refers to the set of relationships, personal interactions, and connections among participants, viewed as a set of nodes and links, with its affordances for information flows and helpful linkages. The community aspect refers to the development of a shared identify around a topic that represents a collective intention—however tacit and distributed—to steward a domain of knowledge an sustain learning about it.[1]

A community implies that members have many things in common, including a common profession and some common goals. A network is all about sharing with those they are connected with. Network members may not know all that much about one another other than some preferences. LinkedIn is a popular business networking site that is "a networking tool to find connections to recommended job candidates, industry experts, and business partners,"[2] whereas something like the CDC CoP is definitely a community of practice:

> Communities of Practice (CoPs) are working to strengthen public health as members learn, share expertise, and work together on solving common problems in their communities' focus areas. Communities are usually open to everyone working or interested in the domain, though some are closed to allow a private space for members to grapple transparently with sensitive issues. CoPs are easy to join, and your level of participation is up to you. CoPs provide a collaborative framework for public health professionals to work together to identify and leverage best practices and standards.[3]

However, not everyone agrees with the distinctions and examples provided by Wenger. LinkedIn is not considered to be a knowledge network by many people, as most organizations would require stronger ties and more substantive connections to exist in a network where knowledge is shared and applied to work. Often, a critical element of a knowledge network is that members are working together to achieve a common goal—whereas in LinkedIn, the objective may be job hunting for a specific individual.

Another perspective is offered by Pugh and Prusak (2013), who define effective knowledge networks as "collections of individuals and teams who come together across organizational, spatial, and disciplinary boundaries to invent and share a body of knowledge" (p. 79).

The authors note that knowledge network members share a common goal but they also share social and operational norms. This means that KN leaders can influence knowledge-sharing behaviors of members. They propose a typology of four KN goals: coordination, learning/innovation, translation/local adaptation, and support of individual members. Coordination refers to ensuring members share best practices. The learning and innovation goal represents the acquisition of knowledge, both from within and external to the network. New knowledge, new practices, new models, and so on, are cocreated and shared by members. Translation and local adaptation goals refer to identifying and adapting as needed knowledge that can address members' specific problems or challenges. Members are best suited to vet and judge relevancy and contextual compatibility of best practices. The final goal of supporting individual members is the most common goal: a safe space to ask questions and get peer feedback. In some organizations, the KN is an integral part of the onboarding process for employees.

Pugh and Prusak (2013) further identified eight key dimensions of knowledge networks that span strategic, structural, and tactical organizational levels:

1. Leader's theory of change
2. Objectives, outcomes, and purpose
3. Role of expertise and experimental learning
4. Inclusion and participation

5. Operating model
6. Structures and infrastructures
7. Facilitation and social norm development
8. Measurement, feedback, and incentives

The leader's theory of change is their expectation of the type of impact the KN will have—how will members' behaviors change? For example, will they perceive a greater sense of belonging? Will they form a more cohesive group that shares common goals? Objectives, outcomes, and purpose refer to the specific targeted outcomes of a KN, such as a specific problem to solve, as well as the overall raison d'etre of the network. These are usually documented in the KN charter. The roles of expertise and experimentation refer to the duality of knowing and being perceived as an expert, yet also being able to say when you don't know and want to learn something. Examples include safe discussions where people can admit mistakes, reflect, experiment, and contribute to a collective learning. Inclusion refers to the diversity of the members' profiles and the level of comfort in working with people who have different personalities, levels of commitment, degree of autonomy, and other characteristics. The structural operating model is the governance of the KN—any formal policies, or guidelines such as a charter. This will typically set out the roles and responsibilities of leaders and members. The convening structures refer to how meetings are organized, whether they are real-time and face-to-face and/or technology-mediated, and so on. The facilitation and social norm development identifies how the KN will be facilitated, what style or tone will be used, and how "good" behaviors such as reciprocity will be established and sustained. Finally, measurement, feedback, and incentives refer to how the KN is assessed, what data is collected and how, as well as how participation is rewarded. The four goal types together with the eight dimensions are a useful way to assess existing KNs and design new ones.

Sociograms and Social Network Analysis

“Social network analysis is the mapping and measuring of relationships and flows between people, groups, organizations, computers or other information/knowledge processing entities” (Krebs, 2002). The nodes in the network are the people and groups, while the links show relationships or flows between the nodes (see figure 5.2). Social network analysis (SNA) provides both a visual and a mathematical analysis of complex human systems to identify patterns of interaction, such as average number of links between people in an organization or community, the number of subgroups, information bottlenecks, knowledge brokers, and knowledge hoarders.

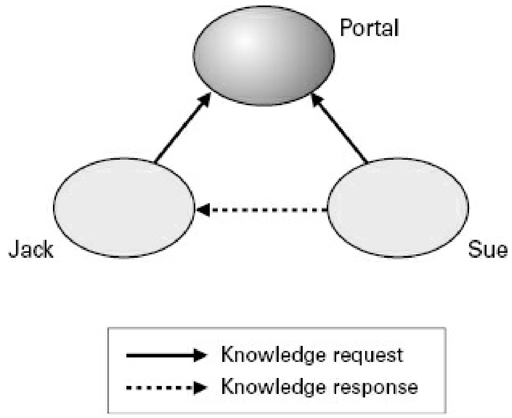

Figure 5.2 Mapping the flow of knowledge

In the context of knowledge management, SNA enables relationships between people to be mapped in order to identity knowledge flows: who do people seek information and knowledge from? Who do they share their information and knowledge with? In contrast to an organization chart which shows formal relationships—who works where and who reports to whom, a social network analysis chart shows informal relationships—who knows whom and who shares information and knowledge with whom (see figure 5.3). It therefore allows managers to visualize and understand the many relationships that can either facilitate or impede knowledge creation and sharing (Anklam, 2003). Because these relationships are normally invisible, SNA is sometimes referred to as an “organizational x-ray,” showing the real networks that operate underneath the surface organizational structure (Donath, 2002; Freeman, 2004).

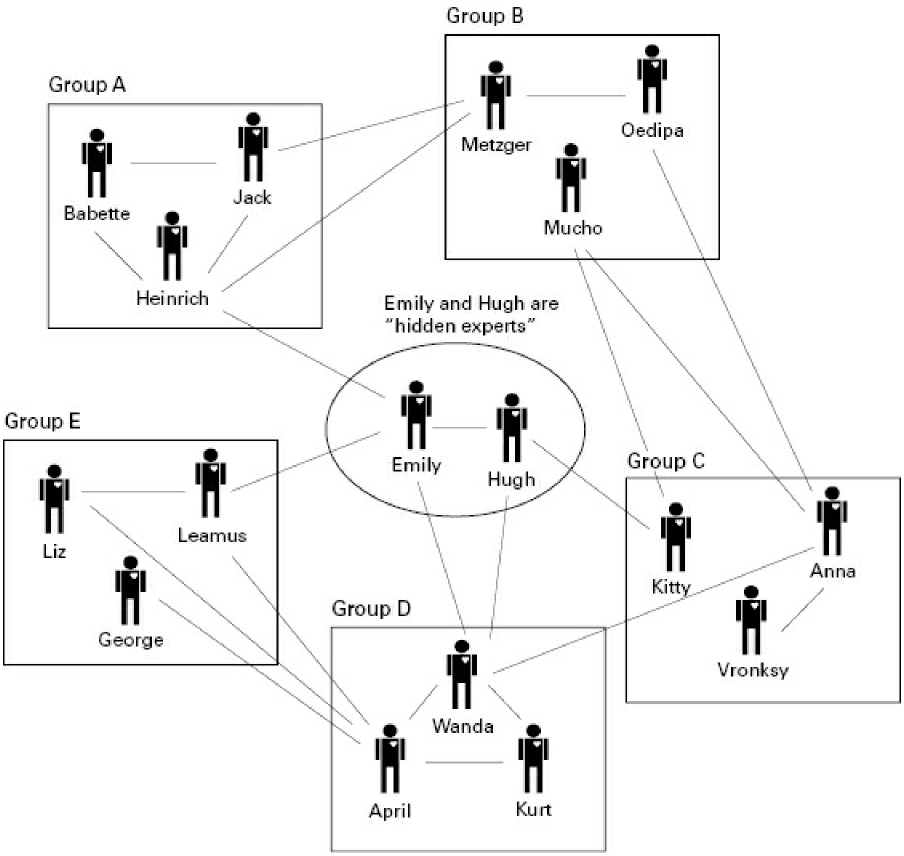

Figure 5.3 Knowledge flow analysis example (adapted from Valdis Krebs)

Once social relationships and knowledge flows can be seen, they can be evaluated and measured. Network theory is sympathetic with systems theory and complexity theory. Social networks are also characterized by a distinctive methodology encompassing techniques for collecting data, statistical analysis, visual representation, and so on. The results of social network analyses can be used at the level of individuals, departments, or organizations to unstopper information bottlenecks and to accelerate the flow of knowledge and information across functional and organizational boundaries. A social network should be thought of as a dynamic or moving target and it will need to be constructed more than once. For example, the data gathering and analysis process can provide a baseline against which you can then plan and prioritize the appropriate changes and interventions to improve the social connections and knowledge flows within the group or network.

The process of social network analysis typically involves the use of questionnaires and/or interviews to gather information about the relationships among a defined group or network of people. The responses gathered are then mapped using a software tool specifically designed for the purpose. Key stages of the process will typically include:

- Identifying the network of people to be analyzed (e.g., team, workgroup, department)
- Clarifying objectives, formulating hypotheses and questions
- Developing the survey methodology and designing the questionnaire
- Surveying the individuals in the network to identify the relationships and knowledge flows between them
- Use a software mapping tool to visually map out the network
- Analyzing the map and the problems and opportunities highlighted using interviews and/or workshops
- Designing and implementing actions to bring about desired changes
- Mapping the network again after a suitable period of time

In order for SNA maps to be meaningful, it is important to know what information you need to gather in order to build a relevant picture of your group or network. Good survey design and questionnaire design are therefore key considerations. Questions will be typically based on factors such as:

- Who knows who and how well?
- How well do people know each other's knowledge and skills?
- Who or what gives people information about xyz?
- What resources do people use to find information/feedback/ideas/advice about xyz?
- What resources do people use to share information about xyz?

While there are quite a number of different SNA tools, there is a need for a user-friendly, end-to-end solution that can be applied in a variety of business settings (Dalkir & Jenkins, 2004). Existing tools have little support, tend to be proprietary, have little track record, and tend to be heavily weighted toward the statistical analysis of data once it has been gathered with little support for the initial data collection activities.

Expertise Locator Systems

Communities are all about connections between people and these connections are often used to develop corporate yellow pages or an expertise location system. While initially community-based, such expertise locators can eventually be integrated to form a corporate-wide yellow pages. Lamont (2003) emphasizes their contribution to organizational learning initiatives, such as facilitating mentoring programs, identifying knowledge gaps, and providing both performance support and follow-up to formal training activities. Figures 5.4 and 5.5 illustrate a typical application for a large, distributed European publishing company.

Directories	Libraries	Discussion area	Support
Products	Best practices library	Discussion themes	Glossary of terms
Projects	Lessons learned	Project management	Frequently asked questions
External suppliers	Stories	Risk management	
Publishing companies	Training modules		
Network of experts			

Figure 5.4 Example of a yellow pages

Network of experts

Function	Geographic area	Business area	**Expertise**
Vice president	Northeast	Sales	Content management
Director	West coast	Operations	Electronic production
Line manager	Midwest	Distribution	Knowledge management
Operator	South	Finance	Publishing management

Expertise		
Content management		
Jane Dennys	Head Office	555 434-4564
Will Jameson	Regional Office 6	555 212-3212
Electronic production		
Jan Zariski	Regional Office 6	555 212-3233
Sarah Marxman	Regional Office 6	555 212-3232

Figure 5.5 Example of a yellow pages (continued)

A wide range of software exists for the development of corporate yellow pages (see table 5.2 for some examples). Most create an initial profile of an individual's expertise based on an analysis of published documents, based on questionnaires or interviews, while others focus on emails. These are very popular KM applications and they are often the first KM implementation a company will undertake primarily due to the fact that they can be developed fairly quickly (in the order of one to two months) and they can provide almost instantaneous benefits to individuals, communities, and the organization itself.

Table 5.2 Software to develop yellow pages or expertise location systems.

Name	Description	Website
Kamoon's Connect	Profiles set up by analyzing unstructured repositories to identify documented expertise	http://www.kamoon.com
AskMe	Web-based questionnaire used on a voluntary basis; can track Q&A to identify any knowledge gaps	http://www.hivemine.com/products.php
Sopheon's Organik	Q&A format, provides answers to questions and then stores the answers in a repository for future reference	http://www.sopheon.com
Tacit's KnowledgeMail	Learns about people automatically through analysis of emails as well as document repositories and databases. Search results include experts and links to content.	http://www.tacit.com

Yellow pages, or expertise location systems, were among the earliest KM applications and they remain one of the best ways to initiate wider-scale knowledge sharing in organizations. Two examples, from Texaco and British Petroleum, are explored here.

Box 5.6
An example: Texaco

Texaco's knowledge management arsenal includes PeopleNet (Gonsalves & Zaino, 2001), a custom-built application that lets employees build a personal profile and post it as a web page on the company's intranet. The content of the profile doesn't have to be purely work-related: pictures and hobby lists coexist alongside users' summaries of their job expertise. The PeopleNet content and the company's email systems are linked through KnowledgeMail from Tacit Knowledge Systems Inc., which monitors an employee's email, moving phrases that seem to reflect a person's expertise on a particular subject into a private profile accessible only to that employee. The person then chooses which phrases to publish in a public directory to help others distinguish him as a potential expert in an area. Someone searching for an expert in marketing crude oil, for example, would get a list of people associated with that phrase; clicking on a name in that list would call up a profile of the person in KnowledgeMail, as well as a link to the person's PeopleNet profile.

Three hundred people at Texaco used KnowledgeMail through a pilot program in its first year and a half. It is considered to be a successful KM application. John Old, the company's director of information, recounts a meeting in which Texaco executives were sharing ideas on knowledge management with a business partner. In demonstrating KnowledgeMail, a colleague typed the word "wireless" and the top name on the retrieved list was a systems architect who was in the room, but had never been identified as someone knowledgeable in wireless technology. "In any large company, there are lots of conversations in email that you're not aware of, and there are lots of hidden experts," Old says.

Box 5.7
An example: BP

BP's yellow pages (Collinson and Parcell, 2007) are entirely bottom-up. About 20,000 employees (of 80,000) have personal pages. It takes about ten minutes to produce a personal page using a form-filling approach, which contains a self-appraisal of skills and interest. No one vets the content but people rarely oversell themselves! People who leave BP may still have a page. Every three seconds someone makes a connection. The yellow pages are widely embedded in the BP intranet; they are integrated into the search environment and are now a part of how they do business.

Knowledge-Sharing Communities

The notion of a community is, of course, not necessarily a new concept. In fact, as far back as 1887, writers such as the German sociologist Tonnies compared and contrasted the more direct, more total, and more significant interactions to be found in a community, as opposed to the more formal, more abstract, and more instrument-driven relationships to be found in a society (Loomis, 1957). Tonnies argued that there are two basic forms of human will: the essential will, which is the underlying, organic, or instinctive driving force; and arbitrary will, which is deliberative, purposive, and future (goal) oriented. Groups that form around essential will, in which membership is self-fulfilling, Tonnies called *Gemeinschaft* (often translated as "community"). Groups that were sustained by some instrumental goal or definite end he termed *Gesellschaft* (often translated as "society"). The family or neighborhood exemplified Gemeinschaft; the city or the state exemplified Gesellschaft.

More recently another sociologist, Anselm Strauss (1978), described Internet communities as "social worlds." Even before there was an Internet, there were "invisible colleges," which consisted of academics, who though spread out around the world, nonetheless developed a sense of collective identity with their colleagues, their field, and their professional position within that field via constant communications (Price, 1963). Their shared communications and mental models gave rise to a discipline, a professional group. Sharing and circulating knowledge appears to be age-old effective social glue. These early communities were made possible by the printing press and are sometimes referred to as "textual" communities, as they primarily circulated written documents. An important characteristic that these early communities share with today's virtual communities is that they organized themselves. The biggest divergence is that whereas documents tend to be fixed, information or knowledge to be shared is fluid in nature.

The first virtual communities emerged about a decade after the establishment of the Internet. The Internet itself was an initiative called ARPANET, which was intended as a means of making it easier to for researchers to share large data files. In the early 1980s, a network called USENET was set up to link university computing centers that used the UNIX operating system. One function of USENET was to distribute news on various topics throughout the network. Initially, all of the newsgroups focused on technical or scholarly subjects, but so-called "alt" and "rec" groups that focused on nontechnical topics such as food, drugs, and music began to appear, which constituted the first evidence of people organizing themselves into virtual networks.

Before long, the number of newsgroups started to grow exponentially. USENET, for example, had 158 newsgroups in 1984. The number grew to 1,732 groups in 1991 and to 10,696 groups in 1994. Today there are more than 25,000 different newsgroups in existence. The Well, based in the San Francisco Bay Area, flourished as a place where online pioneers could gather to meet and talk with one another and is one of the oldest virtual communities around. Rheingold (1993) was one of the first to assert that online networks were emerging as an important social force that could provide rich and authentic community experiences. Hagel and Armstrong (1997) argued that virtual communities have economic as well as social significance. Like Rheingold, they recognize that virtual communities are based on the affinity among their participants that encourages them to participate in ongoing dialog with each other. Knowledge sharing between participants can generate webs of personal communication that reinforce the sense of identification with the community.

Although the literature discusses virtual communities in abundant detail, the technology-mediated interactions were supplanted by a substantial amount of old-fashioned telephone exchanges, face-to-face meetings, and general neighborliness (Rheingold, 1993). When videoconferencing first began to be widely used as an alternate to face-to-face business meetings, it was quickly found that this medium worked well but only after participants had met in person and established some sort of social presence. If participants met one another for the first time during a videoconference, or a teleconference for that matter, the interactions were much more awkward and slow, and the knowledge that was exchanged tended to be less significant (Hayden et al., 2001). Many presentation coaches quote the landmark studies by Albert Mehrabian, PhD,(1981) that identify communication as 55% Visual, 38% Vocal, and 7% Verbal.

Seely Brown and Duguid (2002) point out the neglect of the social aspects of knowledge sharing when they note that documents do more than merely carry information. They "help structure society, enabling social groups to form, develop, and maintain a sense of shared identify" (p. 189). The community-forming character of the Internet is by now quite well known. In fact, a number of technologies that were originally intended to transmit information, such as the Minitel system in

France used to book travel and serve as an electronic phone book, quickly became used as messaging systems between users. Similarly, transactional web sites such as eBay and Amazon.com hold value not only in terms of their product offerings but also in the ability of visitors to the site to annotate content and thus communicate with other visitors.

While technology is a feature of some communities, technological means of interacting are by no means a necessary component of communities. Technology comes into play when members are more dispersed and when they have fewer occasions to meet face-to-face. The critical components of a community lie in the sharing of common work problems between members, a membership that sees clear benefits of sharing knowledge among themselves and who have developed norms of trust, reciprocity, and cooperation.

Types of Communities

All communities share some basic characteristics, regardless of the type of community. Wenger (1998) identifies these as joint enterprise, mutual engagement, and shared repertoire (see figure 5.6).

Figure 5.6 Common characteristics of CoPs (adapted from Wenger, 1998)

Joint enterprise refers to the glue that binds members together—why they want to interact with one another. Reasons for interacting with one another will typically be a personal goal and contribution toward the community's goal. Mutual engagement refers how members become part of the community. They do not automatically belong because they say so, because they have a certain job title, or because they know someone. There are membership rules and each member agrees to carry out certain roles and responsibilities in order to help achieve the goals of the CoP. Finally, a shared repertoire refers to the shared workspace where members can communicate, where they can store and share knowledge products, their profiles, and so on. The shared repertoire is typically space on a server—it may be an intranet within an organization or on the Internet. What is important is that there is a place for real-time exchange, asynchronous discussion, and that this interaction leaves behind tangible archives—the social capital and intellectual capital created by the community. All communities thus need shared cultural objects, a means of sharing them, and a means of storing them.

In other words, networks form because people need one another to reach common goals. Mutual help, assistance, and reciprocity are common to all functioning networks. Another important characteristics is that these networks are not only self-organizing but self-regulating. For example, no one *decrees* that a community will exist (although many organizations have made this mistake). It is not a top-down formal organization as a task force or project team would be. There is no one person *in charge* of the community although there may be founding members. Similarly, if someone is in it only for himself or herself, the other members will quickly realize this. This is illustrated by Hardin's (1968) tragedy of the commons scenario.

Box 5.8

A vignette: Tragedy of the commons

Picture a pasture open to all. It is to be expected that each herdsman will try to keep as many cattle as possible on the commons. Such an arrangement may work satisfactorily for centuries because tribal wars, poaching, and disease keep the numbers of both man and beast well below the carrying capacity of the land. Finally, however, comes the day of reckoning, that is, the day when the long-desired goal of social stability becomes a reality and the logic of the commons remorselessly generates tragedy. As a rational being, each herdsman seeks to maximize his gain. "What is the utility *to me* of adding one more animal to my herd?" Since the herdsman receives all the proceeds from the sale of any additional animal, the positive utility is nearly +1. The negative impact is the additional overgrazing created by one animal. However all the herdsmen share the effect of overgrazing: the negative utility for any particular herdsman being only a fraction of −1. The only sensible course for him to pursue is to add another animal to his herd—and another, and so forth. But this is the conclusion reached by each and every rational herdsman sharing a commons. Therein lies the tragedy.

There are many types of CoPs and they are typically defined as a function of some common focal points such as:

- A profession such as engineering, law, or medicine
- A work-related function or process such as production, distribution, marking, sales, or customer service
- A recurring, nagging problem situated in a process or function
- A topic such as technology, knowledge retention, or innovation
- An industry such as automotive, banking, or healthcare

A CoP may also be described in terms of its goals such as the development of best practices or benchmarking. A CoP may be self-organizing or sponsored by the organization. A CoP may also be distinguished on the basis of the type of recognition (or lack thereof) it has from the host organization (Wenger, 1998): unrecognized, bootlegged, legitimized, supported, and institutionalized. These categories often reflect the maturity level of a community but not all communities will necessarily aspire to become institutionalized (Iverson & McPhee, 2002).

There are many forms that an online community can take but most will contain:

1. Member-generated content (e.g., profiles, home pages, ratings, reviews)
2. Member-to-member interaction (e.g., discussion forums, member yellow pages)
3. Events (e.g., guest events, expert seminars, virtual meetings or demos)
4. Outreach (e.g., newsletters, volunteer/leader/mentoring programs, polls/surveys)

It is important to distinguish a community of practice from other groups such as work teams or project groups. Many online communities may be termed communities of interest as they have an open membership that is catalyzed by interest in a common theme such as a hobby. A community of practice is more like a professional organization. CoPs have a business case, a code of ethics, a mission statement, and so forth. They are there for a reason and they produce results that are of value to the profession. Typically, a CoP goal would have something to do with the improvement of the common profession or professional theme that members are interested in. However, the ways in which they are formed are quite unlike a professional organization as communities self-organize and emerge in a bottom-up manner.

Roles and Responsibilities in Communities and Networks

Communities consist of people, not technology (Cook, 1999). Community members may take an active role by contributing to discussions or providing assistance to other members—this is referred to as "participation." Other members may simply read what others have posted without taking an active role themselves. These types of members used to be referred to as "lurkers," but given the somewhat derogatory connotation of the term, this has been replaced by "legitimate peripheral participants."

In almost every case, the more participation that occurs in the community, the greater the value created for both community members and community creators. However, it is important to keep in mind that in most communities, readers outnumber posters by 10:1 or more. People who visit a community regularly but who do not post anything typically represent 90 percent or more of the total community participation. Passive members are not really passive in most cases as they may be actively using and applying the content they have accessed online.

Kim (2000) lists the key roles as:

- Visitors
- Novices
- Regulars
- Leaders
- Elders

Visitors may visit once or twice and may or may not join. At this point, they are merely curious and seeking to find out what the community is all about. Novices are new members, who typically stay on the periphery until they have learned enough about the community and the other members. At this point, they become regulars, members who provide regular contributions and who interact with other members on a sustained basis. Leaders are members who have the time and energy to take on more official roles, such as helping with the operation of the community. Elders are akin to subject matter experts: they are familiar with the professional theme and the community and have become respected sources of both subject matter knowledge and cultural knowledge. Elders maintain the community history and agree to be consulted from time to time by other community members.

Communities of practice require a number of key roles to be filled. These need not necessarily be a single individual working full-time—more often, they are revolving roles much like everyone taking a turn at being a scribe at business meetings today. However, there is real work to be done in order for the community to succeed and this translates into real time. Depending on the type of organization, the number of members and other scope variables, a good rule of thumb is to budget 10 to 20 percent of a knowledge worker's time as being devoted to CoP work.

Nickols (2000) defines more official community roles. The major CoP roles include a champion, a sponsor, a facilitator, a practice leader, a knowledge service center or office (KSO), and members. The champion ensures support at highest possible level, communicates the purpose, promotes the community, and ensures impact. The sponsor serves as the bridge between the CoP and the rest of the formal organization, communicates the company's support for a CoP, and may remove barriers such as time, funding, and other resources. The sponsor is instrumental in establishing the mission and expected outcomes for the community. Community members are recruited for their expertise relevant to the practice or strategic services the practice or strategic service owner. They are there to better share knowledge, know-how, and best practices to benefit the business by participating actively. They participate in discussions, raising issues and concerns regarding common needs and requirements, alert other members to any changes in conditions and requirements, are on the lookout for ways to enhance CoP effectiveness (e.g., by recruiting high-value members), and, above all, they learn.

CoP facilitators have perhaps the most demanding role. They are responsible for clarifying communications, making sure everyone participates, and ensuring dissident views are heard and understood. They are the chief organizers of events such as meetings (face-to-face as well as virtual meetings). They administrate all communications by drawing out reticent members, reconciling opposing points of view, posing questions to further discussion, and keeping discussions on topic. The practice leader is the acknowledged leader of the CoP "themes." The leader provides thought leadership for the practice or strategic service, validates innovations and best practices, and promotes adherence to them. He or she identifies emerging patterns and trends in CoP activities and knowledge base and in other areas that may impact the practice. Leaders resolve conflicts, evaluate CoP performance with respect to expectations, approve memberships, and lead the way in prioritizing issues and improvements to be tackled. CoP practice leaders serve as model to coach other members or arrange to provide coaching and they are always alert to the potential need for CoP changes (e.g., more members, different members, and different member composition).

CoP knowledge services are information/knowledge integrators who serve to interface with all CoPs to ensure clarity and lack of duplication of the information disseminated within and from the CoPs. They maintain information-sharing relationships with all CoPs, inform CoP members about relevant activities elsewhere, and inform others about relevant CoP activities. The knowledge center coordinates information from CoP members to avoid duplication, redundancies, and poor quality (e.g., in postings to CoP websites and forums) and they filter knowledge and requests for help (e.g., yellow pages). Finally, all the members of the CoP share the responsibility for marketing and promoting the CoP, generating interest in the CoP, generating enthusiasm among current members, and demonstrating its value. Everyone must ensure continued support and resources from sponsor(s), recruit high-potential prospective members, and invite them to special CoP events. Members are expected to better leverage the knowledge created and learning generated by the CoP, to write and publish articles or results descriptions in company publications, and to publish articles in external journals or magazines and then distribute them internally.

In addition, some new types of roles arise from CoPs, such as membership managers, discussion moderators, knowledge editors, knowledge librarians, archivists, usage analysts, and knowledge brokers. A CoP membership manager has to deal with the registration and ongoing membership directory work. A CoP moderator is much like a radio or TV show host. They are conversation managers who help keep discussions focused, inject new topics or provocative points of view when discussion lags, and seed discussion with appropriate content. They must often be critical in order to ensure value generation. Knowledge editors collect, sanitize, and synthesize content created, and they provide a value-added link for the content produced. A knowledge librarian or community taxonomist is responsible for organizing and managing the collection of knowledge objects generated by the community. A knowledge archivist maintains and organizes content generated by participants over time.

A CoP usage analyst studies data on participants' behaviors within the community and makes recommendations to host. Finally, a knowledge broker is someone who can join up with a number of different communities in order to identify commonalities and redundancies, create synergy, form alliances, and feed in to organizational memory and learning (e.g., map of intellectual assets, yellow pages or expertise directory, CoP best practices and lessons learned).

Finally, there will be some new roles and structures at the organizational level. For example, the World Bank inspired knowledge management at CIDA (Canadian International Development Agency). CIDA has implemented over 400 best practices and lessons learned and 30 communities of practice. There is coordination of branch sharing activities through the CIDA KM Secretariat. The CIDA KM Secretariat in the Senior VP's office has a staff of four or five to enable better knowledge sharing within and among branches. This office works closely with two organizations: the Branch KM Leaders group (which has a representative from each of the thirteen agency branches) develops KM agenda, expected results, communication strategy, and specific KM issues. The Network (CoP) Leaders group (which consists of the leaders of each of the pilot CoP networks) helps networks learn from each other, achieve their objectives, share lessons learns, and solve problems.

Box 5.9

An example: Canadian International Development Agency (CIDA)

CIDA (http://www.acdi-cida.gc.ca/) focuses on the dissemination of information, results, and lessons learned. A study showed that CIDA was spending about CA$100 million on repeating and reinventing knowledge that the organization already had. Knowledge is created through bringing together partners and shareholders in the organization around issues and practices to produce new ideas, perspectives, and insights. In the application of knowledge, CIDA has requested that partners and shareholders collaborate online on specific projects. As part of the Canadian government, CIDA needs to make all information and services available to citizens electronically through a project called Government Online. This means making information available outside of Canada as well, such as on immigration services, goods and trade, development assistance, and so on.

CIDA uses an extranet, which is a culmination of the various intranets and the Internet. Access is controlled to promote free-flowing discussion and information sharing. CIDA uses its extranets to promote knowledge sharing through its Partners Forum, Field Representatives Forum, and Strategic Information Management Forum. Finally, regional forums allow different CIDA branches to share among themselves. The first step is to disseminate information that can be used as formal or explicit knowledge. The second step is to encourage members of each extranet to develop new knowledge through online discussions. The third step entails the implementation of this new knowledge in the design, development, and management of specific projects. The goal is to harvest the results of this implementation effort and to disseminate those as formal/explicit knowledge through the Agency's intranet. To date, CIDA has documented about 4,000 best practices and lessons learned.

Within CIDA there are about thirty CoPs involving about 1,200 people. A KM Forum was organized involving about 150 people from various departments and partners. These networks are the primary knowledge-sharing vehicles within CIDA. CIDA management now provides support to the CoPs and has developed expert directories to promote interaction from both within and outside the organization. CIDA is currently involved in profiling and metadata to map and identify appropriate forms of access to knowledge and expertise within the agency. An example is the Online Project Management, which develops tools to support KM within the organization. CIDA is also extending knowledge skills to its partners and encouraging interaction between them through its Strategic Information Management Forum initiative.

Knowledge Sharing in the Virtual Workplace

The establishment of a community identity depends heavily on knowledge sharing. Even something as simple as an online or paper newsletter will provide the backbone for a community to develop. A sense of community arises from reading the same text, the same article, and the same announcement, as discussions can grow around this kernel. Personalization efforts will, to some extent, work against this sense of community as different members would receive different content.

Different knowledge-sharing technologies or channels should always be seen as complementary and as mutually exclusive. All types of communications are some form of conversation. Each communication medium has its strengths and weaknesses. It is important to choose the appropriate mix of channels in order to optimize knowledge sharing. Most communities organize their knowledge-sharing interactions as informal exchanges between peers. Communication genres are chosen primarily on the basis of the developing relationship between community members (Zucchermaglio & Talamo, 2003). The choice of communication medium appears to be a function of specific professional tasks and the stage of maturity of community development. The authors conducted a longitudinal study over a three-year period of an interorganizational community of practice. For example, it took about six months for communications to become predominately informal and email-based among community members. Concurrent with this was an increasing formality in how community members communicated with those external to the community, which indicates that a sense of community boundary has been established.

One important type of knowledge sharing that occurs in a community involves the evolution of a best practice (an improved way of doing things) or lessons learned (learning from both successful and unsuccessful events). Figure 5.7 shows how a good idea can evolve and be transferred in order to be ultimately incorporated into the organizational memory or knowledge repository. The knowledge sharing processes involved include searching, evaluating, validating, implementing (transferring and enabling), reviewing, and routinizing (Jarrar & Zairi, 2000).

Figure 5.7 Knowledge sharing example: best practice/lesson learned (adapted from APQC, American Productivity and Quality Centre, http://www/apqc.org).

Table 5.3 shows the results of an APQC study that looked at how best practice knowledge was shared and transferred within organizations (APQC, 1999). Their findings show that 51 percent of knowledge sharing occurred as part of a formal process within the organization; 39 percent was ad hoc, more tacit, likely within a CoP; and, perhaps most striking, 10 percent of the best practices were never shared. This type of obstacle in knowledge sharing or knowledge flow is very difficult to pick up. Social network analysis (SNA) is one technique that can help identify such knowledge hoarding or knowledge "black holes" where content is received but nothing is ever sent out.

Table 5.3 APQC (1999) study on how knowledge is transferred within a company

Verbally at team meetings	23%
Departmental meeting	21%
Written instructions	17%
Ad hoc verbally	16%
Intranet	9%
Video	5%

Two major characteristics are often used to characterize the channels used for virtual knowledge sharing: social presence and media richness. Thurlow, Engel, and Tomic (2004) define social presence as the degree to which the knowledge sharer feels like they are talking with another person. The highest degree of social presence will, of course, exist in a face-to-face exchange where knowledge sharers can easily hear the tone of voice, see the facial expressions, and therefore easily infer nontextual cues. A teleconference will provide the audio cues and a videoconference will provide both visual and audio contexts. An email or discussion forum, however, must rely upon text, which has a lower social presence. One of the ways in which we try to overcome this limitation is through the use of emoticons (e.g., a smiley face to indicate a joke), uppercase letters to simulate shouting, shortcut expressions, and so forth.

The second attribute of technological knowledge sharing channels is media richness, which is defined by Chua (2001) as the capacity for immediate feedback, ability to support natural language, and social presence. Once again, synchronous communications such as face-to-face meetings or instant messaging conversations will have the fastest feedback (people can react right away to what has been said or typed), participants can use natural language, and the degree of social presence is at a very high level. Social presence and media richness do tend to go hand-in-hand for the most part but there are some channels that possess low media richness with a high degree of social presence, such as newsgroups, bulletin boards, personal web pages, and blogs (Dalkir, 2007.) Finally, when the knowledge to be shared is more tacit than explicit in nature, it becomes more imperative to make use of channels that are quite high in both social presence and media richness (Vickery et al., 2004.)

We can also look more closely at the types of exchanges that occur in knowledge sharing. The majority of the knowledge exchanges consist of requests, revisions, modifications or some form of repackaging, publications, references (e.g., tell people about, who knows about), recommendations, reuse, and reorganization (e.g., adding on of categories, metadata). Reuse is also an excellent measure of the success of knowledge sharing and it can be thought of as being analogous to a citation index. Scholars and researchers produce a number of scientific publications but a metric that is perhaps even more meaningful than the number of papers published is the citation index, which keeps track of how many others have made use of this work. When others do refer to their work, this is evidenced by specific citations and references to the original work or a reuse of the original content. It is possible to track such reuse in a knowledge management system as well, and in some organizations this is used to evaluate how good a knowledge sharer a given employee is.

Knowledge-sharing communities are not just about providing access to data and documents: they are about interconnecting the social network of people who produced the knowledge. A good knowledge management system should include information not just on the people who produced the knowledge but those who will make use of it. There is as much value in talking to people experienced in using knowledge as there is in talking to the original authors (subject matter experts). One way this can be achieved is by making the knowledge visible. This typically involves making the interactions online visible in some way so that “I know that you know x, y, z” and “I know that you know that I know a, b, c.” This helps create mutual awareness, mutual accountability, and mutual engagement to knit group members more closely together.

Figure 5.8 shows a high-level representation of how a CoP can be rendered more visible using social computing systems such as the Babble system (Erickson & Kellogg, 2000). Babble was designed as an online multiuser environment to support the creation, explanation, and sharing of knowledge through text-based conversations.

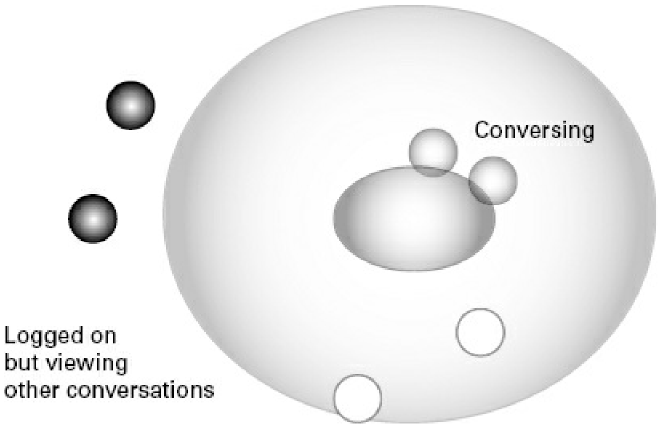

Figure 5.8 Making CoP interactions visible (adapted from the Babble system, Erickson & Kellogg, 2000)

Social computing refers to digital systems that draw upon social information and context to enhance the activity and performance of people, organizations, and systems. Examples include “recommender systems,” such as those that advise you on which books you would enjoy, which music you would like to hear, and which movies you would like to see. Social presence is an important concept in virtual networks as it refers to how much of a sense members have that other people are present. Since communities are all about social interactions for learning and knowledge exchange, it is very important that a social connection be felt. The use of buddy lists is another example of establishing social presence. This is a feature that lets you know who else is currently online when you log on to a virtual space.

Other Ways of Sharing Knowledge

There are a variety of other ways that knowledge can be shared in organizations. Some of the more commonly used approaches include peer assists and after action reviews (discussed in the previous chapter) and knowledge cafés, world cafés, storytelling and tools such as wikis (discussed in the next section).

A knowledge café is a type of facilitated workshop where the goal is to foster open and creative dialogues on a specific topic or theme that is of interest to all the participants. The expected outcome is that at the end of the event, all participants will have contributed their thoughts and perspectives on the topic to create collective knowledge, to share ideas, and to catalyze insights. Each participant should gain a much deeper understanding to the topic addressed than they had before the café. David Gurteen is a strong proponent of knowledge cafés.[4] One of the most important things to keep in mind with a knowledge café is that it is not a broadcast nor a lecture. No one person should be addressing the larger group for any length of time. Knowledge cafés are all about conversations. Typically, the session begins with a facilitator proving an overview about the knowledge café's purpose and way of functioning. This can be omitted if participants are already familiar with knowledge cafés. Next, the facilitator welcomes everyone and outlines the subject or theme to be addressed and asks an open-ended question to get everyone started. An example would be: what would prevent you from sharing your know-how with someone in your company and why? The larger group is then put into smaller groups of about four or five people each so that they can start discussing the question posed. After about 45 minutes, the groups are reconvened and each reports back their key findings to the larger plenary group. One option is to then have participants form new groups by changing tables and continuing the conversation. If time permits, this is a good way to ensure that different perspectives on the question posed are identified. The whole event can last from 90 minutes to several hours. Ideally, there should be between 15 and 30 participants. Typically, nothing is documented so as to not interfere with the conversational flows. When successful, each individual will have learned through their interactions with others.

A world café is similar in how it functions but it has a different scope and set of goals. The world café was originated by Brown and Isaacs (2005) as a structured conversational process with discussion to access the collective intelligence or wisdom of the crowd of the participants. This social innovation has its origins in serendipity: a meeting was planned for a small group consisting of business and academic leaders. They began a large-circle dialogue but they were interrupted by rain. Participants spontaneously formed small groups around tables and started writing on the paper tablecloths. They periodically changed tables but continued the conversation. As they noticed what others had written down on the tablecloths, they began to perform a type of manual or human pattern recognition. In one morning, the group was able to connect, innovate, and effectively collaborate. This became the World Café. They then did a post-project review to better understand why they were able to come up with such great breakthroughs. This led to the seven design principles that underlie world cafés. They differ from knowledge cafés in that their goal is typically to identify innovative approaches to wider issues such as sustainable development. The focus is on exploring and innovating on themes rather than on solving more specific problems (as in the knowledge café). However, these distinctions are not hard and fast boundaries but more general tendencies.

The seven design principles for world cafés are:

1. Set the context
2. Create an inviting "third" space
3. Explore questions that matter
4. Encourage everyone's contribution
5. Connect diverse perspectives
6. Listen together for patterns and insights
7. Share collective discoveries

In setting the context, the facilitator will typically outline the reason everyone is together in a brief overview at the beginning of the world café. The purpose, scope, who is in the room and why, and what the expected outcomes are should all be addressed. The meeting space should be safe and inviting so that everyone feels comfortable. Sticky notes, colored markers, paper tablecloths, and so forth can help create a fun and creative space to work in. These are crucial in making sure that participants can engage in creativity, listening, thinking, and of course, speaking. Ask good questions that will elicit a good conversation. Make sure questions are relevant to the participants. Make sure everyone is heard. Some world cafés use "talking sticks" or other physical objects that are passed from one speaker to the next to ensure more widespread participation. As participants move around tables and connect with new people, they will begin to connect different perspectives together. Facilitators may ask participants to change after a specified period of time has passed, depending on the time that is available for the event. One member may stay behind at each table and then fill in the new members that join. As they listen to others, participants will begin to identify patterns and powerful insights will emerge. Last but not least, facilitators will help "harvest" the collective learning from the event by reconvening all the groups back to the plenary group. Each group is asked to share their key points so that the others can hear them. Unlike knowledge cafés, world café outcomes are typically documented (and usually recorded in some form) during this harvesting stage.

Storytelling is also an excellent means of knowledge sharing, in particular, the sharing of tacit knowledge (Sole & Wilson, 2002). This is discussed in chapter 7 as well. Storytelling, in its oral form, dates far back into human history and continues to be an effective means of knowledge sharing in many societies today. Stories are particularly good at conveying different perspectives, attitudes, complex issues, and the do's and don'ts of both human and organizational survival (best practices and lessons learned). Stories can be used to share values and visions. The process of storytelling can help build trust and generate an emotional response, which means the practices and lessons are remembered better and thus help participants learn. Ironically, stories are also an excellent way to have participants unlearn—habits that need to be broken, old ways that need to be replaced by new ways of doing, and so on. Stories can be text, they can be multimedia (e.g., YouTube segments), or they can be part of online simulations and face-to-face role playing. The format can also vary, ranging from structured case studies to more informal anecdotes.

Hester (2011)[5] outlines an example of how storytelling is used successfully at Fluor. One of the formal techniques employed by management is to collect stories from employees through a form that respondents fill out. In it, they are asked to share their success stories, describing why they consider it a success, and what value it generated. Well-designed and well-told stories can help employees learn from the collective past of the organization so that they are more effective in the present and the future when they face similar situations. Through stories, employees can also become better "acclimatized" to the organizational culture (see chapter 7).

The Role of Technologies

There are many different collaboration tools and platforms. The good news is that most would be fine to use to support knowledge. The bad news is that is hard to choose the right tool or channel for the right purpose. The best way to begin is to do a functional analysis of the user needs of community and network members. Is there a need to meet face-to-face or virtually or a combination of the two (e.g., some participants participate remotely)? Where will the content be stored? Will security be a factor (e.g., password-restricted portal access)? Most of the KM technologies are discussed in greater detail in chapter 8; however, some of the more popular tools used for collaboration will be outlined here.

Common collaboration tools include blogs, wikis, social bookmarking, digital repositories, and visualization tools. Some type of interactive discussion forum or platform is a must, which in turn requires members to prepare and maintain their profiles and have a place where they can comment on what others have already contributed. Some type of event calendar is usually required. Other options include the ability to poll members, ranking systems to rate content usefulness and/or popularity, and some form of metrics or usage tracking (Cianciolo & Evans, 2013).

In addition to challenges related to distance (e.g., differing time zones and languages), technology-mediated knowledge sharing means that it is harder to establish trust than it is in face-to-face knowledge sharing. As trust is a prerequisite to effective knowledge sharing, this is a significant challenge. The presence of technologies necessarily creates a social distance—it is hard to imagine you are speaking to another person when you are interacting directly with a website or speaker (McDermott, 1999).

Obstacles to Knowledge Sharing

There are a number of obstacles that can hinder knowledge sharing within organizations. Chief among these is the notion that knowledge is property and ownership is very important. One of the best ways to counteract this notion is to reassure individuals that authorship and attribution will be maintained. In other words, they will not lose the credit for a knowledge product they created. In fact, maintaining the connection between knowledge and the people that are knowledgeable about it is paramount in any knowledge management system. There is a prevalent notion of knowledge as power. The more that information is shared between individuals, the more opportunities for knowledge creation occur. There is, however, a risk in sharing what you know, because in most cases, individuals are most commonly rewarded for what they know, not what they share. As a result, hoarding of knowledge often leads to negative consequences such as empire building, reinvention of wheels, feelings of isolation, and resistance to ideas from outside an organization. The best way to address concerns is to adapt the reward and censure systems that exist in the organization. In other words, stop rewarding knowledge hoarding and start providing valued incentives for knowledge sharing.

Another common reason given for not sharing knowledge is that either the provider is unsure that the receiver will understand and correctly use the knowledge and/or the recipient is unsure about the truth or credibility of the knowledge in question. Both issues disappear in the context of a community, as it is a self-regulating system that continually vets and validates both content and membership.

Last but not least, the organizational culture and climate may either help or hinder knowledge sharing. An organizational culture that encourages discovery and innovation will help, whereas one that nurtures individual genius will hinder. An organization that rewards collective work will help create a climate of trust, whereas a culture that is based on social status will hinder knowledge sharing. Without a receptive knowledge sharing culture in place, effective knowledge exchanges cannot occur. Significant organizational changes may need to take place before effective knowledge sharing can begin to take place.

Another caveat: while the assessment may show that organizational knowledge sharing is weak due to any or all of the above factors, knowledge sharing may be flourishing quite well—only it has not been detected. This is often referred to as the phenomenon of the "undernet."

The Undernet

Often, organizations conclude that knowledge sharing does not occur because no one is using the organizational knowledge repository. The truth may be that there is a lot of knowledge sharing going on—it is just that many employees choose to circumvent the official knowledge base—most likely because it is too difficult to find what they are looking for there. Since people are the best source of knowledge, it is no surprise that knowledge workers are expert knowledge sharers—it is just that they use their own networks, not the official ones. This is in keeping with the increasingly prevalent view that KM succeeds when it is a grassroots or demand-driven initiative rather than a top-down technology push.

Knowledge flows appears to flow well when members perceive that there is a climate of trust, that the members with whom they exchange knowledge are credible, and that knowledge exchange is bidirectional. In small organizations, these undernets bring different specialties together, such as engineering, design, and marketing. But in larger organizations, these specialties tend to separate into their own groups. When that happens, the communities develop different ways of working, even different vocabularies, and they no longer understand each other. Knowledge still flows easily within specialties, but not across them (Brown, 2002).

Social network analysis is a very useful tool as it provides the means of identifying the undernets in an organization (Weinberger, 1999). The undernet is defined as the intranets that escape the official gaze of the organization—they represent how people really share knowledge and they constitute the skeleton of the communities of practice that have emerged. Weinberger quite aptly refers to these undernets as the "lifeblood" of the organization. In fact, many corporate top-down knowledge management initiatives are met with lack of interest and lack of activity, and investigation invariably turns up the existence of the *other* network—the one people really use!

The undernet is often referred to as KM's dirty little secret: however much you invest in high-tech knowledge banks, employees in search of an answer tend to make their first port of call the folks they know from the water cooler. An example is the Kraken versus KnowledgeCurve system at

Pricewaterhouse-Coopers (PWC) as discussed in an interview with Julia Collins (2001). While PWC has considerable investment in formal knowledge management databases, called KnowledgeCurve, the Kraken is an informal and unofficial email list that has been garnering more attention lately. Named after a mythological sea monster in a poem by Lord Alfred Tennyson, the Kraken is a sort of global glue, sharing knowledge across national borders. Kraken is much less sophisticated as a system goes—it's just email, so what is the secret of its success?

Knowledge sharing in Kraken is a manifestation of a community of practice—in fact, 80 percent of the messages in Kraken begin with a question: Does anybody know? Has anybody ever done? Such questions often result in responses that are four to five pages long. This is knowledge sharing occurs among professionals with concrete decisions to make and problems to solve. In order to do so, they need to connect to their peers and the undernet is the result of their connections. Ideally, such grassroots or bottom-up knowledge systems should be accommodated by the organization-wide systems. Knowledge brokers are individuals who are able to move among more than one network and they can play a key role in putting together a company's "big picture." Formal, top-down KM systems tend to encapsulate more formal, explicit knowledge, whereas community networks tend to be less formal, more tacit, more work-in-progress content. Ellen Knapp, PWC's Chief Knowledge Officer' puts it this way: "KnowledgeCurve is about teaching. Kraken is about learning. You can't have one without the other" (Stewart, 2000).

Organizational Learning and Social Capital

Human capital refers to individuals' education, skills, and background necessary to be productive in an organization or profession. However, sociologists such as Coleman (1994) and Granovetter and Swedberg (2001) argue that there is much more to explaining the differences in individual success than individual characteristics alone. The concrete personal relationships and networks of relations generate trust, establish expectations, and create and enforce norms. These webs of social relationships influence individual behavior and ultimately organizational success. The term "social capital" has been coined to refer to the institutions, relationships, and norms that shape the quality and quantity of an organization's social interactions (Lesser & Prusak, 2001). Social capital is not just the sum of the individuals that comprise an organization—it is the glue that holds them together.

Nahapiet and Ghoshal (1998) define social capital as "the sum of the actual and potential resources embedded within, available through, and derived from the network of relationships possessed by an individual or social unit. It thus comprises both the network and the assets that may be mobilized through that network" (p.243). While the concept is still evolving, there are increasing calls for expanded investment on the part of business, government, and other organizations that promote the development and maintenance of social capital. Institutional settings are conducive to the development of high levels of social capital. It is because of their more dense social capital that firms, within certain limits, have an advantage over markets in creating and sharing intellectual capital.

Knowledge-sharing communities are the primary producers of social capital as they provide the opportunity for individuals to develop a network with members who share similar professional interests. The community provides a "Who's who" in the form of yellow pages to help make connections between members. The community provides a reference mechanism to quickly enable members to evaluate content, solve problems, and make decisions based on vetted, validated, and current knowledge. Social networks can increase productivity by reducing the costs of doing business. Social capital facilitates coordination and cooperation. However, social capital also has an important downside (Portes & Landolt, 1996): communities, groups, or networks that are isolated, parochial, or working at cross-purposes to the organization's collective interests.

A broader understanding of social capital accounts for both the positive and negative aspects by including vertical as well as horizontal associations among people, and includes behavior within and among organizations, such as firms. This view recognizes that horizontal ties are needed to give communities a sense of identity and common purpose, but also stresses that without bridging ties that transcend various social divides (e.g., religion, ethnicity, socioeconomic status), horizontal ties can become a basis for the pursuit of narrow interests and can actively preclude access to information and material resources that would otherwise be of great assistance to the community (e.g., tips about job vacancies, access to credit).

Measuring the Value of Social Capital

Organizations have begun to implement a large number of communities of practice in the hopes of achieving such benefits as:

- Building loyalty and commitment on the part of stakeholders
- Promoting innovation through better sharing of best practices
- Improving efficiency of processes
- Generating greater revenue and revenue growth
- Decreasing employee turnover and attrition

It remains a challenge to be able to evaluate whether or not communities in fact achieve these objectives—or even to measure whether or not progress has been made toward such goals. Communities of practice come packaged with a business plan—they are there for a business reason and as such they must be evaluated just like any other business initiative in order to be able to calculate the return on the company's investment.

One way of measuring value is to calculate the additional value that a community member represents in comparison to the average site visitor. For example, in a transactional website, if a community member purchases twice as much per month as the average user, then the community is generating additional revenue. Similar comparisons may be made with respect to usage for noncommercial sites. It appears that communities that are actively managed have higher participation rates and consequently bring greater value to the organization. Most companies lack experience in community management and will have to find resources that can possess the necessary expertise, processes, tools, and infrastructure to get the job done.

Community development costs may be based on hardware and software costs (one time and ongoing), community strategy development costs (one time), and the ongoing community management costs. Benefits other than usage are much more difficult to assess. For example, the benefits of the closer relationships that build among the community members often lead to higher employee retention rates. Organizational learning is likely accelerated and process efficiencies attained as a result, but it is difficult to quantify these valuable outcomes. Another example would be the power of viral marketing or word of mouth that uses a community as a conduit. Such recommendations would be much more targeted and relevant, and add to that the fact that they come from trusted peer sources, then the outcomes would be much more favorable in terms of the internalization and application of this shared content.

Another approach is to attempt to measure the value of the social capital that has been produced as a result of the knowledge sharing. Social capital has been measured in a number of innovative ways, though for a number of reasons obtaining a single *true* measure is probably not possible, or perhaps even desirable. Measuring social capital may be difficult, but it is not impossible, using different types and combinations of qualitative, comparative, and quantitative research methodologies. (Woolcock & Narayan, 2000, Sveiby & Simons, 2002). It is especially challenging because social capital is comprised of concepts such as trust, community and networks, which are difficult to quantify. The challenge is increased when one considers that the quest is to measure not just the quantity but also the quality of social capital on a variety of scales. A useful form is that of a story or vignette of success due to the existence of a knowledge-sharing community, such as the one working toward a cure for SARS.

Box 5.10

An example: Knowledge sharing and the search for a SARS cure

Global teams of scientists working on a vaccine for the SARS virus (Severe Acute Respiratory Syndrome) have been collaborating online to store common knowledge on a website, to look up experts, and to create communities. They make use of a KM tool from Knexa (now Knoco) (http://www.knoco.com) to stay in touch and to receive pertinent up-to-date information without having to actively search for it. This website has become a virtual home to the collection of international scientists working on the SARS problem. Although there has been much published on how incentives are needed to get people to embark upon KM solutions, this is not the case here. The major incentive is that this knowledge network makes it easier for the scientists to successfully do their jobs. Several groups can work simultaneously instead of sequentially to move ahead more quickly.

It may also be possible to adapt methods used in measuring social capital of countries or societies. For example, in his research comparing north and south Italy, Putnam (1995) examines social capital in terms of the degree of civic involvement, as measured by voter turnout, newspaper readership, membership in choral societies and football clubs, and confidence in public institutions. Northern Italy, where all these indicators are higher, shows significantly improved rates of governance, institutional performance, and development, when other orthodox factors were controlled for. His more-recent work on the United States (Putnam, 2000) uses a similar approach, combining data from both academic and commercial sources to show a persistent long-term decline in America's stock of social capital. Putnam validates data from various sources against the findings of the General Social Survey, widely recognized as one of the most reliable surveys of American social life. Other examples include the World Values Survey, which has measured interpersonal trust in 22 countries by asking questions such as: "Generally speaking, would you say that most people can be trusted or that you can't be too careful in dealing with people?" (Knack & Keefer, 1997). The Social Capital Initiative at the World Bank funds social capital projects which will help define and measure social capital, its evolution, and its impact (e.g., Narayan & Cassidy, 2001). Refer to chapter 10 for additional ways of measuring KM and CoPs.

Strategic Implications of Knowledge Sharing

Some of the strategically important benefits of knowledge sharing include:

- Connecting professionals across platforms, across distances
- Standardizing professional practices
- Avoiding mistakes
- Leveraging best practices
- Reducing time to access talent
- Building reputation
- Taking on stewardship for strategic capabilities

Knowledge resides in communities in the form of social capital. The key is often connecting people to solve problems, to develop new capabilities (learn), to improve work practices, and to share what's new in the field. The type of knowledge that is transferred is shared expertise. Unlike formal education and training where public knowledge is transferred, CoPs provide apprenticing situations over long periods of time. These need a shared background (context) and shared language in order to share expertise and will also need to be technology-mediated using email, telephone, groupware, videoconferencing, and intranets or websites.

Employees today are more often loyal to their profession than they are to a particular company. In turn, companies are no longer able to afford employment for life—not even in Japan where "salary men" are expected to work at a company for life—even there, layoffs have occurred. One of the biggest benefits of communities of practice is that they help retain employees. If a knowledge worker is working at an organization where he or she is able to be an active member of one or more communities of practice, this will be a significant incentive to stay with that organization. Lesser and Storck (2001) looked at the relationships that form in these communities and suggested that the obligations, norms, trust, and identification that come with being a community member enhances the members' ability to share knowledge with and learn from community participants. The community also serves as a powerful tool to welcome new members into the organization. New employees can quickly plug in to the network, connect, get help, pick up the organizational culture, and quickly develop a sense of identity and belonging.

Another key benefit of communities lies in the now popular notion of "six degrees of separation" where every person can be linked to another by six links (Watts, 1999). This stems from the famous 1967 experiment by Milgram (1967) where he asked 160 people in Kansas and Nebraska to each direct a letter to a particular person in Massachusetts by sending it to an acquaintance whom they thought might be able to forward it to the target. To Milgram's surprise, 42 letters eventually arrived after an average of only 5.5 hops. Networks are powerful conduits for the sharing of knowledge—powerful in terms of the reach of the network and the speed with which knowledge can be exchanged, but also powerful in that content is not merely conveyed but explicitly or implicitly *vouched for* because it is being sent to you from a trusted, credible source.

Practical Implications of Knowledge Sharing

Whereas knowledge sharing practices do emerge and run on their own, a minimal level of investment and support is crucial (Wenger et al., 2002). First and foremost, senior management should ensure that the organizational climate or culture is one that encourages networking. In addition to financial support, it is important that employees are given the time they need to fulfill their knowledge sharing roles and responsibilities. They will need a physical place to meet for the face-to-face meetings that should occur at least once a year. They should receive a travel budget if one is required. Their group membership should be recognized and evaluated as part of the performance review. Additional resources such as community moderators, journalists, librarians, taxonomists, and archivists should be facilitated as well. Experience has shown that one of the most important factors contributing to the success of a community is that of an active and effective facilitator.

A conversation is more than an intellectual endeavor: it is a fundamentally social process, as is learning. People need to connect; they need to speak to an audience, note how they are receiving, and adjust accordingly. People portray themselves through conversations—bringing forth personal agendas, showing personal style, taking credit, and sharing blame. In a virtual world, it is important to realize that all such connections and conversations are public and that once digitized, conversations can persist. This means that anyone can access them at some time in the future. It is important for knowledge-sharing interactions to be maintained at a professional level at all times and that all members of a virtual network are aware of and agree to adhere to a professional code of ethics, both online and offline.

Key Points

- The cost of not finding information is extremely high—both for individuals and for the organization as a whole.
- It is not always about knowing what but "knowing who knows what," which can take the form of a corporate yellow pages or expertise location system
- Learning is a primarily social activity
- Knowledge sharing occurs quite efficiently and effectively in communities of practice where members share a professional interest and goal
- In order for effective knowledge sharing to occur in CoPs, a number of key roles need to be in place such as knowledge sponsor, champion, facilitator, practice leader, KSO, membership managers, discussion moderators, knowledge editors, librarians, archivists, usage analysts, and knowledge brokers.
- Virtual communities are the primary sources of social capital produced that is of value to the organization.
- Knowledge networks emphasize the connections that allow you to share and disseminate valuable content; communities of practice develop a shared identity with shared goals that all members agree to try to attain.
- Social network analysis can be used to visualize the people and their connections in virtual communities.
- Social presence and media richness are two dimensions that can be used to assess how well technological channels such as email, blogs, wikis, and so forth can accommodate the sharing of both tacit and explicit knowledge.
- In addition to communities of practice and knowledge networks, knowledge sharing can be facilitated through knowledge and world cafés as well as through organizational storytelling.
- Some of the key obstacles to knowledge sharing are notions such as knowledge is property and knowledge is power, credibility of the content and the source, organizational culture, and the presence of undernets.

Discussion Points

1. What are the major distinguishing characteristics of a community of practice that a community of interest would not possess?
2. Compare and contrast some different types of communities of practice. Describe how they would differ with respect to their goals.
3. What are the key differences between the functionalist and the social constructivist perspectives on knowledge? Why is the latter better suited to knowledge management?
4. Describe the roles and responsibilities of a knowledge broker in a virtual community. Provide examples of how they could help promote knowledge sharing and increase the value of the social capital of the firm.
5. What is the difference between human and social capital?
6. What are some of the key deterrents to knowledge sharing and knowledge flow within an organization? How could you help overcome them?
7. List some of the ways in which social network analysis techniques can be used to better understand how knowledge is circulated within an organization.
8. What lesson can be learned from the Tragedy of the Commons? Provide some modern-day examples and discuss how you would ensure effective knowledge sharing takes place. Identify the types of knowledge-sharing channels you would use and justify them with respect to their social presence and media richness.
9. What are some popular technologies used to support knowledge networks and communities of practice? How do they compare? When would it be beneficial to use what tool? How would you make your decision?
10. What are some of the key steps you would need to carry out in order to conduct a social network analysis of an organization? What would you need to know before you could start? What sorts of questions could the SNA answer?

Notes

1. See wenger-traynor.com/resources/communities-versus-networks.

2. See https://ca.linkedin.com.

3. See https://www.cdc.gov/phcommunities.

4. See http://www.gurteen.com/gurteen/gurteen.nsf/id/kcafe-run.

5. See http://jeffhester.net/2011/02/01/successful-km-storytelling.

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6 Finding Knowledge

All that is gold does not glitter; not all those that wander are lost.

—J. R. R. Tolkien (1892–1973)

This chapter brings us to the final step in the knowledge management cycle when the knowledge that has been captured, coded, shared, and otherwise made available is put to actual use. Unless this step is accomplished successfully, all of the KM efforts have been in vain for KM can only succeed if the knowledge is used. However, it now becomes imperative to understand which knowledge is of use to which set of people and how best to make it available to them so that they not only understand how to use it, but believe that using this knowledge will lead to an improvement in their work. The use of learning taxonomies, task support systems, and personalization or profiling techniques can help ensure the best possible match between user and content. Expertise location systems and other collaboration aids can help groups of people find and apply valuable knowledge and know-how. Content management systems can be designed to optimize knowledge application on an organization-wide basis. A number of real-world KM applications are presented covering the range of vertical industries such as manufacturing and education, KM for the developing world, and KM applications for the nonprofit sector.

Learning Objectives

1. Understand how user and task-modeling approaches can help promote effective knowledge use at the individual, group, and organizational level.
2. Describe how an organizational knowledge management architecture is designed.
3. Define organizational learning and describe the links between individual and organizational learning.
4. Compare and contrast learning and understanding with internalization of knowledge.
5. List the different knowledge support technologies that can help users put knowledge into action.
6. Describe a range of diverse KM applications that have been successfully implemented in the real world.

Introduction

Knowledge management typically addresses one of two general objectives: knowledge reuse to promote efficiency and innovation to introduce more effective ways of doing things. Knowledge application refers to the actual use of knowledge that has been captured or created and put into the KM cycle (refer to figure 6.1).

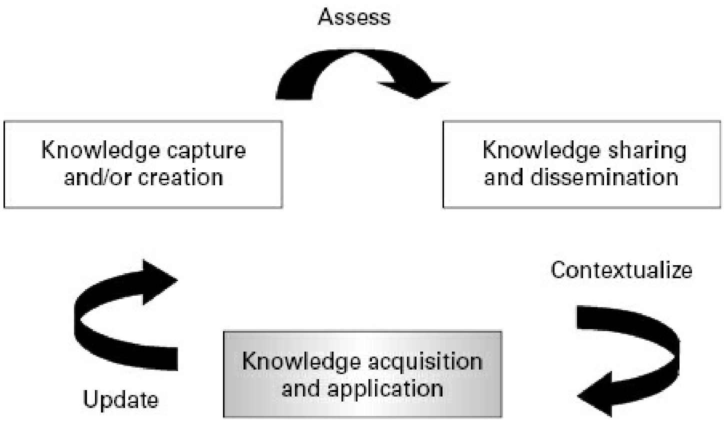


Figure 6.1 An integrated KM cycle

Knowledge eventually ends being made accessible to all the knowledge workers in an organization with an implicit assumption that the knowledge will be used. This turns out to be a rather large and often unfounded assumption. In fact, if we recall the Nonaka and Takeuchi model from chapter 3, we can see that having captured, coded, reorganized, and made knowledge available, we are still only in the third quadrant. The knowledge spiral needs to be completed by successful internalization of knowledge. This process of internalization, it should be recalled, consists not only of accessing and understanding the content but of consciously deciding that this is indeed a good—ideally better—way of doing things and hence the knowledge is applied to a real world decision or problem.

This is knowledge reuse, the process whereby useful nuggets of knowledge or knowledge objects are made available in a library of such objects. These knowledge objects can be annotated references, components (programs or text), templates, patterns, or other types of containers. For example, consulting companies often reuse project proposal templates as they convey the company brand and contain useful reusable objects such as testimonials, company description, and so on. The goal is to reduce the time it takes to complete tasks as well as to help maintain higher standards regarding the quality of the work to be done. The benefits to new employees are enormous as they are able to attain "day one" performance with the help of such a reuse library, that is, they are able to perform at a fairly high level on their first day on the job. The other major benefit is the work that is not done—because it was possible to see that someone else had already done it. The savings involved in not reinventing the wheel can be considerable.

KM aims to support learning organizations that provide all employees with access to corporate memory so that both the individuals and the organization as a whole improve. Corporate memory is often incomplete, as it has captured only explicit knowledge. KM attempts to also make accessible the valuable tacit knowledge and add this to the corporate memory. While it is possible to reuse tacit knowledge and this is done all the time during knowledge-sharing interactions, reuse tends to refer to packaged explicit knowledge. Reuse of explicit knowledge affords a longer-term advantage. Whereas tacit knowledge reuse can benefit the individual who sought the advice of a more experienced colleague, knowledge objects that are accessible through the knowledge repository are accessible to all workers and they remain so for as long as they are useful.

That being said, it is imperative to try to include or at least be able to point to where the tacit knowledge associated with a given knowledge object resides. It is never possible or even desirable to try to render all knowledge explicit. If knowledge workers can easily locate and communicate with individuals in the company that are connected to a given knowledge object (e.g., they are familiar with how it is used, they have been trained, etc.), then the ability to apply or to make use of this knowledge is greatly increased. In the example of the proposal-writing knowledge object or template, hyperlinks can easily be included to not only good examples of past proposals that were successful (best practices) but to the individuals who were involved in their preparation so that they can be contacted for advice, a read-through, or other forms of help.

The essence of problem solving, innovation, creativity, intuitive design, good analysis, and effective project management involves more tacit, rather than explicit, knowledge. By putting tacit knowledge in a principal role and cultivating tacit knowledge environments, KM can play an important role in application development, and particularly in reuse. Another aspect of the explicit knowledge problem is the fallacy that documentation (explicit knowledge) equals understanding. We seek understanding in order to successfully reuse a component. However, the larger and more complex the component, the harder it is to gain the required understanding from documentation alone. Understanding, in this context at least, is a combination of documentation and conversation —conversation about the component and the context in which that component operates. No writer of documentation can anticipate all the questions a component user may have. Even if this were possible, the resulting documentation would be so extensive and cumbersome that potential users would simply develop their own component rather than wade through the documentation.

Knowledge management systems that focus on gathering, recording, and accessing reams of knowledge, at the expense of person-to-person interactions, have proven to be expensive and less than satisfactory. Organizations that fail to understand tacit knowledge will repeat many of the mistakes made with methodologies such as Computer Assisted Software Engineering (CASE). A common assumption in the past was that all relevant knowledge could be bundled up in nice, neat, easily accessible packages of best practices that practitioners could then repeat.

When we attack reuse as a knowledge management problem we begin to ask new questions, or at least look for different avenues for finding solutions to the problem. How do we go about finding the component we need? How do we gain confidence that the component does what we want it to do, and does not do strange things that we do not want? What is the distance (organizationally or geographically) between the component developer and users? Are there other people who have used this component that we could talk to and learn from? Do we have access to the author of this component? Have others found this component to be effective? How should we go about testing this component? How easily will this component integrate into our environment?

Dixon (2000) outlines factors that affect knowledge transfer: characteristics of the receiver (skills, shared language, technical knowledge), the nature of the task (routine, non-routine), and the type of knowledge being transferred (a continuum from explicit to tacit). The author then identifies five categories of knowledge transfer that she has observed, from near transfer ("transferring knowledge from a source team to a receiving team that is doing a similar task in a similar context but in a different location") to serial transfer ("the source team and the receiving team are one and the same"). Dixon then describes techniques that work well for each of these five types of transfer.

It is not the objective of this chapter to describe the practices for knowledge transfer in detail, but rather to point out that merely coding a component and scratching out a few lines of documentation will rarely be enough to facilitate knowledge transfer. Other researchers such as Hatami, Galliers, and Huang (2003) found that a key to organizational success in the face of global competition is the ability to capture organizational learning, to effectively reuse the knowledge through efficient means, and to synthesize these into more intelligent problem recognition, strategic analysis, and choices in strategic directions. By tapping into their organization's memory, decision makers can make more intelligent business decisions. This is achieved when individuals access data, information, and knowledge residing in repositories. However, retrieval alone is not enough—knowledge application must follow and the success of knowledge application appears to be a function of the characteristics of the individual, of the knowledge content, the purpose of reuse for the particular task at hand, and the organizational context or culture.

Knowledge Application at the Individual Level

Characteristics of Individual Knowledge Workers

Individual differences play a major role in knowledge-sharing behaviors (Hicks & Tochtermann, 2001). Knowledge workers vary with respect to their familiarity with the subject matter and their personality and cognitive styles. Cohen and Levinthal (1990) found that sharing is more likely to occur when a foundation of prior relevant knowledge exists. A number of studies (e.g., Ford et al., 2002; Kuhlthau, 1993; Spink et al., 2002) found significant correlations between online searching behaviors and the Paskian cognitive styles of holistic and operational learners. On the other hand, the business world heavily favors the use of instruments such as the Myer-Briggs Type Indicator (MBTI) personality style assessment (Myers et al., 1998) to assess differences in personality styles. Some research has been done to correlate MBTI type with knowledge-sharing behaviors (e.g., Webb, 1998, found in a study of the consulting firm Price Waterhouse Coopers that a strong outgoing personality was important in knowledge sharing irrespective of qualifications and prior experience).

Characteristics of the individual who is seeking to apply or reuse knowledge are likely to play a role in how effective they are at finding, understanding, and making use of organizational. Individual characteristics may include, for example, personality style, their preferences regarding how they best learn, how they prefer to receive their information, as well as how they can best be helped to put the knowledge to work. This may range from something as simple as asking for and subsequently accommodating the language the user prefers to work in to more sophisticated modeling of the user in terms of their abilities and their goals. One good framework that is of use here is the Bloom taxonomy of learning objectives (Bloom, Mesia, & Krathwohl, 1964) that was designed to help teachers set learning goals for learning activities. The taxonomy can be easily adapted to knowledge application goals for each knowledge object in a repository.

One way of visualizing personalization is to think of the one-person company or the one-person library. All of the knowledge resources in a given repository can be made to appear as if they were there at the disposal of a given person, reflecting their preferences, their background, and so forth. Figure 6.2 illustrates this concept of “many-to-one” interactions.

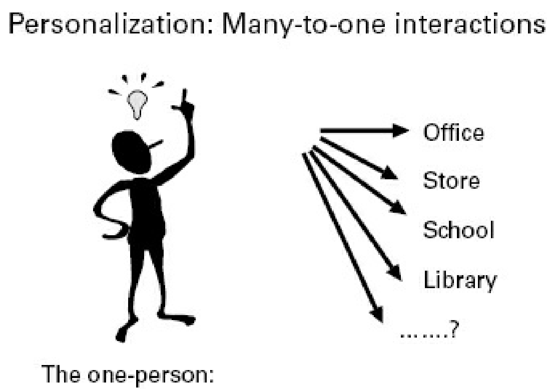
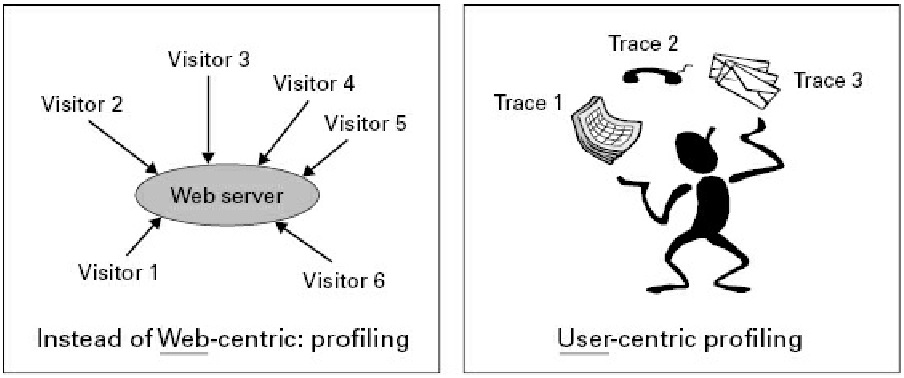


Figure 6.2 Illustration of the personalization concept

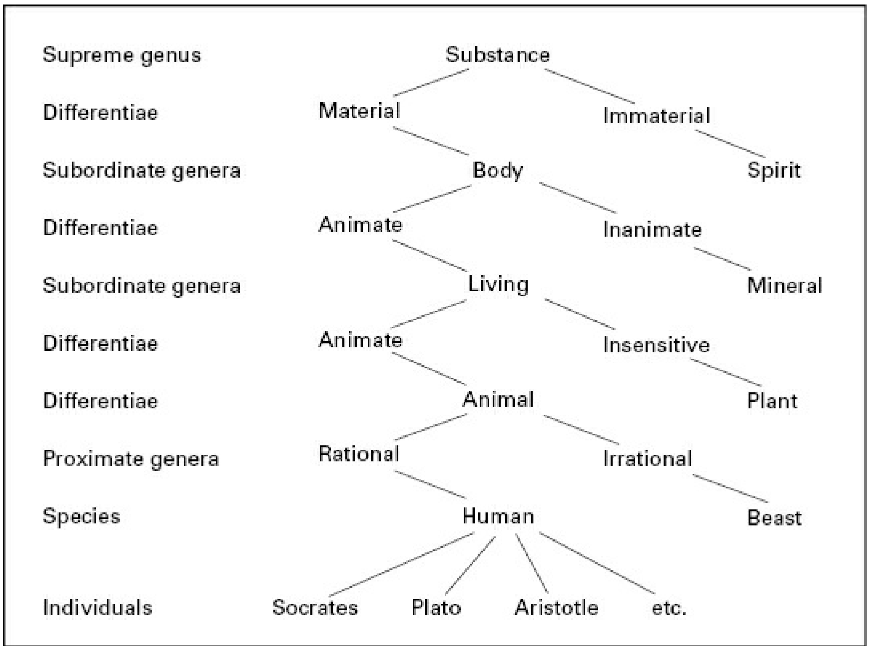
Personalization and profiling is currently a popular means of characterizing visitors to a given website. This is particularly true of virtual stores where customer data can be analyzed in order to improve marketing efforts. However, in knowledge management we are less concerned with database marketing applications of personalization; the emphasis is more on ensuring that information retrieval and knowledge application processes are tailor-made for each knowledge worker. The easier it is for a knowledge worker to find, understand, and internalize the knowledge, the greater their success in actually applying this knowledge. An alternative approach to user modeling is proposed in figure 6.3.



[Figure 6.3](#) An alternative approach to personalization

Instead of using profiling technologies to better understand all customers, we can make use of similar techniques to follow or trace a given individual's interactions with a number of corporate memory interfaces. This alternative approach will yield a user model. This model will help us to better understand the types of human–knowledge interactions that have occurred in order to optimize knowledge application within the organization. For example, push technologies are based on user models that look at historical information requests in order to push or automatically send out similar new content that becomes available.

We will need to be able to find and use content based on an individual's personal model, how they perceive the knowledge world around them. This is often influenced by their particular background (e.g., IT vs. sociology), how long they have been in the company, how expert they are in the topic, as well as a whole spectrum of preferences ranging from the linguistic to the format they prefer to receive knowledge (e.g., visual types of people who prefer diagrams vs. those who prefer to read text). These are often represented as semantic networks (see figures 6.4 and 6.5).



Tree of Porphyry, as it was drawn by the logician Peter of Spain (1329). It illustrates the categories under substance, which is called the supreme genus or the most general category.

[Figure 6.4](#) Example of a semantic network

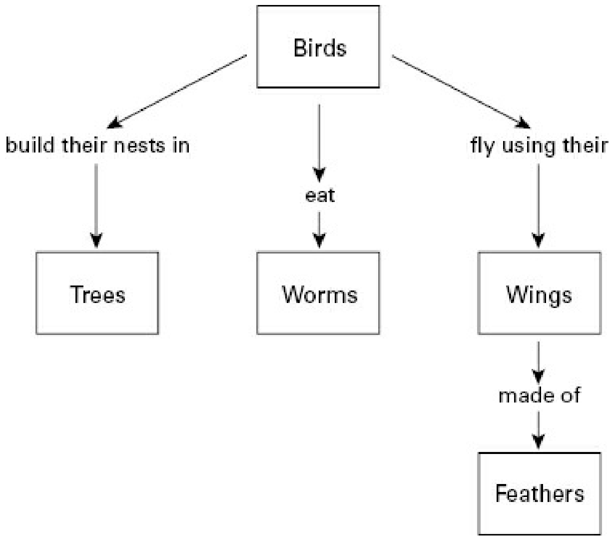


Figure 6.5 Example of a semantic network (continued)

There are also systems that monitor users' tasks online and interpret them in context, based on traces they leave behind. These systems work well for tasks that are well identified and where knowledge can be described in a clear ontology (e.g., a postal address template). In general, this approach is based on a user interacting with a computer system to perform a task that leads to changes in the system. An observer agent (a software routine) observes these changes according to an observation model to generate a log or trace of what the user has done. The trace is then analyzed to identify and extract significant episodes interpret them according to explained task signatures. Each episode represents a pattern and each pattern can be mapped onto a task, a subtask, or a more specific step that forms part of the subtask. For example, if the user is trying to locate, open, and print out a particular file, there are three distinct episodes that can be identified: behaviors related to the locating, the opening, and the printing of the file. Assistant agents that help the user to do what they are trying to do can then reuse these episodes. The assistance episodes themselves can also be reused in the future (see figure 6.6). In this way, the system has modeled how users behave when they are undertaking these particular types of tasks.

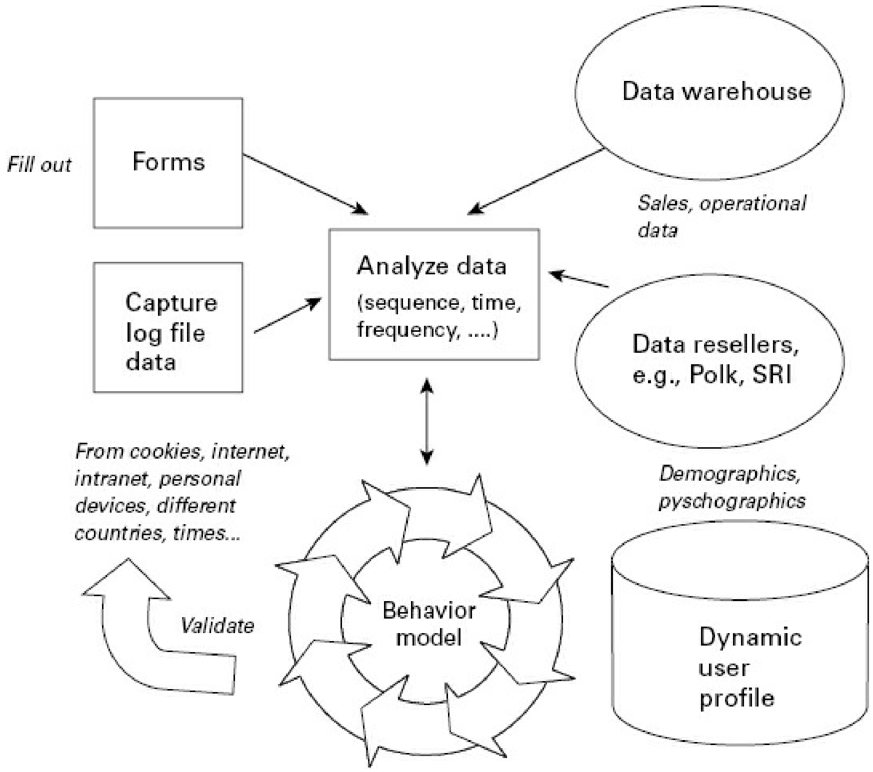


Figure 6.6 Dynamic profiling system design

The important factor to note here is that user modeling is an ongoing process, not a one-shot deal. Dynamic profiling systems need to be developed based on a mix of human and automated trace facilities, in order to be able to continually adapt to changes in the environment, changes in the organization, and changes in the individuals themselves (e.g., different job responsibilities, different preferences, new competencies, and new interests).

Bloom's Taxonomy of Learning Objectives

Bloom et al. (1964) has divided knowledge into a hierarchical scheme that distinguishes between psychomotor skills, affective domain (e.g., attitudes), and cognitive domain (e.g., knowledge). The latter is the one that is more commonly, used although attitudinal changes are often required in knowledge management too. Bloom emphasizes that learning is hierarchical with learning (objectives) at the highest level as dependent on the achievement of lower level knowledge and skills first.

The cognitive domain taxonomy is shown in table 6.1. The levels shown are from low (1. knowledge) to high (6, evaluation).

Table 6.1 Bloom taxonomy of the cognitive domain

	Level	Description	Action verbs that can be used
1	Knowledge	Remembering of previously learned material	Recall, repeat, define, describe, list, identify, label, match, name, state
2	Comprehension	Ability to grasp the meaning of material, e.g., translating from one form to another, estimating future trends, explaining or giving examples of	Classify, convert, discuss, explain, generalize, give an example of, paraphrase, restate in your own words, summarize, review
3	Application	Ability to use learned material in new and concrete situations by applying rules, methods, concepts, principles, laws, and theories	Articulate, assess, chart, computer construct, determine, develop, discover, establish, extend, operationalize, participate, predict, provide, show, solve, use, apply, demonstrate, sketch, practice, illustrate
4	Analysis	Ability to break down material into its component parts so that its organizational structure may be understood. Identification of parts, relationships between parts, recognition of organizational principles	Break down, correlate, diagram, differentiate, discriminate, distinguish, focus, infer, outline, point out, recognize, separate, subdivide, compare, contrast, inspect, inventory, relate, examine
5	Synthesis	Ability to put parts together to form a new whole. Creative behaviors stressed in the formulation of something new	Adapt, categorize, collaborate, combine, communicate, compile, compose, create, design, devise, facilitate, formulate, generate, incorporate, individualize, initiate, integrate, model, plan, propose, assemble, organize
6	Evaluation	Ability to judge the value of material based on definite criteria	Appraise, conclude, criticize, decide, defend, judge, justify, support, evaluate, rate, value, score, prioritize, select

Source: Adapted from Bloom 1956.

The affective domain includes the manner in which we deal with things emotionally, such as feelings, values, appreciation, enthusiasms, motivations, and attitudes. The five major categories are listed in table 6.2.

Table 6.2 Affective domain as characterized in the Bloom taxonomy

Receiving phenomena: Awareness, willingness to hear, selected attention.	Examples: Listen to others with respect

	Listen for and remember the name of newly introduced people Keywords: asks, chooses, describes, follows, gives, holds, identifies, locates, names, points to, selects, sits, erects, replies, uses
Responding to phenomena: Active participation on the part of the learners. Attends and reacts to a particular phenomenon. Learning outcomes may emphasize compliance in responding, willingness to respond, or satisfaction in responding (motivation).	Examples: Participates in class discussions Gives a presentation Questions new ideals, concepts, models, etc., in order to fully understand them Knows the safety rules and practices them Keywords: answers, assists, aids, complies, conforms, discusses, greets, helps, labels, performs, practices, presents, reads, recites, reports, selects, tells, writes
Valuing: The worth or value a person attaches to a particular object, phenomenon, or behavior. This ranges from simple acceptance to the more complex state of commitment. Valuing is based on the internalization of a set of specified values, while clues to these values are expressed in the learner's overt behavior and are often identifiable.	Examples: Demonstrates belief in the democratic process Is sensitive towards individual and cultural differences (value diversity) Shows the ability to solve problems Proposes a plan to social improvement and follows through with commitment Informs management on matters that one feels strongly about Keywords: completes, demonstrates, differentiates, explains, follows, forms, initiates, invites, joins, justifies, proposes, reads, reports, selects, shares, studies, works
Organization: Organizes values into priorities by contrasting different values, resolving conflicts between them, and creating a unique value system. The emphasis is on comparing, relating, and synthesizing values.	Examples: Recognizes the need for balance between freedom and responsible behavior Accepts responsibility for one's behavior Explains the role of systematic planning in solving problems Accepts professional ethical standards Creates a life plan in harmony with abilities, interests, and beliefs Prioritizes time effectively to meet the needs of the organization, family, and self Keywords: adheres, alters, arranges, combines, compares, completes, defends, explains, formulates, generalizes, identifies, integrates,

	modifies, orders, organizes, prepares, relates, synthesizes
Internalizing values (characterization): Has a value system that controls their behavior. The behavior is pervasive, consistent, predictable, and most importantly, characteristic of the learner. Instructional objectives are concerned with the student's general patterns of adjustment (personal, social, emotional).	Examples: Shows self-reliance when working independently Cooperates during group activities (displays teamwork) Uses an objective approach in problem solving Displays a professional commitment to ethical practice on a daily basis Revises judgments and changes behavior in light of new evidence Values people for what they are, not how they look Keywords: acts, discriminates, displays, influences, listens, modifies, performs, practices, proposes, qualifies, questions, revises, serves, solves, verifies

Source: Adapted from Bloom 1956.

The psychomotor domain includes physical movement, coordination, and use of the motor-skill areas. Development of these skills requires practice and is measured in terms of speed, precision, distance, procedures, or techniques in execution. The seven major categories listed in table 6.3.

Table 6.3 Bloom taxonomy of the psychomotor domain

Perception: The ability to use sensory cues to guide motor activity. This ranges from sensory stimulation, through cue selection, to translation.	Examples: Detects non-verbal communication cues Estimates where a ball will land after it is thrown and then moving to the correct location to catch the ball Adjusts heat of stove to correct temperature by smell and taste of food Adjusts the height of the forks on a forklift by comparing where the forks are in relation to the pallet Keywords: chooses, describes, detects, differentiates, distinguishes, identifies, isolates, relates, selects
Set: Readiness to act. It includes mental, physical, and emotional sets. These three sets are dispositions that predetermine a person's response to different situations (sometimes called mindsets).	Examples: Knows and acts upon a sequence of steps in a manufacturing process Recognizes one's abilities and limitations Shows desire to learn a new process (motivation) NOTE: This subdivision

	of Psychomotor is closely related with the “responding to phenomena” subdivision of the affective domain. Keywords: begins, displays, explains, moves, proceeds, reacts, shows, states, volunteers
Guided response: The early stages in learning a complex skill that includes imitation and trial and error. Adequacy of performance is achieved by practicing.	Examples: Performs a mathematical equation as demonstrated Follows instructions to build a model Responds to hand-signals of instructor while learning to operate a forklift Keywords: copies, traces, follows, reacts, reproduces, responds
Mechanism: This is the intermediate stage in learning a complex skill. Learned responses have become habitual and the movements can be performed with some confidence and proficiency.	Examples: Uses a personal computer Repairs a leaking faucet Drives a car Keywords: assembles, calibrates, constructs, dismantles, displays, fastens, fixes, grinds, heats, manipulates, measures, mends, mixes, organizes, sketches
Complex overt response: The skillful performance of motor acts that involve complex movement patterns. Proficiency is indicated by a quick, accurate, and highly coordinated performance, requiring a minimum of energy. This category includes performing without hesitation, and automatic performance. For example, players are often utter sounds of satisfaction or expletives as soon as they hit a tennis ball or throw a football, because they can tell by the feel of the act what the result will produce.	Examples: Maneuvers a car into a tight parallel parking spot Operates a computer quickly and accurately Displays competence while playing the piano. Keywords: assembles, builds, calibrates, constructs, dismantles, displays, fastens, fixes, grinds, heats, manipulates, measures, mends, mixes, organizes, sketches NOTE: The key words are the same as for mechanism, but will have adverbs or adjectives that indicate

	that the performance is quicker, better, more accurate, etc.
Adaptation: Skills are well developed and the individual can modify movement patterns to fit special requirements.	Examples: Responds effectively to unexpected experiences Modifies instruction to meet the needs of the learners Performs a task with a machine that it was not originally intended to do (machine is not damaged and there is no danger in performing the new task) Keywords: adapts, alters, changes, rearranges, reorganizes, revises, varies
Origination: Creating new movement patterns to fit a particular situation or specific problem. Learning outcomes emphasize creativity based upon highly developed skills.	Examples: Constructs a new theory Develops a new and comprehensive training programming Creates a new gymnastic routine Keywords: arranges, builds, combines, composes, constructs, creates, designs, initiates, makes, originates

Source: Adapted from Bloom 1956.

These taxonomic categories can be used “inside out” to help understand what users are trying to do. The level of internalization can be identified for effective performance, for example, setting a minimum threshold that must be reached in order for the worker to be able to understand and make appropriate use of the knowledge object. This can in turn be incorporated into a user model. The Bloom taxonomy serves as a means of determining not only what knowledge workers are expected to do (usually referred to as skills or expertise) but also the level of performance that is expected (also referred to as mastery level). For example, using the cognitive skill portion of the Bloom taxonomy, it is possible to characterize a particular knowledge object, say a best practice procedure on how best to present a project team member’s resume when preparing a project proposal. The knowledge worker who prepares the bid would be expected to have a level of understanding that allows for critical judgment in order to be able to execute this task at the required proficiency level. He or she must not only be skilled in the selection of team members to be included in the proposal but also be able to repackage their resumes in the form that has been shown to be the best based on past successes. Another example, using the affective domain Bloom taxonomy, once again can make use of this best practice but this time addresses the best way to judge whether candidates who meet the technical skill requirements also possess the appropriate “soft skills,” such as being a good team player, having a collaborative approach to work, and not being prone to knowledge hoarding or claiming individual credit for group work.

The Bloom taxonomy provides a good basis for the assessment of knowledge application. All too often in KM, simply having accessed content is taken to mean that knowledge workers are using (and reusing) this content. It is far more useful to assess the impact that the knowledge residing in the knowledge base has had on learning, understanding, and “buying in” to a new way of doing things. It is only through changes in behavior that knowledge use can be inferred, and the taxonomy provides a more detailed framework to evaluate the extent to which knowledge has been internalized (using the Nonaka and Takeuchi 1995 model). For example, at the lower cognitive skill levels, simply being aware that knowledge exists within the organization is easily observed when knowledge workers are able to locate the content within a knowledge repository. Access is typically tracked using log file statistics, which are similar to the number of hits or visitors that a website has attracted. Knowledge application, however, requires that knowledge workers have attained much higher levels of comprehension such as analysis, synthesis, and evaluation. It is only at these levels that knowledge can be truly applied. In contrast to someone who can point to a template in the knowledge base, knowledge application will be manifested by a change in how a knowledge worker goes about doing his or her job.

The affective component is equally important to take into consideration when analyzing knowledge application. Often, the reason knowledge is not being used is not due to the fact that it has not been understood. Rather, it is often the case that the knowledge worker was not convinced that this new best practice or lesson learned represents any significant improvement over the way he or she is already working. An attitudinal change is more often than not a critical prerequisite to internalization. It is not enough that someone be made aware of and understand a given practice—they must also believe that it is indeed a better way of doing things and that they stand to gain by adopting this new way of working.

The psychomotor domain is less widely used in knowledge management and is often more related physical work and skills.

A user model is, however, not enough for the facilitation of knowledge application. We also need to know what the users are doing, what their goals or purposes are in applying this knowledge object. To this end, we will also require a task model. As with the user model, the task model will serve to better characterize the different reasons why someone would apply a particular knowledge item.

A user- and task-adapted approach is highly recommended in order to facilitate internalization processes. This means that we need to know enough about the user and what they are trying to do in order to support them in the best possible way. This is of course quite similar to what a good reference librarian or coach would do—that is, try to understand who you are and what you are trying to accomplish before beginning to attempt to help out. Someone who is browsing to pick up general information and background on a subject of interest may be mistakenly taken for someone who is lost in a sea of information. On the other hand, someone who has a looming deadline to meet and is looking for a specific template to help him or her complete the task at hand as quickly as possible without too many errors would not appreciate being flooded with too much information. They are looking only for the specially selected, vetted, and guided nuggets of knowledge—sometimes referred to as just-in-time (JIT) knowledge and just-enough knowledge. Task support systems or Electronic Performance Support Systems (EPSSs) best exemplify the latter just-enough knowledge.

Task Analysis and Modeling

Task analysis studies what knowledge workers must do with respect to specific actions to be taken and/or cognitive processes that must be called upon to achieve a particular task (e.g., Preece et al., 1994). The most commonly used method is task decomposition, which breaks down higher-level tasks into their subtasks and operations. The lower levels may make use of task flow diagrams, decision flowcharts, or even screen layouts to better illustrate the step-by-step process that has to be undertaken in order to complete a task successfully. A good task analysis should show the sequencing of activities by ordering them from left to right. In order to break down a task, the question should be asked, “How is this task done?” If a subtask is identified at a lower level, it is possible to build up the structure by asking, “Why is this done?”

The task decomposition can be carried out using the following stages:

1. Identify the task to be analyzed.
2. Break this down into between 4 and 8 subtasks. These subtasks should be specified in terms of objectives and, between them, should cover the whole area of interest.
3. Draw the subtasks as a layered diagram ensuring that it is complete.
4. Decide upon the level of detail into which to decompose. Making a conscious decision at this stage will ensure that all the subtask decompositions are treated consistently. It may be decided that the decomposition should continue until flows are more easily represented as a task flow diagram.
5. Continue the decomposition process, ensuring that the decompositions and numbering are consistent. It is usually helpful to produce a written account as well as the decomposition

diagram.

6. Present the analysis to someone else who has not been involved in the decomposition but who knows the tasks well enough to check for consistency.

Task flow analysis can include details of interactions between the user and the current system, or other individuals, and any problems related to them. Copies of screens from the current system may also be taken to provide details of interactive tasks. Task flows will not only show the specific details of current work processes but may also highlight areas where task processes are poorly understood, are carried out differently by different staff, or are inconsistent with the higher level task structure. An example of a task analysis is shown in table 6.4.

Table 6.4 Example of a task analysis: Tying shoelaces

For more experienced individuals	For novices
1. Grab one lace in each hand. 2. Pull the shoelaces tight with a vertical pull. 3. Cross the shoelaces. 4. Pull the front lace around the back of the other. 5. Put that lace through the hole. 6. Tighten the laces with a horizontal pull. 7. Make a bow. 8. Tighten the bow.	1. Pinch the laces. 2. Pull the laces. 3. Hang the ends of the laces from the corresponding sides of the shoe. 4. Pick up the laces in the corresponding hands. 5. Lift the laces above the shoe. 6. Cross the right lace over the left one to form a teepee. 7. Bring the left lace toward the student. 8. Pull the left lace through the teepee. 9. Pull the laces away from one another. 10. Bend the left lace to form a loop. 11. Pinch the loop with the left hand. 12. Bring the right lace over the fingers and around the loop. 13. Push the right lace through the hole. 14. Pull the loops away from one another.

Such task analyses are an important first step in the design of knowledge application support systems. A popular form of these has been around long before the term KM came into common usage. Electronic Performance Support Systems (EPSS) were and continue to be widely used to provide on-the-job learning and advice. E-learning is also currently enjoying a high level of usage and they can be seen as a subset of EPSS, as described in the next sections.

EPSS

In the ground-breaking book, *Electronic Performance Support Systems*, Gery (1991) defined EPSS as an integrated electronic environment that is available to and easily accessible by each employee and is structured to provide immediate, individualized, online access to the full range of information, software, guidance, advice and assistance, data, images, tools, and assessment and monitoring systems to permit job performance with minimal support and intervention by others.

An electronic performance support system can also be described as any computer software program or component that improves employee performance by reducing the complexity or number of steps required to perform a task, providing the performance information an employee needs to perform a task, or providing a decision support system that enables an employee to identify the action that is appropriate for a particular set of conditions (see figure 6.7).

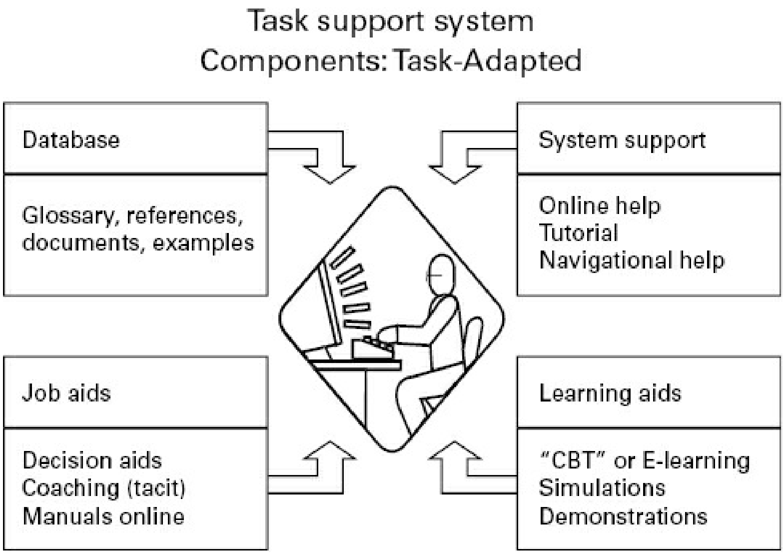


Figure 6.7 Components of an EPSS

The EPSS point of view has been revolutionary. Its significance was how it reframed our thinking from the training paradigm of "fill them up" with knowledge and skills and then "put them to work." EPSS practitioners and business sponsors came to understand that people could be put on task far sooner—almost from day one—if we provided an appropriate suite of integrated supports in the context of performing real-work tasks.

Performance support systems such as EPSS help distill content into useful chunks. The famous experiment by Miller (1956) found that our span of immediate memory is severely limited—in fact, we can only hold seven (plus or minus two) discrete items in our minds at the same time. Psychologists then did quite a bit of research on how chunking, or combining items into more general categories, can help to overcome this human information-processing bottleneck. This is also the reason why mnemonics work in helping us to remember. For example, in trying to recall a list of things to do, one mnemonic trick is to visualize each item as being in different room of your house.

EPSSs capitalize on such useful methods by reducing say a document into discrete knowledge chunks (see figure 6.8). Each chunk then becomes a knowledge object and the EPSS can direct you to the specific piece of knowledge you need in order to carry out the task at hand. This is another important distinction in how KM carries out content management as opposed to systems such as document management systems. KM operates at a finer level of granularity—the work has been done a priori so users need not wade through thick technical documents or other containers of knowledge. These have been broken down into the valuable knowledge nuggets that are of greatest use.

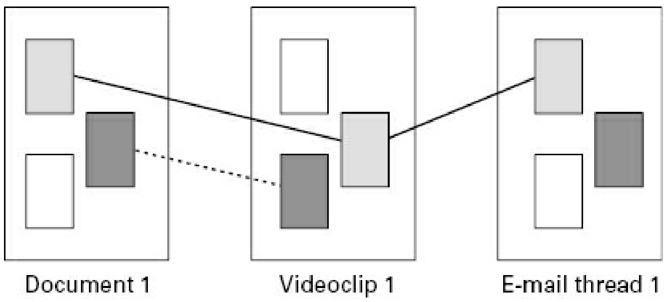


Figure 6.8 Chunking in content management

Content management in KM thus involves breaking down documents into their conceptual components and mapping these out using concept indexes, semantic networks, or hierarchical knowledge taxonomies. Decomposition is also a prerequisite for the development of EPSS. Understanding the EPSS vision remains far from common. Indeed, misunderstanding of the EPSS vision is far more common—a result, in part, of misapplication of the term by people who sought currency in being on the band wagon, despite the fact that they were selling traditional CBT, online reference materials, and so on. Still, , there are quite a few success stories for true performance support systems. What we call EPSS may change—there's a movement to replace the term with “performance centered systems,” an attempt to recapture the original intent and to better appeal to the IS community—but the concept is here to stay, justified by the value these systems have provided to the visionary organizations that sponsored them.

EPSS can help an organization to reduce the cost of training staff while increasing productivity and performance. They can empower an employee to perform tasks with a minimum amount of external intervention or training. By using this type of system, an employee—especially a new employee—will not only be able to complete their work more quickly and accurately, but as a secondary benefit they will also learn more about their job and their employer’s business. For an update on this approach, see Dickleman (2003). Malcolm (1998) discussed the extension of the EPSS concept to apply to groups (CoPs) and to house content that could be dynamically updated within an organization’s knowledge repository. Performance support systems today have been designed primarily for individual use: they support an individual as he or she works to accomplish some performance goal. On the commercial market, programs that help you prepare your income tax returns, write a will, or create a newsletter template all illustrate this level of support. In corporations, systems that support customer service representatives—whether in a call center for financial transactions or travel reservations, or face-to-face in the lobby of a hotel—also represent an individual’s use of an EPSS. Imagine a group around a table with the means to project a computer display. The group would work through the steps of the process together, brainstorming, and receiving group-processing advice from a built-in “coach.” The work product belonged to the group and it was the group’s performance that had been enhanced by the EPSS.

Another way to look at this challenge is to say that yet another conceptual merger needs to take place—this time assimilating the discipline of KM, that is, capturing and sharing vital business information from a variety of sources, not just top-down, in order to enable better decision making in a dynamic business environment. We in the field of performance support have much to learn from it, just as those who study knowledge capture and sharing have much to learn from us about how to integrate various kinds of support into the context of performing work.

Examples are fairly common in the large consulting firms where dynamically updated EPSSs are integrated within the organizational knowledge repository in order to make the complex task of sharing critical business and personal development information much easier.

Barron (2000) summarizes the current state of the art of EPSS and related approaches in the following manner: “take an e-learning course; chunk it into discrete learning bites; surround it with technology that assesses a learner's needs and delivers the appropriate learning nuggets; add collaborative tools that allow learners to share information. What do you get? Something that looks a whole lot like knowledge management.”

The best approach, then, requires a user model or trace—a record of the interaction between the user and the system. The user model would capture the objects of interest or focus—that is, what content was accessed, when, how often, in which sequence, and so on. A log of user interactions can be abstracted to produce a user and task signature. Together, these will yield a model of the user and the task the user is attempting to perform, and these two sources of information can help in providing the best possible support for knowledge application in that particular case. Figure 6.9 illustrates a sample user and task model.

		Task Characteristics				Features		
Users	Tasks	Frequency	Consequence of errors	Difficulty	Inter-dependencies	Type of support	Complexity	Desirability
U(1) Manager	T(1) T(2) T(3)	Weekly Monthly Quarterly	Low Moderate High	Low Moderate High	T(7), T(4)	Template Example	Low Moderate High	Low Moderate High
U(2) Technical	T(2) T(7) T(8)							
U(3) Sales	T(1) T(2) T(3) T(5)							
Help Desk	Support request	Daily	High	Moderate	N/A	Knowledge repositories	Moderate	High
IT	Problem report	Daily	Moderate	Moderate	N/A	Manuals	Moderate	Moderate
Research	Tech. Watch	Monthly	Low	Low	Strategic objectives	–	Moderate	Moderate
CKO	Strategic priorities	Quarterly	High	Moderate	Business units	–	High	High
U(n)	T(n)							

Figure 6.9 Sample user and task model

Box 6.1

An example: A knowledge service center uses task and user modeling

An R&D organization relies upon a dedicated team of ten information professionals who are continually updating their user and task models in order to optimize knowledge services. For example, each researcher's profile is updated regularly to reflect changing interests, new skills, and/or new projects. In addition, each information request is also analyzed periodically to assess the level of noise versus the level of "hits"—that is, how often was the information judged to be useful? This analysis is used to further refine or fine-tune the profiles so that the next information request will yield increasingly better results.

It is assumed that episodes related to particular tasks usually share some common features or patterns. Once these common features have been identified for a given task, they can be considered a signature of the task, or evidence that the user is performing this task.

Knowledge Application at the Group and Organizational Levels

Knowledge management systems (KMSs) are tools aimed at supporting knowledge management. KMS evolved from information management tools that integrated many aspects of computer-supported collaborative work environments (CSCW) with information and document management systems (Ganesan, Edmonds, & Spector, 2001; Greif, 1988; Kling, 1991). Key characteristics of KMS are support for

- Communication among various users
- Coordination of users' activities
- Collaboration among user groups on the creation, modification, and dissemination of artifacts and products
- Control processes to ensure integrity and to track the progress of projects

Systems that support KM provide specific functions related to communication (email and discussion forums); coordination (shareable calendars and task lists); collaboration (shareable artifacts and workspaces); and control (internal audit trails and automatic version control). User-centered KMSs contribute to an organizational culture of sharing by providing a sense of belonging to a community of users and by supporting reciprocity among users (Marshall & Rossett, 2000). KMSs extend the perspective of employees as knowledge workers by providing them with the means to create knowledge and to actively contribute to a shared and dynamic body of knowledge. KMS provide support for many information functions, including:

- Acquiring and indexing, capturing, and archiving
- Finding and accessing
- Creating and annotating
- Combining, collating, and modifying
- Tracking (Edmonds & Pusch, 2002)

These KMS functions allow multiple individuals to organize meaningful activities around shared and reusable artifacts to achieve specific goals. In short, KMS address the distributed nature of work and expertise (Salomon, 1993).

Within business and industry, KM technology is being used to support organizational learning (Morecroft & Sterman, 1994; Senge, 1990). The dynamics of the global economy place a premium on organizational responsiveness and flexibility. Partly as a response to the demands of a highly competitive global economy, KMS technology has emerged as a new generation of information management systems. In contrast with previous information management systems, KMSs are designed for multiple users with different and changing requirements.

Key enabling technologies include object orientation, broadband communications, and adaptive systems. Object orientation provides for the creation of knowledge objects that can be easily found, modified, and reused. Broadband communication allows users separated in time or space to work on large data objects effectively as a team. Adaptive systems recognize that different users may have different requirements and preferred working styles.

KMSs can be viewed as activity systems that involve people making use of objects (tools and technologies) to create artifacts and products that represent knowledge in order to achieve a shared goal. Previous information management systems focused on a small portion of such a system, such as a narrow set of objects in the form of a collection of records or simple communication among team members. KMSs embrace the entire activity system but maintain a focus on the human-use aspects (people with shared goals) as opposed to the underlying or enabling technology aspects. KMSs have already met with significant success in the business sector and are spreading to other sectors, including education (Marshall & Rossett, 2000) and instructional design (Ganesan et al., 2001). Table 6.5 provides some examples of KM systems.

Table 6.5 Examples of knowledge application support technologies

Name	Description	Website
Mindjet's Mindman	High-level visualization	http://www.mindjet.com

	and mapping tool	
Groove	Collaboration software	http://www.groove.net
Visio	High-end flowcharting tool	http://www.microsoft.com/office/visio/
Themescape	Topographical knowledge maps	http://info.thomsoninnovation.com/en/features/analyze
OpenText's eDocs and Livelink	Automatic taxonomy creation	http://www.opentext.com/what-we-do/products/opentext-product-offerings-catalog/rebranded-products
ClearForest's ClearTags	Automatic taxonomy creation	http://www.clearforest.com
Vignette	Content management software	http://www.ciosummits.com/media/pdf/2010_02/open_text_integra
EPSS Catmedia	Electronic performance support systems	http://catmedia.com/from-training-to-performance-support/

The organizational knowledge management architecture will be comprised of at least three levels: the data layer, which is the unifying abstraction across different types of data with potentially different storage mechanisms (e.g., database, text documents, video, audio); the process layer, which describes the logic that links the data with its use and its users (other people or other systems who use that data); and the user interface, which provides access to the information assets of the company via the logic incorporated in the process layer. The KM organizational architecture is shown in figure 6.10.

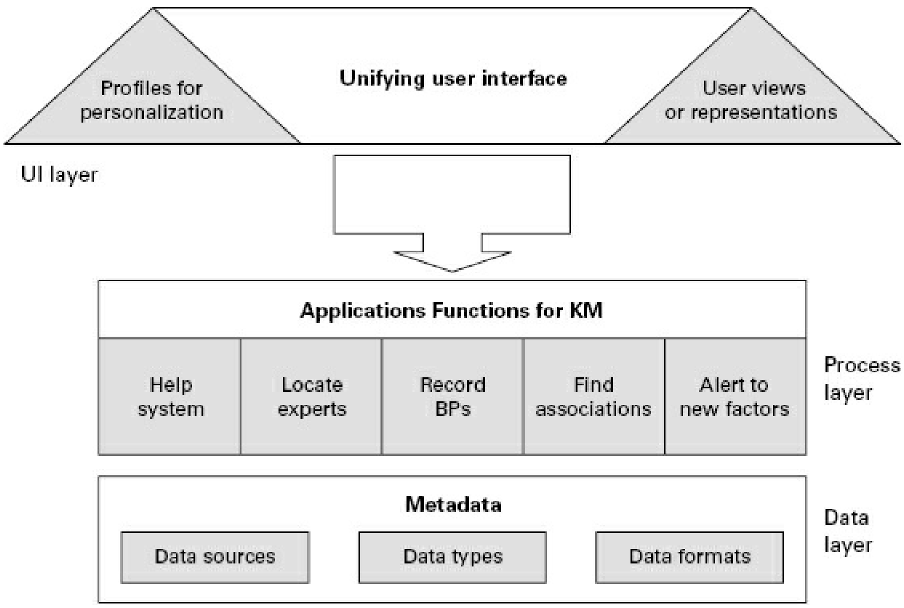


Figure 6.10 KM organizational architecture

However, KM cannot be supported by the simple amalgamation of masses of data. KM requires the structuring and navigation of this content supported by metadata, the formal description of the content, and its interrelationships with other content or other knowledge objects. Metadata encompasses information about physical structures, data types, access methods, and the actual content. There are a variety of tools and techniques available for knowledge application phase of the

KM cycle. Dissemination and publication tools typically involve some type of knowledge repository design. They will have features such as the routing and delivery of information to those who have a need or who have subscribed (push vs. pull approach). Email and workflow are examples of push technologies that notify users of any changes such as newly posted content or expired content. Pattern matching can be done against user profiles in order to better target where pushed content should go.

Other tools help structure and navigate through the content. They provide a classification scheme for the organization's knowledge assets. We saw examples of these knowledge taxonomies in chapter 5. The user interface layer is where such navigation guides are to be found. Once the content has been properly indexed and organized, multiple views can be made available for the same underlying content in order to accommodate user and task needs. Electronic linkages can be used to cross-reference this content and a thesaurus can encapsulate these cross linkages. Similarly, expertise location systems should be available from the user interface layer of the KM architecture. In this way, links are made from the user interface topics to the relevant KM content, people, and processes.

Knowledge Reuse

Reusing knowledge involves recall and recognition, as well as actually applying the knowledge, if we use Bloom's taxonomy. Reusing knowledge typically begins with the formulation of a search question. It is here that expert–novice differences quickly become apparent, as experts know the right questions to ask. Next, experts are searched for and located using expertise location systems or yellow pages, as we saw in chapter 5. The appropriate expert and/or advice are then chosen and the knowledge nugget is applied. Knowledge application may involve taking a general guide and making it specific to the situation at hand which is sometimes referred to as "recontextualization" of knowledge (where "decontextualization" to some degree occurred during knowledge capture and codification).

There are three major roles required for knowledge reuse: the knowledge producer, the person who produced or documented the knowledge object; the knowledge intermediary, who prepares knowledge for reuse by indexing, sanitizing, packaging, and even marketing the knowledge object; and the knowledge reuser, who retrieves, understands, and applies it. Of course, these roles are neither permanent nor dedicated roles—individuals will perform all three at some time during their knowledge work. Knowledge repackaging is an important value-added step that may involve people, information technology or, as is often the case, a mixture of the two. For example, there are automatic classification systems that can index content but a human is almost always needed in the loop to validate, to add context, caveats, and other useful indicators for the most effective use of that knowledge object.

Markus (2001) suggests there are four distinct types of knowledge reuse situations, according to the individual who is doing the reusing and the purpose of knowledge reuse, which is quite compatible with the user- and task-adapted approach that has been outlined in this chapter. His four situations are:

1. Shared work producers, who produce knowledge they later reuse
2. Shared work practitioners, who reuse each other's' knowledge contributions
3. Expertise-seeking novices
4. Secondary knowledge miners

Shared work producers usually consist of teams or workgroups who have collaborated together. A common example is an MD who consults a patient's chart to see what medications had been prescribed recently by other members of their practice; or special education teachers and therapists who share student files to see what sorts of interventions worked and which ones did not have any effect. This is the easiest form of knowledge reuse as everyone is quite familiar with the knowledge content—they share the same context that makes knowledge application rapid and effective.

Shared work practitioners are members of the same community of practice. They are peers who share a profession. This form of knowledge reuse will require a higher degree of filtering and personalization, typically done by CoP knowledge librarians. Reusers would need more reassurance about the source's credibility—they would need to be able to trust that the content is valid and should be applied. They are less likely to completely overlap in their contexts, so it is likely that knowledge reuse would require contact with others knowledgeable about the knowledge object.

Expertise-seeking novices are often in a learning scenario. Unlike the previous two types of reusers, novices are the most distant or different from the knowledge object authors and those experienced with its use. Knowledge intermediaries have a much greater role to play here, in making sure novices begin by accessing more general information (e.g., FAQs, introductory texts, glossaries) before they attempt to apply the knowledge object or attempt to directly contact those who are more expert in using it. EPSSs and other performance support aids such as e-learning modules would also be of great use to such reusers.

Secondary knowledge miners are analysts who attempt to extract interesting and hopefully meaningful patterns by studying knowledge repository use. They are analogous to the usage analysts who perform similar roles for a CoP library, as discussed in chapter 5. They are also analogous to librarians who periodically assess the collective holdings of a library, whether physical or digital, to see which items are no longer being actively accessed and should perhaps be archived, which have been superseded by newer and better best practices, and so forth.

Different types of reusers will interface differently with knowledge repositories and they will differ in their support needs. Repositories therefore need to be able to personalize—either at the extreme of treating each individual differently or at the very least, personalizing at the level of a community of practice. Since CoPs revolve around organizational and professional themes, it makes sense to partition the global knowledge repository along similar lines. Careful attention must also be paid to the roles of intermediaries needed to develop and maintain the organization's corporate memory. Content authors are as vital to successful knowledge application and reuse, as are container maintainers.

Knowledge Repositories

Knowledge repositories are usually intranets or portals of some kind that serve to preserve, manage, and leverage organizational memory (discussed further in chapters 8 and 11). There are many different types of knowledge repositories in use today and they can be categorized in a number of different ways. In general, a knowledge repository will contain more than documents (document management system), data (database), or records (record management system). A knowledge repository will contain valuable content that is a mix of tacit and explicit knowledge, based on the unique experiences of the individuals who are or were a part of that company, as well as the know-how that has been tried, tested, and found to work in work situations.

Davenport et al. (1998) make a distinction between repositories that store external knowledge such as that gathered from competitive intelligence, demographic or statistical data from data resellers and other public sources, and internal knowledge repositories that store informal information such as transcripts of group discussions, emails, or other forms of internal communications. Internal knowledge repositories will have a less constraining or less formal structure in order to be able to better accommodate its fluid, subjective knowledge content.

Zack (1999) classifies repositories based on the type of content they contain such as general knowledge (e.g., published scientific literature) and specific knowledge (which includes knowledge of the local context of the organization). This distinction is most useful, as knowledge reusers need to know whether the credibility of the knowledge comes from general or common knowledge or whether this is something that was discovered by their colleagues.

E-Learning and Knowledge Management Application

Many organizations have integrated KM applications with e-learning or technology-mediated learning (as opposed to traditional classroom-based teaching.) There are a number of ways in which KM can intersect with e-learning (Khan, 2005): one is as a major part of the KM cycle where knowledge is reused and applied—and, in order to do so, knowledge must be understood, learned, and/or internalized. E-learning can therefore be seen as another type of knowledge-sharing channel, one that makes use of technologies such as computers or the Web and one that also requires a very high degree of social presence and media richness (as discussed in chapter 5.). The major advantage of traditional in-class learning is that the interaction is face-to-face. The corresponding disadvantage is that time and space constraints do not allow for in-depth one-to-one interactions. With online learning, students have the ability to relearn through replaying a video, viewing the lecture slides, and asynchronously interacting with both classmates and instructors. The major advantage of e-learning is the time and travel cost saved by not having people go off-site for a period of time. More students can be registered in the same course. The major drawback is the lack of face-to-face interaction, which is often compensated for through the use of a blended learning model (a combination of some e-learning with some face-to-face instruction, tutoring, or discussion.)

E-learning has developed an innovative approach to learning through the use of technologies such as the computer and the Web: learning objects. A learning object is a standalone unit of learning—a reusable online learning resource (Morales et al., 2005). A set of learning objects make up an e-learning library or repository so that once posted, other users can reuse the same learning object. The learning objects may be used as is or they may be adapted, modified, or otherwise changed to better need their specific needs. Users are able to manage and reuse content according to their needs without interoperability problems. Learning objects are good examples of reusable knowledge—once they have been created, they then continue along the KM cycle as they are shared, disseminated, and applied by other users. Examples of learning objects would include a learning module on a given topic, lecture slides, a test, a demonstration, or combinations of different content formats, including multimedia.

Box 6.2

An example: GetSmart—An e-learning solution for the National Science Digital Library (NSDL) (Marshall, Zhang, Chen, & Lally, 2003)

The NSDL has been providing students and educators science education resources since 2002. Seamans and McMillan (1998) define a digital library as more than the digitization of a collection; it also consists of information management tools and responsibilities to bring together collections, services, and people to create, use, disseminate, use, and preserve content. NSDL collections cover a wide range of topics including astronomy, biology, economics, mathematics, and technology. The NSDL GetSmart system is a good example of how knowledge management and e-learning can be integrated. GetSmart was designed by blending together learning and information-seeking theories, and it has been implemented as an integrated suite of tools for curriculum support for teachers, search support for those seeking information, and for concept mapping support to support student learning.

Curriculum tools are typically Learning Management Systems (LMSs) that provide a standardized environment to support classroom learning (e.g., WebCT and Blackboard, http://www.blackboard.com). Digital library tools provide information seeking and retrieval to help users navigating through the digital collection to locate the resources they are looking for. Knowledge representation tools provide a visualization of the content (e.g., concept maps) to allow users to visually review, capture, or develop knowledge. Concept maps represent concepts and relationships as node–link diagrams or semantic maps. Such maps and the very act of mapping have proven to be very effective ways of presenting information and also serve to promote effective learning (Chmielewski & Dansereau, 1998.) For example, a text syllabus may be found in the curriculum e-learning tool, a search aid to find all relevant resources in the digital collection related to that course may be found in the digital library tool, and a course map of learning objectives and prerequisite knowledge may be found in the knowledge representation tool.

From a KM perspective, GetSmart is a system for the generation, codification, and representation of knowledge. GetSmart is organized to help individuals, groups, and communities develop knowledge. Curriculum tools provide a context for individual and group learning. As users construct concept maps, they explore available information and then synthesize selected ideas into personal knowledge representations, which allows them to learn by exploration ("discovery learning.") When group maps are created, several users collaborate, clarifying concepts and relationships and fitting them together. The search and curriculum functions access repositories of community knowledge that tend to be more formal and to use established vocabulary. The search tools help knowledge travel as information to the user/learners. As information is transferred to the individual it becomes enriched, expanded, and synthesized into new or unique contexts. These processes are viewed as information flowing from experts and repositories to individuals and groups. When a body of maps has been created, the information flow can be reversed.

Real World Applications of KM

There is a wide range of KM applications in the real world. They can be found in every sector, including the for-profit and nonprofit sectors; NGOs and developmental agencies; government at the federal, state/province (states in the United States and provinces in Canada), and municipal levels; and for all the vertical industry sectors, ranging from agriculture to the water industry. Some excellent resources to read about these applications are discussed in this section.

Kasper (2007) summarized some of the major KM applications in the nonprofit sector and noted that there were applications for each of the key KM processes, including knowledge creation and capture, knowledge organization, and knowledge transfer, sharing, and application. For example:

> At the Ford Foundation, the archiving staff interviews program officers before they leave the foundation to capture what formal document might be missing from the written record, what correspondence and tacit knowledge could be transferred, and how language in the issue area may be changing. The interviews were deemed valuable enough that the foundation is now beginning to conduct these types of interviews on an annual basis, even when a staff person is not leaving the organization, to make sure that knowledge is captured on a regular basis. (p. 3)

The After Action Review originated with US Army and continues to capture valuable lessons learned after each project or major activity. Before everyone leaves on new assignments, team members meet to identify what they learned and what they could do better next time, not only to document but also for the team to learn and improve and even bond better.

Kasper (2007) provides the example of George Soros for as a good knowledge codification application:

> In 2005, George Soros began to shift the mission of his collection of foundations. They saw themselves increasingly moving toward policy and advocacy and away from the silos they had created over time. Open Society Institute and the other Soros Foundations operate as a network of 6 or 7 core offices and 32 networked foundations, cutting across a matrix of geographies and program areas. Because of the independent structures, the network could be making grants in certain program areas and from several national foundations without being aware of what the others were doing. The various foundations realized that they would need to do more sharing across programs and organizations, so they created a customized technological tool, based on Plone, and are now piloting its use. The most basic goal of the new system is to provide a single knowledge backbone to the network of foundations. Until now, there was no centralized repository for information for the network, and several of the larger offices had created their own intranets, while other offices had none at all. The new system created a global intranet that all of the Soros offices could share. (p. 5)

The best-known example of knowledge sharing is the World Bank. They developed thematic networks in the 1990s to cut across regional silos and instead encourage more informal communities of practice. These thematic groups were responsible for the development of "knowledge collections about good practices and sector statistics … dissemination and outreach through brown bag lunches, workshops, websites, and newsletters" (Kasper, 2007, p. 8).

Some examples of governmental KM applications include the National Firefighters Near Miss Reporting system which was set up to collect and share firefighter lessons learned. Their mission is to "reduce firefighter and EMS provider injury and death by helping the fire service apply local lessons globally (http://www.firefighternearmiss.com.)." The system provide firefighters with the means to anonymously share their near-miss stories via an intuitive online reporting tool and share them out with the entire fire service. The data are aggregated and analyzed to see if there are any patterns or trends that can be identified. Training materials are then developed based on the reports collected to ensure that changes and improvements are made to avoid repeating the near misses. Other examples include knowledge continuity policies and guides (knowledge transfer for succession planning when employees retire) such as:

- The U.S. Office of Personnel Management (https://www.opm.gov/about-us/open-government/reference-materials/learning-and-knowledge-sharing-strategy.pdf).
- The Canadian Treasury Board (https://www.tbs-sct.gc.ca/gui/spgr/spg-gpgr-eng.asp?for=execs).
- The Government of Province of New Brunswick, Canada (http://www2.gnb.ca/content/dam/gnb/Departments/ohr-

brh/pdf/cdt/succession_planning_knowledge_transfer_guide.pdf).

- The Government of the Province of Alberta, Canada (https://www.albertacanada.com/files/albertacanada/successionplanning.pdf).
- The State of California, U.S.A. (http://www.calhr.ca.gov/state-hr-professionals/Pages/State-of-California-Succession-Planning-Model.aspx).

In the private or for-profit sector, *KM World* publishes its annual list of "100 Companies That Matter in KM." The 2016 list is available at http://www.kmworld.com/Articles/Editorial/Features/KMWorld-100-COMPANIES-That-Matter-in-Knowledge-Management-109344.aspx. The list includes some well-known companies such as HP, IBM, and Microsoft, as well as others such as:

- **Enterprise Knowledge (**http://www.enterprise-knowledge.com/**),** which offers consulting services in the areas of knowledge and information management, application development, and project management
- **Igloo** (https://www.igloosoftware.com/), which offers Enterprise social software to connect people in businesses, share information, and work together more efficiently
- **TallyFox (**https://www.tallyfox.com/), which offers a business ecosystem platform created to facilitate knowledge sharing, content management, and communication

Another way of looking at these applications is by vertical industrial sector. Table 6.6 provides examples for each of the major sectors.

Table 6.6 Examples of KM applications for major industrial sectors

Industry sector	Description of KM application	Reference
Aerospace	NASA: KM is used to ensure that NASA is a learning organization. Applications include a comprehensive lessons learned database, case studies, and stories.	http://km.nasa.gov
Agriculture	Embrapa, the Brazilian Agricultural Research Corporation's KM system manages both the knowledge produced and knowledge development process and incorporates learning that takes place during the research process.	https://www.embrapa.br/en/international
Chemical	Buckman Laboratories, a KM leader, sells chemical products, services,	http://www.kmbestpractices.com/buckman-laboratories.h

	and solutions and emphasizes knowledge sharing: "... so that no individual will stand alone in the face of competition, but will always have the full global force of the company behind them." —Bob Buckman. The K'Netix knowledge portal allows employees to share knowledge and also stores and preserves all organizational knowledge and experience.	
Computer	IBM was one of the early adopters of KM and continues to focus on collaboration applications such as a searchable resource to look for experts company-wide.	
Construction	Fluor Corporation is an engineering, procurement, construction, and maintenance firm that has institutionalized KM by developing KnowledgeOnline, which connects people to people and people to content to create global knowledge communities.	http://www.fluor.com/about_fluor/corporate_informatio knowledge-online?segment=2&bsl=Engineering
Defence	The Army Lesson Learned Centre strives to collect, analyze, and communicate key and based observations and lessons to transform the Canadian army into a learning	http://www.army-armee.forces.gc.ca/en/lessons-learned- learned-index.page

	organization. The lessons are preserved in a warehouse and a database is maintained of all observations and documents taken from national and international areas of operations and collective training events.	
Education	Triune developed Air Force Knowledge Now, a mechanism for finding and accessing time-critical knowledge, training, and performance support resources to provide online performance support to the workforce. It encompasses support for communities of practice, e-learning, learning management systems, and comprehensive metrics.	http://www.triunegroup.com/exp_afkn.html
Energy	BP (formerly British Petroleum) was one of the early adopters of KM to leverage the experience and expertise of its employees worldwide and to make them available through a best practices database. This includes both technical and engineering as well as project management best practices. CoPs then serve to ensure that	Valot (2010)

	employees across disciplines can connect with one another to collaborate and connect with this database in order to be consistent in applying procedures, guidelines, and the best way of doing things, which in turn ensures KM effectiveness and sustainability.	
Entertainment	Walt Disney World really emphasizes the value of human capital and takes steps to ensure that employees are rewarded when they create not only customer satisfaction but "customer delight." They enlisted employees' help in addressing the problem of wait times: the longer customers have to wait, the less they are satisfied and the less they spend. They applied the mathematical analyses involved in queueing theory and developed a virtual queue in the form of a reservation system. This decreased both the perception of wait time and actual wait times. This climate of knowledge sharing is further supported by collaboration through CoPs.	Cope et al. (2011)

Financial	At Chase Manhattan Bank, KM is considered to be part of the employees' benefits package. Each employee can access the knowledge base in order to find the answer to a professional, personal, or work/life problem.	Ribiere and Chou (2001)
Food	Kraft Foods (now KraftHeinz) speeds innovation by enabling quick access to new ideas, prior art, and company-wide participation through IdeaJams where everyone can participate using their preferred communication channel to help solve a specific challenge within the 72-hour time frame. Employees are encouraged to consult the knowledge base of pre-existing solutions (from internal and external sources) to avoid reinventing the wheel.	King and Lakhani (2013)
Health care	NurseONE is a national, bilingual, web-based health information service designed for the Canadian nursing community to share knowledge and expertise, thereby promoting best practices and enhancing client outcomes.	CNA (2009)

	NurseConnect is the NurseONE portal's interactive service that brings together electronically groups of individual subscribers in order to network and seek peer and expert advice and opinions.	
Hospitality and Tourism	Starwood Hotels implemented six-sigma and KM to manage all assets including databases, documents, expertise, and experience. Best practices that can be of use to other areas are identified and transferred to all their hotels around the world via their e-tool.	Delener (2012)
Information	The New York Times implemented Beehive software that enables organizations to collect and distribute knowledge captured in email to build expertise profiles of employees. It then automatically sends email to the appropriate expert and archives the emails for future reuse. Employees can share their knowledge and expertise with one another and with their clients and partners outside the organization.	Shand (2000)
Manufacturing	Caterpillar has more than 600	Ardichvili et al. (2002)

	online communities, with more than 16,000 members worldwide that use Knowledge Network, supported by a group of KM technology experts and experts from the Caterpillar corporate university. The system allows users to find subject area experts, post questions to specific experts or to the community at large, post and find knowledge entries, conduct online chats and asynchronous threaded discussions of questions and problems, and connect to numerous other online communities.	
Telecommunications	AT&T used knowledge management tools to integrate a global sales team's efforts. The company set up an interactive website offering competitive research fed by timely information from the field, which was accessed by the sales force. IT gave the team the agility to win the deal during an arduous sales cycle. Based on its success, AT&T began using KM techniques to support its entire	Rosenberg (2000)

	global sales force.	
Transport	The Washington State Department of Transport has implemented KM to improve the way in which they organize resources for easy retrieval by employees and by the public. They have improved access to information and knowledge resources through their portal which provides value-added search tools to make sure content can be found in a timely manner. They have also integrated wikis, blogs, and listservs to facilitate interactive discussions.	http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_8
Water	Detroit Water and Sewerage Department (DWSD) in Michigan implemented KM throughout their organization "from management and first-line supervisors to field operations and maintenance staff." (p. 2423). Their KM initiatives include portals, dashboards, document inventory, process improvements, and key performance indicators and metrics.	Lieberman et al. (2006)

Strategic Implications of Knowledge Application

Knowledge application implies that employees in an organization can quickly find answers to the following types of questions:

- What have we already written or published on this topic?
- Who are the experts in this area and how can I contact them?
- Have any of our partners, contacts, and clients addressed these issues?
- What sources did we use to prepare the publications on this topic?
- What are the best websites or internal databases to go to find more information?
- How can I add my own experience applying this particular piece of knowledge?

A knowledge repository should be a one-stop shop for knowledge application. Employees should be able to find out what they need in order to access, understand, and apply the cumulative experience and expertise of the organization. In this way, knowledge workers can concentrate on doing their actual work and not lose precious time trying to find all the bits and pieces of knowledge and know-how that have already been captured, coded, vetted, and made available to them. Reuse of proven knowledge can serve to not only increase efficiency and effectiveness but can also free up knowledge workers to devote their efforts to innovative and creative knowledge to be added to corporate memory, as opposed to reinventing what has already been developed or solved.

In many cases, reusing knowledge is nontrivial. This counterintuitive result is generally due to two particular problems. In an organization of more than moderate complexity, locating the knowledge to be reused is difficult. Workers may be unaware that the knowledge they need is available. The knowledge may be held in the organization and correctly identified, but may also be in the wrong form for the task—the essential information may be only implicit in the repository. The knowledge may have to be reconfigured in some way to meet the requirements of the task in hand. It may be that the knowledge requires some partial modification (e.g., updating). Here, understanding the knowledge requirements of both the users and their tasks is the key to understanding, identifying, and using the correct knowledge from the various sources. This in turn would enable more leverage to be gained from the knowledge already at hand, thereby increasing the returns on the investment in those knowledge assets.

Practical Implications of Knowledge Application

At a minimum, do these things:

- Create an organizational knowledge base to house the intellectual assets
- Create a corporate yellow pages so that knowledge workers can find out who is knowledgeable in which areas of expertise
- Capture best practices and lessons learned and make them available to everyone in the organization via the knowledge base
- Empower a chief knowledge officer to develop and implement a KM strategy for the organization
- Ensure that the organizational culture will help facilitate the key phases required for the KM cycle (to capture, create, share, disseminate, acquire, and apply valuable knowledge)

Make sure that it is fairly easy to continually update and feed the corporate memory. Users should be able to contribute best practices, lessons learned, comments and questions about content, tips and tools they would recommend, working examples, and case studies. Openly encouraging and applying new ideas fosters the cooperation and innovation that is critical to a learning organization.

Knowledge application is far more likely to succeed if the type of content that is being made available can "hit the ground running"—in other words, it is not just a repository of "stuff" but also chunks of executable knowledge. The knowledge nuggets should always include that tacit and contextual knowledge of when this should be used, where it can and cannot be applied, why and why not, and the ground truth or knowledge of how things really work and what is required for successful performance.

Key Points

- There are a number of ways of ensuring that individuals apply knowledge, such as deriving user and task models in order to better match knowledge content to individual knowledge workers' preferences and requirements.
- EPSSs, the Bloom taxonomies of cognitive, affective, and psychomotor skills, and content chunking are all good means of providing learning and task support to knowledge workers who apply knowledge and of optimizing the match between user needs and the content that is to be applied.
- A KM organizational architecture needs to be designed, developed, and implemented in order to facilitate knowledge application at the organizational level.
- Knowledge reuse is a good measure of how well valuable content has been preserved and managed in organizational memory management systems.
- KSS are tools that can assist in organizational knowledge use and reuse, typically through some form of knowledge repository or intranet application.
- KM and e-learning share many of the same goals and processes and their integration can help solidify the application of knowledge—the use, reuse, and continuous improvement of both knowledge resources and learning objects in an organizational repository.

Discussion Points

1. Discuss personalization and profiling approaches to model knowledge workers. How would you make use of more information about users in order to better target valuable knowledge content to them? How would you increase the likelihood of their applying the content?
2. When would you make use of which Bloom taxonomy? Provide examples of some knowledge applications where each of the three taxonomies could provide useful information.
3. What are some of the tools used in organizational memory management?
4. What are the key components that should be addressed by an organizational KM architecture? Why are these critical for organizational knowledge application?
5. What is reuse and why is it an important measure of the success of KM within an organization?
6. Why is knowledge application the most important step in the KM cycle?
7. How does knowledge application relate to the internalization phase of the Nonaka and Takeuchi knowledge spiral model that was presented in chapter 3?
8. Discuss why counting the number of "hits" to a knowledge repository (much like website statistics) would not be the best measure of knowledge application within an organization.
9. What is chunking? Why is this a good content management strategy? How would you take advantage of chunking for individual and organizational knowledge application situations? How could an e-learning system make good use of chunking?
10. Provide an example of a task analysis for a task you are familiar with. What are the major challenges in designing an EPSS based on such a task analysis? How would you address these challenges?

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7 Organizational Culture

> As the soil, however rich it may be, cannot be productive without cultivation, so the mind without culture can never produce good fruit.
>
> —Seneca (Roman senator, ca. 60 B.C.–37 A.D.)

This chapter examines the role played by organizational culture in more detail. Different types of organizational cultures are described with a view to better understanding the key dimensions of the different microcultures that thrive in organizations. Cultural enablers and obstacles to knowledge sharing are presented together with a discussion on how to institute desired organizational changes to better accommodate knowledge management.

Learning Objectives

1. Define what organizational culture is.
2. Understand the relation between organizational culture and the business context. How does culture contribute to organizational innovation and success?
3. Appreciate the contribution of organizational culture to the management of change.
4. Understand the analytic elements of organization culture, such as different types of cultures and organizational maturity models.
5. Describe how organizational culture intersects with knowledge management.
6. Discuss the key organizational culture enablers and the key obstacles to effective knowledge sharing and KM.
7. Discuss to what extent organizational culture can be managed.

Introduction

There are a number of common myths that still persist in the field of KM. Among these are the "build it and they will come" myth. Unfortunately, people rarely take the time to learn new tools, technology does not always give them what they want/need, and they often are not in a position to even know what they need. A second myth is that "technology will replace face-to-face." However, valuable tacit knowledge sharing and the important role of informal networks and peer-to-peer learning cannot and should not be ignored. The third common KM myth is that "the first thing to do is change the organizational culture to one of learning." While a number of successful KM initiatives grew in organizations that already had a solid learning culture, in others it is very hard and it takes a very long time to change (and subsequently maintain) cultural change. If you begin with this challenge, you will end up waiting a long time for KM to succeed. Most organizations can be envisaged to sit on a KM readiness gradient: some are already there while others have to move up to a cultural state that will more readily accommodate or enable KM to succeed. Regardless of position, one thing is certain: the cultural environment in which the organization finds itself will play a crucial role in what happens to knowledge management within that organization (see figure 7.1).

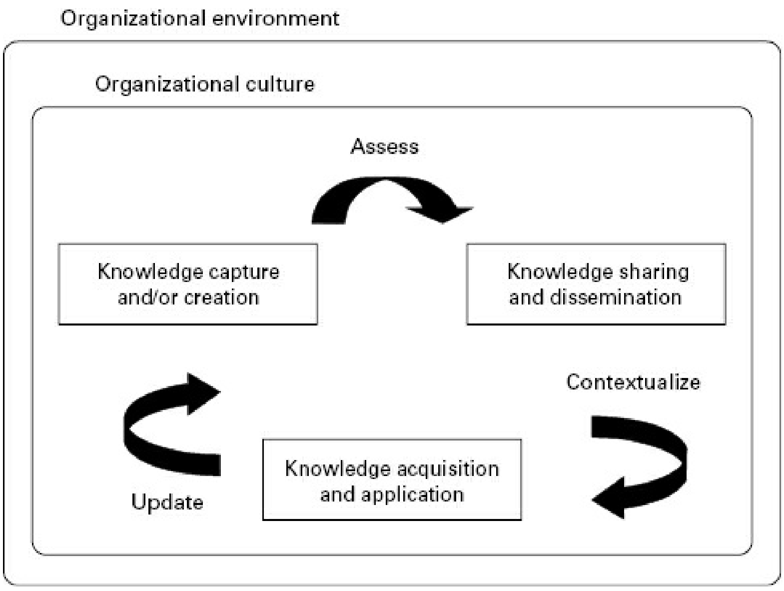

Figure 7.1 The cultural component in an integrated KM Cycle

What is organizational culture? The literature on organizational culture borrows heavily from anthropology and sociology. Originally an anthropological term, culture refers to the underlying values, beliefs, and codes of practice that makes a community what it is. The customs of society, the self-image of its members, and the things that make it different from other societies are its culture. Culture is powerfully subjective and reflects the meanings and understandings that we typically attribute to situations, the solutions that we apply to common problems. The idea of a common culture suggests possible problems about whether organizations have cultures. Organizations are only one constituent element of society. People enter them from the surrounding community and bring their cultures with them. It is still possible for organizations to have cultures of their own as they possess the paradoxical quality of being both *part of* and *apart from* society. They are embedded in the wider societal context but they are also communities of their own with distinct rules and values.

Culture has long been on the agenda of management theorists. Culture change must mean changing the corporate ethos, the images and values that inform action, and this new way of understanding organizational life must be brought into the management process. There are a number of central aspects of culture. There is an evaluative element involving social expectations and standards, the values and beliefs that people hold central and that bind organizational groups. Culture is also a set of more material elements or artifacts. These are the signs and symbols that the organization is recognized by but they are also the events, behaviors, and people that embody culture. The medium of culture is social interaction, the web of communications that constitute a community. Here a shared language is particularly important in expressing and signifying a distinctive organizational culture. This is particularly apparent in communities of practice where members tend to have their own jargon or brand.

There are, not surprisingly, many definitions of culture. One of the earliest definitions was provided by Morgan (1977) who more recently (1997) describes culture as "an active living phenomenon through which people jointly create and recreate the worlds in which they live" (1997, p. 141). For Morgan, the three basic questions for cultural analysts are:

- What are the shared frames of reference that make organization possible?
- Where do they come from?
- How are they created, communicated, and sustained?

Shein (1999), who is generally considered the father of organizational culture, provides the following definition: "organizational culture is a pattern of basic assumptions—invented, discovered, or developed by a given group as it learns to cope with its problems of external adaptation and internal integration—that has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems" (p. 385). Organizational culture can also be defined both in terms of its causes and effects. Using an outcomes perspective, culture can be defined as a manifest pattern of behavior, cross-individuals behavioral consistencies, or "the way we do things around here." Culture thus defines consistent ways in which people perform tasks, solve problems, resolve conflicts, treat customers, treat employees, and so on. Using a process perspective, culture can also be defined as a set of mechanisms such as informal values, norms, and beliefs that control how individuals and groups in an organization interact with each other and with people outside the organization.

Morgan (1977) found that some key elements of organizational culture include:

- Stated and unstated values
- Overt and implicit expectations for member behavior
- Customs and rituals
- Stories and myths about the history of the group
- Shop talk—typical language used in and about the group
- Climate—the feelings evoked by the way members interact with one another, with outsiders, and with their environment, including the physical space they occupy
- Metaphors and symbols—which may be unconscious or embodied in other cultural elements

Other authors define corporate culture as the set of understandings (often unstated) that members of a community share in common. Shared understandings consist of norms, values, attitudes, beliefs, and paradigms (Sathe, 1985). *Webster's New Collegiate Dictionary* defines culture as the "integrated pattern of human behavior that includes thought, speech, action, and artifacts and depends on man's capacity for learning and transmitting knowledge to succeeding generations." Organizational culture can be taught to new members of the organization as the "correct" or accepted way to think, perceive, and feel with respect to organizational work, problems, and so forth.

Although every organization has its own culture, strong or weak, most organizations do not create their culture consciously. Culture is created and ingrained into people's life unconsciously. Unless special effort is taken, people will not recognize that the attitudes, beliefs, and visions they have always taken for granted are actually standardized assumptions that they may pass to future generations. The difficulty of making sense of culture lies in the fact that even though the artifacts of culture can be easily sensed, the core of the culture, values, which are defined as "broad, nonspecific feelings of good and evil, beautiful and ugly, normal and abnormal, rational and irrational are often unconscious and rarely discussable" (Hofstede et al., 1990, p. 291). Cultural artifacts are both conceptual (such as language) and material. They mediate interaction with the world, coordinating people's activity with the physical world and with each other.

There is a reciprocal relationship between organizational culture and communication (Pepper, 1995). On the one hand, communication is the tool that helps employees to transmit organizational culture to each other and to the newcomers of the organization, and it also enables the culture to be maintained and developed in its certain way. In a sense, culture comes into being through constant communication among the members of the organization, and communication changes the cultural assumptions over time. On the other hand, culture deeply shapes and alters the communication within this specific culture. “The culture encourages certain topics for communication and discounts others. The culture often determines who talks with whom, on what occasions, and covering what matters” (Neher, 1997). Organizational culture, therefore, may be thought of as the manner in which an organization solves problems to achieve its specific goals and to maintain itself over time. Moreover, it is holistic, historically determined, socially constructed, and difficult to change (Hofstede et al., 1990).

Different Types of Cultures

Of course, people don't always behave as expected and the above cultural profiles are very generic. There is a good analogy between organizational culture and the climate control of a large building: although the temperature may be set at room temperature throughout the building, there are in fact a series of different microclimates depending on which part of the building you are in, how the office furniture is arranged, the number of people, the number of plants, and so forth. A similar situation exists with organizational culture: although an organization as a whole may be characterized as having a particular type of culture, there will be in fact many different types of microcultures in evidence throughout the company. Some of these may be picked up in examining the communities of practice that exist, the different types of professionals or skill sets that make up the company's human capital, and so forth.

One way of exploring cultures is to classify them into types. There are many ways to differentiate organizational culture. Goffee and Jones (2000) identified four types of organizational culture. In their research, they used two dimensions to create the four distinct types. The first dimension, sociability, is a measure for friendliness. A highly sociable culture indicates that people within the culture tend to be friendly to each other without expecting something in return. Solidarity, the second dimension, measures the task orientation. High solidarity means that people can work together toward common goals very well, even they if may have personal disputes or conflicts.

Table 7.1 Four types of organizational culture

	High solidarity	Low solidarity
High sociability	1. Communal culture	2. Networked culture
Low sociability	3. Mercenary culture	4. Fragmented culture

This classification scheme produces four types of organizational cultures as shown in table 7.1. These are described in greater detail below:

1. A communal culture can give its members a sense of belonging, though it also is task-driven. Leaders of this culture are usually very inspirational and charismatic. The major negative is that leaders often exert too much influence and other members are rarely heard from.
2. In a networked culture, members are treated as friends and family. People have close contact with each other and care for each other. People are willing to help each other and share information. The disadvantage of this culture is that people are so kind to each other that they are reluctant to point out and criticize poor performance.
3. A mercenary culture focuses on strict goals. Members are expected to meet the goals and get the job done quickly. Since everyone focuses on goals and objectivity, there is little room for political cliques. The negative is that those with poor performance may be treated inhumanely.
4. In an organization with fragmented culture, the sense of belonging to and identifying with the organization is usually very weak. The individualists constitute the organizations, and their commitment is given first to individual members and task work. The downside is that there is a lack of cooperation.

There are a number of other ways of characterizing culture, and organizational cultural analysis must be one of the first steps to be taken in any KM initiative. One of the fundamental prerequisites to a culture that fosters rather than hinders knowledge management is the notion of trust. When organizational members feel that they are respected, that they can expect to be treated in a professional manner, and that they can trust the other members of their group, then knowledge sharing is greatly enhanced. Trust removes any potential barriers due to lack of confidence that the person on the receiving end will not attribute authors of knowledge or that they will make inappropriate use of the knowledge shared. A number of studies have confirmed that mutual trust is an important facilitator of knowledge sharing and therefore of an organizational culture that is "KM-friendly." (Evans et al., 2015; Serenko & Bontis, 2016). An interesting finding is that people do not necessarily expect reciprocity, in other words, they are motivated to trust and share their knowledge with others without expecting anything in return. This form of trust is referred to as altruistic trust or benevolent trust.

Organizational Culture Analysis

Culture surrounds us all, and we need to understand how it is created, embedded, developed, manipulated, managed, and changed. To understand the culture is to understand your organization. Schein (1992) approaches this issue through his three levels, as shown in table 7.2. The third level is ultimately the basis for all values and actions.

Table 7.2 Levels of culture

Cultural level	Description
1. Artifacts	The visible organizational structures and processes
2. Values	The stated strategies, goals, philosophies, and justifications
3. Assumptions	The basic underlying assumptions, and unconscious, taken-for-granted beliefs, perceptions, thoughts, and feelings

Source: Adapted from Schein 1992.

Artifacts are easy to detect (e.g., a dress code) but they may be difficult to understand. They represent the tip of the iceberg, and it remains a challenge to discern or decipher what lies beneath them (i.e., what is reason for this type of dress code or other visible structures and processes?). General and abstract statements that express certain ideas and truths about human beings usually represent basic assumptions in organizational culture. They are the expression of a philosophy, of a general concept of individuals and society. Given the diversity of such concepts and the contradictory characteristics they have, these assumptions often have an eclectic, heterogeneous, fragmentary, and unilateral aspect.

The values shared by the members of an organization represent the second layer in culture analysis. From an organizational perspective, values express essential meanings of basic assumptions. Therefore, values define a set of organizational expectations from its members. Values are expressed and often imposed by the managerial elite and become, in some ways, a reference system for activity assessment. They are included in attitudes and behaviors, in the organizational habitat. The two levels, assumptions and values, represent the content of what we call an organization expressive area or expressive culture. Its origins can be found both in the organization’s history and in the personal histories of its members.

Norms form the instrumental and visible area of organizational culture. They represent the most evident layer for someone who comes in contact with the organization for the first time. They derive from culture values and basic assumptions. Norms are expressed in a set of rules and expectations that orient people’s behavior within the organization. This is why, even for the organization personnel, norms constitute their contact with culture and are the conveyor of values and basic assumptions. There are two basic categories of norms: formal, institutional norms, produced by managers or experts, hired for this purpose alone, and made mandatory; and informal norms, produced by the personnel or by certain groups and disseminated through legends, stories, myths, or reflected in ceremonies or rituals. They are the expression of informal culture, based on certain values spread in an informal space. An expressive culture is one that reflects the emotions, feelings, and aspirations of the organization,s personnel. An illustration is provided in box 7.1.

Box 7.1

A vignette: Imagine the following situation (adapted from Kotter, 1996)

Four groups of about ten individuals are all in the same park at the same lunch hour. Soon, ominous rain clouds loom, threatening a serious downpour. In the first group, one person gets up and says, “It is going to rain, follow me, this is what we will do. …” In a second group, someone says, “I have a plan: each one of us will stand up, we will walk in pairs of two towards the covered tent, we will maintain a distance of two feet from the person in front and the person behind us. …” In a third group, a few people start conversing, each putting out a different idea: “Why don’t we go over to that big tree there? But what if there is lightning, it wouldn’t be safe. How about the tent? That makes more sense plus there are picnic tables where we could continue our picnic lunch.” In the last group, someone stands up and says: “This reminds me of the adventure we had during the last rainstorm. Let me tell you that story. …”

The above illustrates four different types of microculture in evidence:

Group 1: authoritarian doctrine

Group 2: micromanagement

Group 3: grassroots brainstorming, collaborative, consensus-driven

Group 4: storytelling to share knowledge of lessons learned and best practices.

Norms are directly involved in the change process, since they allow for interventions in a field that is very accessible to individuals. Those who want to understand and comprehend organizational culture refer to its philosophical and value layers. Those who want to change culture and use it as maintenance or development tool, refer mainly to its normative layer or as a normative culture. A normative culture is one based on a set of formal rules, norms, prescriptions, positions, and hierarchies and it is a culture that emphasizes compliance with the rules.

On the other hand, norms represent one of the premises for cultural unity, the reference system for managers in personnel assessment. Such assessments sustain norm strengthening and are often accompanied by bonuses. Norms are thus a reference system for personnel as well, whose attitude toward them represents the framework that produces organizational ethos.

Schein (1999) argues that the pattern of basic underlying assumptions can function as a cognitive defense mechanism for individuals and the group; as a result, culture change is difficult, time consuming, and anxiety provoking. Cultures are deep-seated, pervasive, and complex, and it can be extremely difficult to bring assumptions to the surface. Schein uses the classic three-step approach to discuss change—unfreezing, cognitive restructuring, and refreezing. The key issue for leaders is that they must become marginal to a sufficient degree in their own culture to recognize what may be its maladaptive assumptions and to learn some new ways of thinking as a prelude to unfreezing and changing their organization.

A number of instruments exist that can help diagnose organizational culture (e.g., Harrison & Stokes, 1992). These are typically surveys or questionnaires that help to identify the critical aspects of an existing culture and will provide a profile of an organization’s culture, typically in the form of an orientation.

The most important dimensions of an organizational culture are that culture promotes an ideal that mobilizes learning institutions in achieving it and that culture can bring uniformity and unity, as well as diversity. Culture is customs and rights and the organization’s “own way,” its norms, values, behavior patterns, rituals, and traditions. Culture implies structural stability, patterning, and integration. It arises from shared history, and adaptation and change are not possible without making changes that affect the culture. It is not always rational; more often it is not. For large organizations there are issues around the development of subcultures and the integration of newcomers. Organizational learning, development, and planned change cannot be understood without considering culture as the primary source of resistance to change (Schein, 1999). It is at this juncture—the resistance to any change in the organizational culture—that we first encounter the intersection between organizational culture and knowledge management.

Culture at the Foundation of KM

Knowledge management implementations almost always require a cultural change—if not a complete transformation, at least a tweaking of the existing culture(s) in order to promote a culture of knowledge sharing and collaboration. In almost all cases, KM will trigger a change that will in turn trigger a maturing or evolutionary process. However, the instigator of change rarely meets with a receptive audience. People do not necessarily always oppose change for the sake of opposing but they will do so if they perceive the proposed change as an imposition rather than an improvement in their personal work lives. They are also often left out of the loop and feel neither ownership nor vested interest in whether or not the change succeeds. A knowledge-sharing culture is one that is built upon the foundation of trust and as such it is imperative to inform, involve, and inspire organizational participants during the organizational changes that are needed.

Corporate culture is a key component of ensuring that critical knowledge and information flow within an organization. The strength and commitment of a corporate culture will almost always be more important than the communication technologies that are implemented to promote knowledge sharing. Traditionally, knowledge flows were vertical, from supervisor to supervisee, following the lines of the organizational chart. Organizations today need to change their culture to one that rewards the flow of knowledge horizontally as well.

Communication systems can be thought of as the disseminators of culture (Bloom, 2000). In more ancient times, physical transportation routes fulfilled this role. For example, the Egyptians used the Nile to unite towns across 4,000 miles. The Phoenicians sailed to shuttle goods and ideas 2,400 miles away. St. Paul used the Roman highway systems to send his Epistles on 170-mile journeys. The Chinese used land and river routes to pull together a 3-million-square-mile empire. In all of these systems, ideas flowed, were shared, exchanged, or integrated. The Romans did not just build highways—they spread a common language. The Chinese disseminated a common alphabet, the Incas a uniform system of accounting based on knots. Knowledge dissemination therefore needs some type of *lingua franca*, something in common like a language, standards, norms, protocols, and so on.

The types of ideas that need to be disseminated for KM to be successfully implemented include a change from perceiving knowledge and knowledge creation as being a proprietary and solo undertaking to a perception of participation and collaboration. This idea can be linked back to earlier discussions on the social construction of knowledge, an understanding of the individual differences and organizational contexts that can influence such perceptions.

A knowledge-sharing culture is one where knowledge sharing is the norm, not the exception, where people are encouraged to work together, to collaborate and share, and where they are rewarded for doing so. A paradigm shift has to occur from “knowledge is power” to “sharing knowledge is more powerful,” and culture will determine what you can and will do with the knowledge assets of the organization.

Sveiby and Simons (2002) suggest that a collaborative climate is one of the major factors influencing effectiveness of knowledge work. They surveyed 8,277 respondents from a diverse group of public and private organizations. The degree to which an organizational culture is collaborative can be assessed and this in turn will provide a good indicator of how successful KM will be. It is not a surprise that the study found that distance was bad for collaboration, that is, the more dispersed a company, the less the climate is collaborative.

Gruber and Duxbury (2000) conducted an in-depth study of the research and development department of a high technology company. They looked at the linkages between organizational culture and knowledge sharing and used the variables of trust, openness, top management support, and the reward structure of the organization to try to explain any correlations. They interviewed thirty employees, and their initial questions addressed the sharing of explicit knowledge. It was found that this sharing was mostly through databases, intranets, and shared drives, but 28 percent was still through face-to-face contact (see table 7.3). The face-to-face sharing typically involved questions such as “Where is it? How do I get it? Who should I go see?”

Table 7.3 Explicit knowledge sharing

Knowledge sharing medium	Percentage of respondents who selected this
Database	55
Intranet	40

Face to face	28
Shared drive	25

Source: From Gruber & Duxbury 2000.

The study also elicited some information on what made it hard to share explicit knowledge and suggestions as to how it could be made easier. The major difficulties mentioned were that it was hard to find, there were different systems and no standards, the information was not where it should be, the tools were difficult to use, and the database was difficult to access. Some suggestions that were made were to conduct training on knowledge retrieval, to define a knowledge strategy that would categorize in a standard way, to standardize the information technologies, and to create project websites.

Next, the authors looked at how tacit knowledge was shared. The most popular means used was face-to-face (90 percent) followed by informal networks (25 percent). Some of the factors that made it difficult to share tacit knowledge included attitudes that knowledge was power, not knowing who the expert was, not knowing if the knowledge exists, and loss of knowledge when people left the company. Some suggestions that were made to improve tacit knowledge sharing included recognizing the value of tacit knowledge, improving relationships within the organization, and increasing opportunities for people within different parts of the organization to interact.

The ideal knowledge-sharing culture would thus emphasize communication and coordination between groups, experts would not jealously guard their knowledge, knowledge sharing would be actively and visibly encouraged at all levels of the hierarchy through the recognition and rewarding of knowledge sharing and through embedding such statements in corporate and individual performance objectives. A culture that promotes knowledge sharing would be one where tools and taxonomies are standardized to make access and exchange easy, where there are a significant number of semisocial events such as workshops for sharing with experts and other groups, where organizational goals explicitly include knowledge sharing, where trust is prevalent in all interactions, and where the communication channels flow across geographical, temporal, and thematic boundaries.

Gruber and Duxbury (2000) concluded that an environment that truly supports the sharing of knowledge has the following characteristics:

- Reward structure—recognition for knowledge sharing with peers
- Openness/transparency—no hidden agendas
- Sharing supported—communication and coordination between groups
- Trust—shared objectives
- Top management support—upward and downward communication

The Effects of Culture on Individuals

How does organizational culture influence the behavior of organizational members? If consistent behavioral patterns are the outcomes or products of a culture, what is it that causes many people to act in a similar manner? There are four basic ways in which a culture, or more accurately members of a reference group representing a culture, creates high levels of cross-individual behavioral consistency: social norms, shared values, shared mental models, and social identities.

Social norms are the most basic and most obvious of cultural control mechanisms. In its basic form, a social norm is simply a behavioral expectation that people will act in a certain way in certain situations. Social sanctions enforced by other members of a reference group support norms (as opposed to rules). Kilmann et al. (1986) characterize norms by level:

1. Peripheral norms are general expectations that make interactions easier and more pleasant. Because adherence to these norms is not essential to the functioning of the group, violation of these norms generally results in mild social sanctions.
2. Relevant norms encompass behaviors that are important to group functioning. Violation of these norms often results in noninclusion in important group functions and activities.
3. Pivotal norms represent behaviors that are essential to effective group functioning. Individuals violating these norms are often subject to expulsion from the group.

Why do individuals comply with social norms? What explains the variance among individuals in a group in the degree of compliance with norms? That is, why do some members comply with all norms, while others seem to ignore them? Individuals motivated primarily by means of acceptance, worth, status, and other forms of external validation would be most likely to comply with social norms. Since social sanctions involve the withholding of acceptance, these individual are most likely to comply. Likewise, those characterized by weak self-concepts would be more likely to comply with social norms than with those with strong self-concepts. Those with strong self-concepts are less likely to need the acceptance and other forms of affirmation contingent upon compliance with norms.

Individuals who identify with the group, that is who tend to define their social identity in terms of the group, are more likely to comply with the group's norms. One of the most powerful bases of compliance or conformity is internalization, which is believing that the behavior dictated by the norm is truly the right and proper way to behave. Over time, many group members began to internalize pivotal and relevant norms. High status members of a group are often exempt from peripheral norms, as are those with high amounts of what is called "idiosyncratic credit." Idiosyncratic credit is generally awarded to group members who have contributed a lot to the group and have earned the freedom to violate the norms free from sanctions.

As a cultural control mechanism, the keyword in shared values is "shared." The issue is not whether or not a particular individual's behavior can best be explained and/or predicted by his or her values, but rather how widely is that value shared among organizational members, and more importantly, how responsible was the organization/culture in developing that value within the individual. Value is any phenomenon that is some degree of worth to the members of giving groups: the conception of the desirable that establishes a general direction of action rather than a specific objective. Values are the conscious, affective desires or wants of people that guide their behavior.

Values influence individual behavior in a number of ways. For example, individuals who internalize the value of honesty feel guilty when cheating or stealing. This negative affect state stops them from acting in a way inconsistent with their internalized value. Public values arise when we believe that everyone around us holds a certain value (social value), we often act in ways consistent with that value even though we don't personally hold that value. This is done to gain acceptance and support from the group.

A mental model or theory defines a causal relationship between two variables. The idea that people rely on mental models can be traced back to Kenneth Craik's 1943 suggestion that the mind constructs small-scale models of reality that it uses to anticipate events. Mental models can be constructed from perception, imagination, or the comprehension of discourse. They underlie visual images, but they can also be abstract, representing situations that cannot be visualized. Each mental model represents a possibility. This phenomenon has been studied by a number of cognitive scientists for the past few decades (e.g., Gentner & Stevens, 1983; Johnson-Laird, 1983; Rogers et al., 1992; Oakhill & Garnham, 1996.). The belief structure of managers can be represented as a complex set of mental models, which they use for diagnosing problems and making decisions. In organizations with strong cultures, members of the organization began to share common mental models about employees, competition, customers, unions, and other important aspects of managerial decision making. Mental models are often called basic underlying assumptions. Mental models impact the behavior of individuals to a very large extent. Decisions are often based on one more of our mental models. For example, if a manager believes that increasing satisfaction will increase employee performance, he or she is likely to do things that eliminate dissatisfaction among employees and to work hard to increase employee levels of satisfaction. When all managers of the organization share the same mental models or theories, they are likely to make very similar decisions when solving problems. This leads to a consistent way of doing things and solving problems in an organization.

Cognitive schema are mental representations of knowledge. Cognitive scripts are types of schema involving action or the way to do something. Schema are generally enacted subconsciously, that is, we enact a script without much thought or deliberation. In other words, cognitive scripts are like programs (e.g., macros) we store and call upon when certain stimuli are present. We develop scripts over time by performing a certain task many times (e.g., driving home from work). The first time we perform a task, we tend to think about every step and deliberate about the many alternative ways we can perform each step. Over time, as we learn the best way to perform the task, we "lock in" the script, or program, and do not think about each step again (unless we experience a significant problem). This is called direct schema development. In some cases, we do not go through this deliberate step-by-step learning process; we simply copy (or are told) how to perform a certain task from members of the reference group (culture). This is called indirect schema development. In either case, when schema become widely shared they are called consensual schema, and they account for a large amount of cross-individual behavioral consistency.

In summary, organizational culture:

- Establishes a set of roles (social identities)
- Establishes a set of role expectations (traits, competencies, and values) associated with each identity
- Establishes the status or value/worth to the reference group of each social identity
- Provides values, cognitive schema, and mental models to influence how individuals behave with respect to the various groups or communities they find themselves a member of (microculture) as well as with respect to the organizational culture as a whole

However, organizational culture is not so much a discrete "thing" that can be pointed to—rather, organizational culture should be envisaged more as the medium that the organization resides in. This medium is not only complex but it is also a moving target—organizational culture as a whole is dynamic and always in the process of changing. It is very important to keep in mind that culture is not a static object stored somewhere in the organization—culture is a fluid, dynamic medium that encompasses the organization. In fact, there is usually a series of "microcultures" that are typical of different work groups within a given organization. Culture is a complex entity that represents a moving target of sorts.

Transformation to a Knowledge-Sharing Culture

How is culture developed, reinforced, and changed? It is often said in organizations that, “we need to change the culture around here.” What is usually meant is that someone desires a behavioral change, such as employees paying more attention to customers, or that they want managers to come to meetings on time, or some other set of behaviors. While these patterns of behavior can be changed by changing the organization’s structure (rules, regulations, and reward systems), changing behaviors through culture involves changing the underlying mechanisms that drive behavioral patterns: namely norms, social values, or mental models. Since these underlying culture control mechanisms are often taken for granted and are subconscious in nature, they are difficult to change.

Changing structure by changing a rule and its enforcement mechanism is rather simple when compared to changing a social value. Culture is resistant to change because many of the cultural control mechanisms become internalized in the minds of organizational members. That is what makes culture such a strong control mechanism. Changing culture often means that members have to change their entire social identity. Sometimes changes in the statuses of various roles or identities cause even more resistance on the part of high-status role holders.

While changing behavior by changing structure may have more appeal because it appears easier, in many cases this type of change is not successful because managers have not changed the underlying culture and they find that the culture and structure are in conflict. While organizational change is difficult and often lengthy to undertake, it is a critical requirement for most if not all KM implementations. The key often lies in symbolic action, that is, dealing with important symbols of values, norms, and assumptions. Kilman, Saxton, and Serpa (1986) provide some good general guidelines:

1. Role modeling is crucial. People look to leaders for clues about what is important in an organization. The most important thing a leader can do is act in a manner consistent with the desired social value. When it comes to instilling culture values, “do as a say not as I do” does not work very well. When organizational members observe a leader making a personal sacrifice for a value, it sends a strong message that this value is important. For example, if senior managers are seen to be “practicing what they preach” by actively sharing knowledge and rewarding collaborative efforts, then the organizational members can see that this type of behavior is in fact highly valued and practiced at all levels of the organization.
2. Culture is often transmitted through stories and myths that extol certain virtues held to be important to the organization. These stories are often told in informal settings as well as published in company newsletters. For example, when new employees join an organization, they are not only handed manuals and directed to databases containing forms to be filled out, but they are also regaled with stories of key events in the organization’s history, stories relating spectacular successes and disappointing failures. These stories have a strong message that relays “how things are done around here” to the new employees.
3. In reacting to crises, leaders can send strong messages about values and assumptions. When a leader supports new values in the face of crisis, when emotions often run high, he or she communicates that this value is very important. For example, if the organization has repeatedly supported a strong notion of professional ethics and ends up losing a bid to a competitor who did not bother about such niceties, it is even more powerful if the organization’s leaders reinforce this message in the face of and in spite of the crisis situation they are in. In this way, everyone can see that values are not being treated as “fair-weather friends,” that is, values are not adhered to when it is convenient to do so but that they are always to be adhered to.
4. In addition to motivating behavior directly, a reward system can send powerful messages regarding what is important. For example, if a university declines to promote a professor who has won the university-wide Outstanding Teaching award, this sends out the strong message that teaching is not valued and only research productivity is really valued at this particular institution.
5. Important and public decisions also communicate the importance of certain values. If the first thing to be cut in budget crunches is training, it sends the message the training is not valued. The criteria for allocation of resources often become what are valued in an organization. For example, if budgets are determined by steady past performance it sends a different message than if they are determined by past innovation and risk taking.

6. Leaders communicate the importance of values by what they praise and what they criticize. It is important to pay attention to what is said. Social values are often changed through the selection process. As new members are hired, effort is made to hire new members that hold the new value. Different organizations will elect to implement this reward (praise) and censure (criticize) cycle differently. For example, at Buckman Labs, employees who have been voted the “top 100 knowledge sharers” are invited to take a trip to the head office where the company president himself bestows a gift of a fully loaded laptop to them in recognition of their excellent KM work.

In most cases, individuals making decisions and solving problems do not question their basic assumptions (underlying mental models). They simply use them, without thinking, and arrive at a decision or a solution to their problem. If the solution does not work, they mostly likely question the inputs to their decision and attempt to make a better decision next time. Argyris and Schon (1978) refer to this type of learning as “single-loop” learning. In some cases, the individual or group actually begins to question the basic assumptions and models underlying the decision, which is called “double-loop” learning. It is through double-loop learning that changes in shared mental models take place. When attempting to change the shared mental models of a group, it is important to take time out from the day-to-day problem-solving processes to outline, challenge, and agree on changes to the shared mental model.

Most change programs inside of companies do not work because they address content (the knowledge, structure, and data in a company) or process (the activities and behaviors) but never address the context in which both of those elements reside. The sources of people’s actions are not what they know but how they perceive the world around them. Context can be an individual’s mind-set or the organizational culture. It includes all of the assumptions and norms that are brought to the table. Context is perception, as opposed to facts or data. People don’t go off and design their context—they just inherit it. Culture is also socially constructed and reflects meanings that are constituted in interaction and that form commonly accepted definitions of the situation.

Culture is symbolic, which is why it is best described by telling stories about how we feel about the organization. A symbol stands for something more than itself and can be many things, but the point is that a symbol is invested with meaning by us and expresses forms of understanding derived from our past collective experiences. The sociological view is that organizations exist in the minds of the members. Stories about culture show how it acts as a sense-making device. Also, culture is unifying and refers to the processes that bind the organization together. Culture is thus consensual and not conflicted. The idea of corporate culture reinforces the unifying strengths of central goals and creates a sense of common responsibility. Culture is also holistic and refers to the essence—the reality—of the organization: what it is like to work there, how people deal with each other, and what behaviors are expected.

Culture is rooted deep in unconscious sources but is represented in superficial practices and behavior codes and embodied in cultural artifacts. In order to best accommodate this, some initial steps to creating a knowledge-sharing culture could include:

- Having knowledge journalists begin interviewing key people to document projects, best practices, lessons learned, and good stories
- Instituting KM get-togethers, which could be breakfasts, lunch-and-learn sessions—any type of informal gathering to help people get to know one another, sometimes with thematic talks, and to show managerial support
- Newsletters to publicize KM initiatives and celebrate good role models
- KM pilot projects such as expertise location systems or intranets with space devoted to different communities of practice
- Changing performance evaluation criteria to reflect and assess knowledge-sharing competencies and accomplishments
- Censuring knowledge hoarders and rewarding effective knowledge sharers
- Redesigning workplaces to allow for gathering places (Sullivan & Horwitz-Bennett, 2014; Gladwell, 2000)

The redesign of workplaces extends beyond simple physical office layout designs to a process of facilitating more effective knowledge sharing. Owen (1997) developed the notion of Open Space Technology (OST) as a large-group facilitation process. In practice, OST meetings take on many forms and variations, but they follow the same general guidelines. OST meetings begin with all the participants sitting in a circle, and no items on the agenda. The meeting opens with an agenda setting exercise following which the group self-organizes into smaller discussion groups. Discussion group conveners are responsible for providing a report of the discussions, which is immediately added to a book of proceedings. At the conclusion of the meeting, or very shortly thereafter, participants receive a copy of the proceedings including all of the discussion groups' reports and any action plans that were developed.

OST meetings operate on four principles and one law. The principles are:

- Whoever comes is the right people
- Whatever happens is the only thing that could have happened
- When it starts is the right time
- When it's over it's over

And the law is known as the "Law of Two Feet" (sometimes referred to as the "Law of Mobility"). It states that "If you find yourself in a situation where you are not learning or contributing, go somewhere where you can."

Gladwell (2000) discusses how the set-up and character of offices can influence innovation and knowledge sharing. He notes the importance of frequent interaction among colleagues and how far basic office layout goes in shaping the human relationships of a workplace. Gladwell states that innovation is at the heart of the knowledge economy and it is a fundamentally social phenomenon. Companies will therefore need to design for public and semipublic spaces to promote employee interaction. Many companies provide comfortable seating and access to the knowledge repository via a few workstations to promote both tacit and explicit knowledge sharing.

The cultural approach to open space technology serves to create an environment for innovation, teamwork, and rapid change. Open space offers a chance to gather the members of the organization in an open setting and have the work done efficiently and creatively. Open space involves much brainstorming, but it is not just brainstorming. It is the process in which people have the urge to raise the topic they are passionate about, and they are willing to share their own knowledge, especially tacit knowledge.

Whether the open space can be successful depends on the extent to which the participants are willing to share the knowledge, which is influenced by the organizational culture of those participants. For example, in an organizational culture with high sociability, people know each other and respect their companions. Therefore, they will be more likely to take an active part in the open space, and more likely to offer their knowledge to other members. However, in a low sociability culture, where people focus more on individualism and their own work, it can be expected that members may feel uneasy about talking with people with whom they are not familiar, not to mention sharing something that they are deeply concerned about.

There are other characteristics of an organizational culture that can either encourage or discourage the recognition of belonging to the organization, and consequently, they will influence the members' performance in the open space. Some examples of characteristics that are more connected with open space are individual initiative, integration, a reward system, and ethical climate. The facilitators shouldn't ignore the impact of organizational culture of the group of people who will attend the open space, and they should prepare for the possible outcome that is expected from them. Then the facilitators can work out some methods to encourage the participants to understand and execute the essence of the open space.

Other good practices in encouraging a knowledge-friendly culture include: do not impose top-down, allow cultural change to evolve over a period of time, provide positive role models wherever possible, create opportunities for people to get to know one another, and focus on connecting people rather than capturing content.

Some lessons learned from cultural change initiatives include:

- Provide information about the skills and experience of employees to overcome problems arising from the absence or difficulty of establishing personal relationships (e.g., virtual organizations).
- Provide support mechanisms such as feedback for effective knowledge sharing to take place.
- Active knowledge transfer requires a bidirectional communication channel.
- Develop common goals and mutual trust.
- KM is an evolutionary process that must be embedded into organizational culture.
- The introduction of new communication/information technologies that are capable of enhancing knowledge sharing can be used to catalyze cultural changes by externalizing tacit knowledge, by building up a permanent organizational memory, and by including all members in a participatory development of content, rules, goals, and systems.

As Gruber and Duxbury (2000) discovered: "We have to move to a transparent organization. This means all kinds of information and knowledge is shared across the whole organization. Everyone can find out what everyone else is doing. Any kind of information that influences me and my project have to be made available to everyone else." Tapscott and Ticoll (2003) discuss the notion of organizational transparency and the importance of having good values of honesty and openness and being successful as an organization.

Impact of a Merger on Culture

Culture has been called the DNA of organizations. It is about patterns of human interaction that are often deeply ingrained. While not directly observable, culture is the defining, and in many cases, limiting, factor in creating a new entity that will be healthy, integrated, balanced, coherent, and effective. What is the impact of a merger on the organizational culture of both organizations? One of the hopes of merger is a new organization, with a new culture that is more than the sum of its parts. Given this, the question above can be asked in another way that is really more appropriate for the situation: What is the impact of organizational culture on the merger process and on the newly created entity?

Dayaram (2005) has shown that some of the most critical issues that arise in postmerger integration are in the area of culture. When you have two organizations coming together, the challenge is to create, intentionally, a new culture that reflects the most strategic aspects of the parent organizations. Cultural integration in a merger situation is about understanding and melding what can be two very different "shared lives," and growing a new one in the process.

Those who are tasked with furthering cultural integration have to assess the issues above for the premerger partners, and then address the questions below:

- What are the most compatible elements of our former organizations' cultures?
- What are the elements that suggest the greatest potential conflict?
- What would we like the new organization's culture to look like?
- What do we want to be certain to bring forward into the new culture?
- What will be some indicators of successful cultural integration in our new organization?

Through a deliberate and inclusive process of considering and discussing these issues, the new organization can build trust, camaraderie, and the beginnings a new culture that will develop and evolve over the new organization's future. This can be the most challenging and, in many ways, the most rewarding work of postmerger integration.

Impact of Virtual Work on Culture

The basic challenges that culture faces in a virtual organization are:

- No formalization, each one follows his own norms, styles, and ideas
- No shared values, beliefs, ideas, or norms
- No frameworks or policies that guide individuals working in the organization

The interaction and communication among the members of virtual organizations is so limited and through channels so impersonal (the computer) that the scope for development of a shared sense of belonging or a climate in the organization is almost nonexistent.

Virtual organizations are here to stay and what they need to do today is to build a culture that would give an existence to the organization in the minds of its members and a sense of identification and belonging that will bring them together in spite of limited interactions. And within this culture it is necessary for each individual to take his or her own developmental path, which is actually the core of the functioning of virtual organizations.

Strategic Implications of Organizational Culture

Kanter (1989) refers to the paradox implicit in linking culture with change. On the surface, culture has essentially traditional and stable qualities; so how can you have a “culture of change”? (Fullam, 2001). Yet this is exactly what innovative organizations need. If real change is to occur in organizations rather than cosmetic or short-lived change, it has to happen at the cultural level. Corporate culture has many powerful attractions as a lever for change. The problem is how to get a hand on the lever. Firstly, cultures can be explicitly created; you have to be aware of what it takes to change an existing culture.

The ability of companies to be culturally innovative is related to leadership. Top management must be responsible for building strong cultures. Leaders construct the social reality of the organization, shape values, and help to create and attain the vision of the organization.

The knowledge culture change adoption process will necessarily be a long one. You should not expect results overnight. In fact, the more dispersed the organization, the longer it has been in existence, the less stable its environment and workforce, among other factors, the longer the cultural change period that will be needed. For some organizations, this may be as long as ten years. However, this does not mean that small, meaningful steps cannot be taken to progress toward the overall cultural change goal. The following are some recommendations for bringing about the cultural change needed for KM to succeed:

1. Clearly define desired cultural outcomes.
2. Assess the current cultural state.
3. Diagnose the existing culture with respect to desired knowledge sharing behaviors.
4. Assess tolerance to change.
5. Identify change enablers and barriers.
6. Assess the maturity level of KM within the organization (see chapter 9).
7. Identify KM enablers and barriers.
8. Conduct a gap analysis to yield a map on how to get from where the organization is currently to where they would like to be culturally (discussed in more detail in chapter 9).

Practical Implications of Organizational Culture

At a minimum, the following solutions to potential cultural barriers should be put into place in order to catalyze and successfully implement desired organizational cultural changes (see table 7.4).

Table 7.4 Common barriers to cultural change and possible solutions

Cultural barrier	Possible solutions
Lack of time and meeting places	Seminars, e-meetings, redesign of physical workspaces
Status and rewards to knowledge owners	Establish incentives, include in performance evaluations, develop role models
Lack of absorptive capacity	Hire for openness, educate current workforce
Not-invented-here syndrome	Nonhierarchical approach based on quality of ideas and not status of source
Intolerance of mistakes and need for help, lack of trust	Accept and reward creativity and collaboration, and ensure there is no loss of status for not knowing everything
Lack of common language (not just English vs. Spanish but engineer-speak vs. manager-speak)	Establish a knowledge taxonomy and knowledge dictionary for knowledge content, standard formats, translators, metadata, and knowledge support staff

Cultural change is often thwarted by lack of attention to some of the more basic requirements such as providing employees with a place to meet and legitimate time spent in such meetings. For example, one organization set up a series of expensive employee lounges filled with computers that were linked up to the organizational knowledge base. However, on any given day, these lounges were empty. The reason was that employees who spent time there were subject to comments such as “wow,you must not have much work to do if you have time to spare.” When senior management took visitors around for a site visit of the office, an email memo was sent out ahead of time to warn employees to be hard at work at their workstations and not chatting in the lounges, lest the visitors leave with the wrong perception of the company. The message was very clear—management may have built the physical knowledge-sharing places but they did not provide employees with the clear message that time spent sharing knowledge was time that was productively spent. Similar examples are often found in organizations where employees are told to do KM activities outside of their normal working hours. In other words, KM is done in your spare time, which conveys a view of KM activities as peripheral, secondary, or even hobby-type activities when compared to “real work.” The rewarding of knowledge hoarding is another common barrier to the cultural change needed for effective KM implementations. An example is any science-based organization where recognition, performance appraisals, and promotion criteria are all linked to what has been accomplished by being the first and by being the only one who thought of a great new idea, product, or process. As long as your career prospects are enhanced if you do not share knowledge, cultural change will not occur. It becomes imperative to integrate knowledge-sharing behaviors in performance evaluation criteria. Management can also help by publicly rewarding examples of collaboration, good teamwork, and knowledge reuse wherever possible.

“Absorptive capacity” refers to the individual and/or organizational openness to change and innovation and the capability or preparedness for being able to integrate it. The term originally referred to the prior related knowledge that a firm already possesses (Cohen & Levinthal, 1990). If existing absorptive capacity is low in an organization, it will be very difficult to carry out any significant cultural changes. The organization could augment its existing employee base by recruiting and hiring individuals that have been selected for their openness to new ideas, eagerness to learn, and innovativeness in approach. The existing employees can be provided with awareness seminars, creativity building workshops (e.g., thinking out of the box approaches), and other training opportunities to give them a change to reframe their perception of themselves and of the planned cultural changes.

Change is greatly hindered if mistakes and any requests for help or collaboration are perceived as undesirable behaviors and/manifestations of weakness or incompetence. For example, if in an organization you are expected to have all of the answers and if asking someone for assistance implies that you are not qualified to be in your job, this will greatly diminish the number of requests for help. If, on the other hand, the organization’s role models and reward systems actively promote, support, and value such interactions, then cultural change will be greatly facilitated. Steps must be taken to ensure that employees do not lose face or status if they admit to not knowing everything and if, concurrently, employees who provide knowledge and assistance are rewarded.

Finally, another important cultural barrier lies in the lack of a common language among knowledge workers. Natural language barriers exist, particularly in multinational companies, and translation costs can be prohibitively high. However, there are other types of languages, such as jargon or shared technical or professional languages, that can cause a great deal of confusion. For example, the word “network” may be understood to mean “contacts” by sales and marketing people, whereas the interpretation of the same word by telecommunication engineers would refer to a system of towers. A knowledge dictionary of commonly used terms within the organization, together with a good, up-to-date thesaurus that cross-references all known synonyms, would greatly assist in overcoming this type of cultural change barrier.

Key Points

- Culture penetrates to the essence of an organization—it is almost analogous with the concept of personality in relation to the individual, and this acute sense of what an organization is—its mission and core values—seems to have become a necessary asset of the modern company.
- There is the challenging question of whether or not organizational culture can be changed and/or managed.
- Organizational culture consists of the set of norms, routines, and unspoken rules of how things are done in that organization.
- It is particularly important to address organizational culture issues in the case of a merger and in the case of a virtual or highly distributed organization.

Discussion Points

1. What is the culture of an organization? Why is it important to understand?
2. What is the contribution of organizational culture to the intellectual capital of the organization?
3. What do we mean when we talk about changing the culture of an organization? What would be some examples?
4. What are some of the key enablers and major obstacles to effective knowledge sharing that can be attributed to the overall organizational culture? To the diverse microcultures?
5. Describe how you would initiate an organizational change initiative. Provide an estimate of how long you believe each stage would last.
6. What are some of the ways of assessing whether or not the culture is changing, or maturing, toward an intended end state? Provide examples.
7. What are some of the ways you would go about learning what an organization's values are? How would you collect and analyze stories, myths, and the typical language used by a particular professional group?
8. How would you forge a bridge between the largely tacit cultural knowledge of an organization and the largely explicit organizational memory system that should serve to preserve this knowledge?

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8 Knowledge Management Tools

> Any sufficiently advanced technology is indistinguishable from magic.
>
> —Arthur C. Clarke (1917–2008)

This chapter provides an overview of KM tools, which are all too often treated as black boxes (data goes in and knowledge magically comes out the other end) by the majority of users. The new generation of millennials however appear to have developed different technology skills and have differing expectations of these new tools. New technologies are continually emerging and many will have some intersection with KM. Knowledge-management implementations require a wide range of quite diverse tools that come into play throughout the KM cycle. Technology is used to facilitate primarily communication, collaboration, and content management for better knowledge capture, sharing, dissemination, and application. The major categories of KM tools are presented and described, together with a discussion on how they can be used in KM contexts.

Learning Objectives

1. Describe the key communication and collaboration technologies that can be used to support knowledge sharing within an organization.
2. Illustrate the major advantages and major drawbacks of synchronous versus asynchronous KM technologies.
3. Define data mining and list some cases where it would be used.
4. Compare and contrast the different types of intelligent agents and how they can be used to personalize KM technologies.
5. Define the difference between push and pull KM technologies.
6. Characterize the major groupware tools and explain how they would be implemented within an organization.
7. Sketch out the major components of a knowledge repository and explain how organizations and organizational users would make optimal use of one.
8. Describe how e-learning and knowledge management intersect and in which ways they differ.
9. Identify emerging social media technologies and describe how they may be applied in a KM context.
10. Compare and contrast the skill set and technology expectations of the baby boomer and millennial generations.

Introduction

Technology is a moving target as new tools are being continuously developed and adapted to varying degrees by users. Knowledge management has an added complication in that there is no single tool that will cover all the bases: a suite or toolkit of technologies, applications, and infrastructures are required in order to address all phases involved in capturing, coding, sharing, disseminating, applying and, reusing knowledge. The use of the term "digital workplace" is increasingly being used to describe the full spectrum of KM tools. Yet another variable to further complicate the situation is that the users themselves are continuously changing. While baby boomers have certain preferences, such as preferring the phone to email or meeting face to face as, well as certain expectations of technology (e.g., they are quite tolerant of errors, willing to wait, and quite accepting of asynchronous communications), the same cannot be said of the new millennial generation (Eisner, 2005; Raines, 2003).

The millennial generation is also referred to the Y generation as it comes after Generation X. The baby boomers are generally defined as those born after World War II, in the years between 1945 and 1965. Generation X refers to those born between 1966 and 1980, while the Y generation refers to those born between 1980 and the year 2000. Perhaps the best way to characterize generation Y or the millennials is that they were the first to grow up with television and the Internet. Throughout all three waves, there has been a wide range of innovations and new tools, both for public consumption and for the workplace. The millennials tend to have high expectations of the workplace precisely because they are such avid users of real-time tools in their personal lives. The generational differences thus introduce an added level of complexity to the KM world.

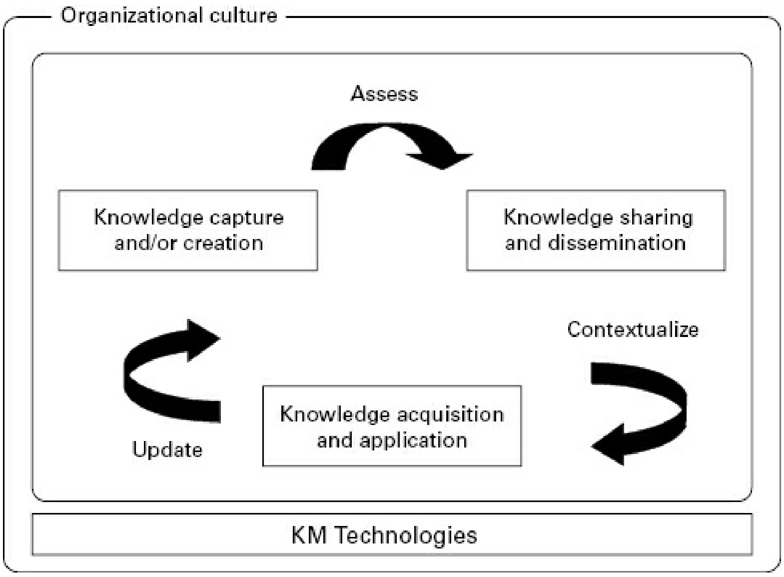
One strategy for navigating through all of this complexity is to categorize the different types of KM tools. Ruggles (1997) provides a good classification of KM technologies as tools that intervene in the knowledge processing phases:

- That enhance and enable knowledge generation, codification, and transfer
- That generate knowledge (e.g., data mining that discover new patterns in data)
- That code knowledge to make knowledge available for others
- That transfers knowledge to decrease problems with time and space when communicating in an organization

Rollet (2003) classifies KM technologies according to the following scheme:

- Communication
- Collaboration
- Content creation
- Content management
- Adaptation
- E-learning
- Personal tools
- Artificial intelligence
- Networking

Rollet's (2003) categories can also be grouped according to which phase of the KM cycle they are used in (refer to figure 8.1). The easiest way to decide which tool to use when is to find the most appropriate tool for the KM process you are tackling.



[Figure 8.1] An integrated KM cycle

The initial knowledge capture and creation phase does not make extensive use of technologies. Methods of converting tacit knowledge into explicit knowledge were discussed in chapter 4. There are very few tools to help in this phase. A wide range of diverse KM technologies may be used to support knowledge sharing and dissemination as well as knowledge acquisition and application. [Young (2010)] reviewed the most commonly used KM tools and technologies. These are included in [table 8.1], which lists the major KM tools, techniques, and technologies currently in use. The underlying theme is that of a toolkit. Many tools and techniques are borrowed from other disciplines and others are specific to KM. All of them need to be mixed and matched in the appropriate manner in order to address all of the needs of the KM discipline, and the choice of tools to include in the KM toolkit must be consistent with the overall business strategy of the organization.

[Table 8.1] Major KM techniques, tools, and technologies

Knowledge creation and codification phase	Knowledge sharing and dissemination phase	Knowledge acquisition and application phase
Content creation • Authoring tools • Templates • Annotations • Data mining • Expertise profiling • Mashups • Visualization • Knowledge maps • Videos (e.g. exit interviews)	Communication and collaboration technologies • Telephone/Internet telephony/Fax • Videoconferencing/web conferencing (e.g. Skype) • Chat rooms/instant messaging/Twitter • Blogs • Email/discussion forums/Wikis • Groupware and collaborative work spaces • Social media • Web 2.0/KM 2.0	Knowledge acquisition • E-learning • Lessons learned databases • Storytelling databases • Best practices databases • Search tools
Content management • Taxonomies • Folksonomies • Metadata • Manual tagging and classification • Automated taxonomy systems • Automated text analysis—summarization • Archiving	Networking technologies • Intranets • Extranets • Web servers, browsers • Knowledge repository • Portal	Knowledge application • Expert systems • Decision support systems • Customization/personalization • Push/pull technologies • Recommender systems • Intelligent agents

• Content management systems • Document management systems		

Knowledge Capture and Creation Tools

Content Creation Tools

Robertson (2003) predicts that content management systems (CMS) will become a commodity in the future. Many CMS projects fail due to lack of good implementation standards and a lack of understanding of usability issues. Technology-only approaches will continue to generate unsuccessful projects. CMS should be handled in a strategic way. Lessons learned from these failures provide a valuable source of learning. The move toward open standards would greatly assist the evolution of CMS. This is likely to proceed with the use of XML-based protocols for communication with and among content management systems. Additional standards are needed for storing, structuring, and managing content. There will eventually be a convergence between content, documents, records, and knowledge management that will be of greatest benefit to organizations. As yet, there is no merged platform to accommodate such a convergence.

Authoring tools are the most commonly used content creation tools. Authoring tools range from the general (e.g., word processing) to the more specialized (e.g., web page design software). Annotation technologies enable short comments to be attached to specific sections of a text document, often by a number of different authors (e.g., the track changes feature in Word). This allows a running commentary to be built up and preserved. Annotations may be public (visible to all who access and read the document) or private (visible to author only).

Data Mining, Knowledge Discovery, and Analytics

Data mining and knowledge discovery are processes that automatically extract predictive information from large databases based on statistical analysis (typically cluster analysis). Using a combination of machine learning, statistical analysis, modeling techniques, and database technology, data mining detects hidden patterns and subtle relationships in data and infers rules that allow the prediction of future results. Raw data is analyzed to put forth a model that attempts to explain the observed patterns. This model can then be used to predict future occurrences and to forecast expected outcomes (see figure 8.2).

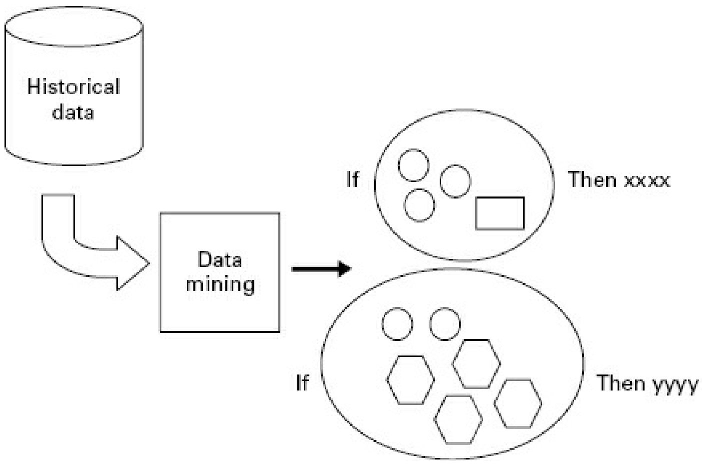


Figure 8.2 Predictive models

A large number of inputs is required, usually over a significant period of time, and the types of models produced range from easy to almost impossible to understand. Easy to understand models are decision trees, for example. Regression analyses are moderately easy to understand, and neural networks remain black boxes. The major drawback of the black box models is that it becomes very difficult to hypothesize about causal relationships (see figure 8.3).

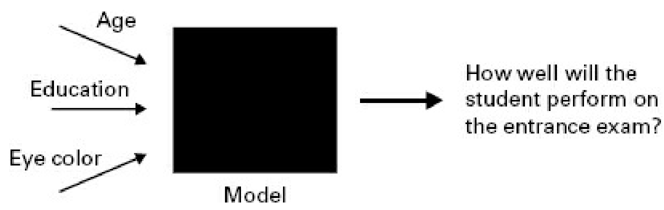


Figure 8.3 Black box models

Variables may be correlated but this relationship may not have any meaning or usefulness. For example, a major bank found that there was a relationship between the state an applicant lived in and a higher percentage of defaults on loans given out. This should not be the basis for a policy that would automatically reject any applicants from that state! Reality checks are always needed with statistics before any conclusions can be drawn, as noted by British statesman Benjamin Disraeli, “There are three kinds of lies: lies, damned lies, and statistics.”

Typical applications of data mining and knowledge discovery systems include market segmentation, customer profiling, fraud detection, retail promotion evaluation, credit risk analysis, and market basket analyses (as described in box 8.1). However, there are a few gems usually to be mined with data mining applications. These are often unexpected correlations that upon further study yield some useful (and often actionable) insights into what is occurring. A famous example is that of the relationship between purchases of beer and purchases of diapers.

Box 8.1

A vignette: Beer with your diapers

A chain of convenience stores conducted a market basket analysis to help in product placement. Market basket analysis is a statistical analysis of items that consumers tend to buy together (that are found in the same "basket" at checkout). One of their hypotheses was to place all infant care–related items together and then run a simple correlation check to validate that mothers of newborns did in fact tend to buy items such as baby powder or cream when they came in to purchase diapers. To their surprise, the highest correlation for an item that tended to be bought at the same time as diapers (in the newborn size and format) was, in fact ,a case of beer. This was later explained by the observation that it was the fathers of newborns who were more likely to be sent to the store to buy more diapers and while they were there, they tended to pick up other equally essential items.

Analytics is a general term that can be defined as:

> studying past historical data to research potential trends, to analyze the effects of certain decisions or events, or to evaluate the performance of a given tool or scenario. The goal of analytics is to improve the business by gaining knowledge which can be used to make improvements or changes[1].

Statistical analysis tools (e.g., SAS, SPSS) are useful to discover patterns in numerical or quantitative data to produce descriptive information such as what is the average (mean) and what range is covered by the data (minimum and maximum). Data mining software (e.g., SAS EnterpriseMiner) discovers relationships or patterns in data from different sources, as shown in the previous market basket analysis example (box 8.1).

It is also possible to apply this technique and use these tools to mine content other than data—namely, text mining and thematic analysis and web mining, to look at what content, how often, and for how long (e.g., number of hits), which is very helpful in content management. Similarly, skill mining or expertise profiling can be used to detect patterns in online curriculum vitae of organizational members. Expertise location systems can be automatically created based on the content that has been mined. Commercial software systems can also be used to mine email data in order to determine who is answering what types of queries or themes. Organizational experts and expertise can be detected by looking at the patterns of questions and answers contained within the emails. The same caveat applies to all of these data mining applications: a human being is always needed in the loop in order to carry out reality checks (i.e., to verify and validate that the patterns do indeed exist and that they have been interpreted in a useful and valuable manner).

Lamont (2012) highlights the fact that, in the past, the cost of storing content was a limiting factor. However, in the present day, storage costs are trivial—leading to another problem: too much content. Relational databases are no longer capable of making sense of this content—creating the need for big data analytics. As the term implies, big data refers to significant volumes of content that needs to be analyzed. The "divide and conquer" approach is used, dividing up the content into smaller chunks, analyzing these, and then reintegrating all the results. Traditional methods would require sampling the data whereas big data can analyze the entire data set, regardless of size. Content has not only increased in volume but has also become more heterogeneous. Sources have multiplied and now include social media such as Twitter and LinkedIn, and content is not limited to text but includes images, sound, and video. Last but not least, content is increasing at an exponential rate. If too much time passes, the analysis becomes even more complicated. Big data involves techniques such as data mining for knowledge discovery to discover otherwise hard-to-detect patterns and correlations. The analysis is a very iterative process as humans need to do a reality check on the outputs and continuously help improve the algorithms to filter out noise. Given the variety of content types to be analyzed, data mining as a technique has branched out to text analytics (data mining on text), sentiment analytics (data mining on text to detect words denoting emotions), and predictive analytics (data mining for forecasting).

Erickson and Rothberg (2015) note that firms are now able to store more data, analyze this data more frequently, and conduct more in-depth analyses to understand their content. They also discuss the fact that most companies are analyzing operational and/or transactional data without considering more strategic content such as their intellectual capital. Analytics holds great potential in analyzing the intangible assets of an organization and contributing to their codification and monetization.

Blogs

A "blog" is a slang term for a web log. A web log, for the uninitiated, is a popular and fairly personal content form on the Internet. A person's blog is almost like an open diary. It chronicles what a person wants to share with the world on an almost daily basis (Blood, 2002; see also: http://www.rebeccablood.net/). A blog is a frequently updated, publicly accessible journal. While the "blogosphere" started off as a medium for mostly personal musings, it has evolved into a tool that offers some of the most insightful information on the web. Furthermore, blogs have become very common, as businesses, politicians, and policy makers, and even libraries and library associations, have begun to blog as a way of communicating with patrons and constituents.

Several librarians publish blogs that offer a wealth of information about social software and its uses. SNTReport.com focuses on the social software industry and how social software tools are being used to help people collaborate. Blogs not only offer a new way to communicate with customers, they have internal uses as well. For example, large organizations can use a well-formed blog to exchange ideas and information about web development projects, training initiatives, or research issues. These questions and answers can be cross-indexed and archived, which helps build a knowledge network among the participating members. Most importantly, the price of setting up a well-formed, secure blog and leveraging it into a knowledge and content management tool is a pittance when compared to other, proprietary solutions.

Blogs began primarily as online text but today, audio and video elements, bring a sophisticated multimedia blend to the medium (Dames, 2004). The popularity of YouTube (www.youtube.com) attests to the powerful draw of the image, and in particular, the moving image. On YouTube, short video clips can be posted on practically any topic. These are often self-filmed and self-indexed. It is possible to search the YouTube website for a clip on a particular topic. While many videos are mostly entertaining, quite a few serve as educational resources (see listings in chapter 14).

Pikas (2005) added the notion of searching to blogs. Blogs are reverse-chronologically arranged collections of articles or stories that are generally updated more frequently than regular web pages. Just like any other information on the net, there is no guarantee of authority, accuracy, or lack of bias. In fact, personal blogs are frequently biased and can be good sources of opinion and information from the "man on the street. Blogs are also good sources of unfiltered information on either faulty or very useful products.

Blog searching breaks down into at least two categories: information from within blogs/across blogs or addresses of feeds from blogs so that you may subscribe in your aggregator. Feeds and blogs are two different things, but are closely linked because most blogs have feeds and many feeds are generated by blogs. Just as in other web search tools, there are search engines and directories.

Mashups

A "mashup" is an innovative way of combining content (Merrill, 2006). Mashups are web applications that offer an easy and rapid way of combining two or more difference sources of content into a single, seamlessly integrated application. The term originates from the practice of mixing tracks from two different songs. One of the first applications was to combine real estate listings with the location map drawn from Google Maps. The integration is typically undertaken by retrieving content from publicly available sources, combining continuous web feeds such as RSS, or using some of the newly created mashup editors and programming languages. Mashups make it very easy to combine different media such as text and images, videos, maps, and news feeds. There is, however, an issue with intellectual property and information privacy that will need to be ironed out with this technology (Zang et al., 2008).

Within a business context, however, if the content to be combined is clearly available for use by the company and its employees, then mashups become an intriguing means of creating new content from old. Some popular business uses of mashups have been to create presentations that contain aggregated content and to support collaborative work such as joint authoring of content. In a way, mashups may also be considered as knowledge portals—both aggregate content—but mashups do so in a much more dynamic way (portals are discussed later in this chapter).

Crowdsourcing

Crowdsourcing refers to "the practice of obtaining needed services, ideas, or content by soliciting contributions from a large group of people and especially from the online community rather than from traditional employees or suppliers[2]." While the source of the data is different, similar types of analytics can be conducted on this data. Customers, for example, can be invited to participate in brainstorming, problem solving, or even product design. Consultation often occurs over the Internet and may include voting on the best ideas or solutions as well as just eliciting feedback to capture knowledge that may be otherwise very difficult to identify, let alone obtain. Ackerman et al. (2013) describe a crowdsourcing application for translating phrases or sorting out images which can lead to quick results. However, at the same time, relying on the aggregate knowledge of a crowd can be risky, as little is known about the contributors. One good solution is to combine crowdsourced content with expert opinion in order to validate the results obtained.

Visualization Tools and Knowledge Maps

Asking experts to visualize their knowledge can assist in knowledge capture. Two commonly used ways of visualizing knowledge are knowledge maps and visualization tools. A knowledge map is a common way of visualizing complex knowledge to be captured and codified. As Awad and Ghaziri (2007) describe, a knowledge map is not a repository of knowledge but rather a map showing where various knowledge chunks are located. A knowledge map is analogous to the site map of a website—it is the conceptual representation of knowledge that clearly shows its scope (i.e., its boundaries or limits), its location of knowledge (e.g., documents, procedure, or 100 percent tacit), as well as the relationships between the chunks of knowledge. Visualizing knowledge helps identify clusters which eventually can lead to knowledge categories. Knowledge maps can help classify captured knowledge and they can be used throughout the KM process cycle to help share, disseminate, and make use of the knowledge.

Data visualization is way of detecting "patterns, trends, and correlations that might go undetected in text-based data [that] can be exposed and recognized [more easily] with data visualization software[3]." Data is presented in some type of graphical or pictoral form so that we can "see" the patterns. In fact, visualization can be thought of as visual data mining (Ferreira de Oliveira & Levkowitz, 2003). Examples include traditional pie charts but can be as sophisticated as interactive three-dimensional environments. Data visualization software coherently present a large amount of information in a small space. They make use of the human computer—your eyes—to detect patterns (e.g., virtual reality and simulation software) and walk around the data points. For example, a researcher can walk around their data points in order to identify patterns of clustering. This is sometimes referred to as "big data"—great volumes of data can be easily processed by today's computers and presented in a more visual form. Information visualization is typically used when there are vast amounts of data that is not numerical, for example, the results of polls or trend analyses (Burley, 2010).

Videos for Exit Interviews

The use of videos has already been discussed for a number of tools. They are also very powerful media to capture expertise in exit interviews. Exit interviews are, of course, a misleading term. While they are operationally useful (e.g., to recuperate employee access cards), for knowledge capture, much more time is needed than a short interview at the end of someone's career. In fact, the best way to capture knowledge is to do so throughout the career of the employee. Ideally, interviews should begin long before the employee leaves the organization. Videos can be used to capture structured interviews during knowledge capture. Goodman and Riddell (2014) note that sometimes it is easier on the expert if they don't have to prepare too much ahead of time. They advocate having other employees wanting to learn about a given subject take turns asking the expert about it. This can be face-to-face or technology-mediated. In either case, the question and answer session can be captured in a short video. The authors note that "they can cover a lot of ground in a relatively short time" (p.217). Note that with the advent of YouTube, many knowledge capture activities are carried out using this tool. An example is the World Bank's video stories (https://www.youtube.com/user/WorldBank). A minority of organizations would use actual filming to achieve "documentary" quality. An example would be Oxfam's digital storytelling initiatives (http://oxfam.ca/sites/default/files/file_attachments/Digital%20Storytelling%20and%20Good%20

Mobile Tools

Mobile tools such as smartphones and tablets are increasingly popular and they have a range of functionalities including voice recording, photo capture, and even video recording. They offer the potential to assist in knowledge capture and codification.

Content Management Tools

Content management refers to the management of valuable content throughout the useful lifespan of the content. Content lifespan will typically begin with content creation, handle multiple changes and updates, merging, summarization, and other repackaging, and will typically end with archiving. Metadata (information about the content) is used to better manage content throughout its useful lifespan. Metadata includes such information as source/author, keywords to describe content, date created, date changed, quality, best purposes, annotations by those who have made use of it, and an expiry or “best before” date where applicable. Additional attributes such the storage medium, location, and whether or not it exists in a number of alternative forms (e.g., different languages) are also useful to include. XML is increasingly being used to tag knowledge content, and taxonomies serve to better organize and classify content for easier future retrieval and use.

XML (eXtensible Markup Language) provides the ability to structure and add relevance to chunks of information (that’s why many CM solutions use XML), and in theory, exchange data more easily between applications e.g., with your suppliers, customers, and partners). However, you may all use the same words (tags), but if each of you defines and applies them differently, then we remain in the land of Babel. Common agreed schemas are essential. Keep tabs with developments on the schemas and metadata standards in your field. Useful sources are XML.org (http://www.xml.org) and the W3C XML schemas section (http://www.w3.org/XML/Schema).

Taxonomies—hierarchical information trees for classifying information—act like your library subject catalog. They can help overcome differences of language usage in different parts of an organization and even the use of different languages. Traditionally manually intensive, the growing problem of information overload means that they are receiving significant attention. But how do you cope with the evolution of terms, whose meaning seems to change from one year to the next? Automatic (or semiautomatic) classification of information objects—natural language analyzers, text summarizers, and other technology—helps to understand some of the meaning—the concepts—behind blocks of text, and to tag and index it appropriately for to aid subsequent retrieval. Many take advantage of the organization’s underlying knowledge taxonomy. Similarly, automated text summarization tools can be used to help sift through references and other resources in order to capture the expert’s knowledge. Document or content management systems can help find knowledge resources (often referred to by the expert being interviewed) but they also serve to organize knowledge once it is codified.

Folksonomies and Social Tagging/Bookmarking

Metadata is literally translated as “data about data” and refers to specific information about content contained in books, reports, articles, images, and other containers so that they can be organized and retrieved in an orderly fashion. Metadata is also referred to as tags or keywords. Taylor (2004) notes that metadata comes in three general flavors: administrative, structural, and descriptive. The Oxford Digital Library (ODL; (http://www.odl.ox.ac.uk/metadata.htm) defines the three types of metadata as follows:

1. Administrative metadata is the information needed to manage the information resource over its lifecycle such as data about how it was acquired, where it came from, licensing, intellectual property rights, and attribution (e.g., was it scanned, what format is it stored in, etc.) This is sometimes referred to as preservation metadata.
2. Structural metadata relates to the actual computer elements involved such as tables, columns, and indices—all the logical units of the information resource.
3. Descriptive metadata refers more to the content or subject matter of the information resource to help users find it (e.g., cataloguing records, findings aids, key words). Descriptive metadata is of greatest concern in KM because we often need to expand this type of data about data greatly in order to increase the usability (and reusability) of a given unit of knowledge.

Metadata is very formal and tends to be created and updated by dedicated personnel such as catalogers and other library and information science professionals. This is the highest standard in metadata but is time-consuming to produce (Mathes, 2004). An alternative is to have authors create and add their own metadata for their own works. The Dublin Core best exemplifies author-created metadata (Greenberg et al., 2001). Both of these approaches work well for the person who develops the metadata but not necessarily as well for other users (often referred to as unknown or unanticipated users). A third option exists—that of user-created metadata. This bottom-up or grassroots approach is referred to as a “folksonomy” or as “social bookmarking” or “tagging.” The advantage of this third option is that metadata is created by the collectivity of users. All users should more readily understand the tags or data about data, not just their creators.

Social bookmarking is a method whereby users participate directly in the storage, organization, searching, and managing of web resources. One way is by saving personal bookmarks on a publicly accessible website and then tagging these sites with your own metadata. Early sites included: del.icio.us (https://del.icio.us/), Furl a web page bookmarking sites, and Citeulike (www.citeulike.org), a social citation site for scholarly publications. Today, the most popular sites include Facebook, Twitter, Pinterest, Google Plus +, Tumbler, and Reddit (http://www.ebizmba.com/articles/social-bookmarking-websites). Other users can then view the bookmarks by category, or search by key word or use other attributes. Users make use of informal tags instead of more formal cataloguing methods. Since all the tags originate from the intended end users, they are easier to understand than more standardized or top-down indexing terms. The major drawback is this very lack of standardization: there is no controlled vocabulary (i.e., list of standard key words), therefore many errors can occur due to misspelling, synonym confusion, tags with more than one meaning, or tags that are too personalized. This situation brings us right back to the problem faced by more traditional cataloguing approaches: How to tag so that others can understand your tags?

In a KM context, social bookmarking makes it possible to share knowledge with others in a new way: by sharing not only the original knowledge but also what you think about it (the metadata). The technology is easy to use with hardly any learning curve to speak of. The real potential lies in what the metadata can be used for. For example, if the knowledge resource (data) is a best practice, then the metadata (data about this data) can include annotations on: what others think of the best practice, testimonials, cautionary notes (when not to apply and why), and other contextual information that can greatly increase the successful use and reuse (application) of this knowledge. Social bookmarking is an excellent vehicle to peer-to-peer knowledge sharing and may play a greater role in future communities of practice. In a given community of practice, there is, in addition to a shared purpose and a shared repository, a shared vocabulary. Since CoP members share the same jargon, tagging is less likely to be a problem: tagging for yourself should approximate tagging for your peers, who are neither unknown nor unanticipated users.

As social bookmarking sites mature and ever-increasing numbers of users participate in them, it becomes possible to see some patterns emerging with respect to the tags that are most commonly used. This tag "cloud" can be found by looking at the right hand side of individual tag pages, under "related tags" on most social bookmarking sites. Tag clouds represent emergent or organically grown taxonomies—commonly referred to as "folksonomies," a term coined by Thomas van der Wal in 2004 (Smith, 2004, in Mathes, 2004) as a combination of "folk" and "taxonomy."

Folksonomies differ from traditional taxonomies in that there is no hierarchy, no object-oriented style of inheritance from parent object to child object, just clusters of tags that appear to be loosely related. They also don't follow taxonomy rules in that folksonomies can have more than one type of relationship between the same terms. In a typical folksonomy, terms will differ in their level of specificity, they may be qualitatively different, and they may not necessarily make sense! A folksonomy, in other words, freely advocates mixing apples and oranges. The drawbacks are once again lack of standardization, ambiguity, diminished rigor in classifying, and the use of a flat rather than hierarchical space. The advantages are being able to use the everyday language that users have and unlimited expansion of key words. Finding through serendipity improves retrieval—by being able to observe what others felt were related knowledge.

As with social bookmarking, folksonomies appear particularly well suited to communities of practice, where peer-to-peer sharing can be augmented through the folksonomy approach. A folksonomy should help increase cooperation and knowledge sharing among community members by making visible what often remains an invisible model of who knows whom and who knows what or who is interested in what topic. Folksonomies can therefore be considered as knowledge creation tools (creation of tags) and knowledge sharing and dissemination tools (peer-to-peer sharing, public posting of tags) as well as a knowledge application tool (metadata that contextualizes when and where the knowledge should be used).

A final note: folksonomies and more traditional knowledge organization schemes (see chapter 4) need not be mutually exclusive. A folksonomy can be an excellent starting point for a more formal taxonomy. The folksonomy can serve a needs-analysis function and permit the users to make use of their own preferred vocabulary, while the designers link this to the more formal taxonomy through a thesaurus. This linkage will also serve as a form of personalization of the search and retrieval interface for the users.

Knowledge Sharing and Dissemination Tools

Rollet (2003) made a distinction between communication technologies (such as telephone and email) and collaboration technologies (such as workflow management), yet it is very difficult to draw a line between the two. Communication and collaboration are invariably intertwined and it is quite difficult to establish where one ends and the other begins. Both types of tools have been grouped under the category of groupware or collaboration tools. Although all organizational members will make use of communication and collaboration, including project teams and work units, communities of practice will be particularly active in making use of many if not all of the communication and collaboration technologies described in this section.

Groupware and Collaboration Tools

Groupware represents a class of software that helps groups of colleagues (workgroups) attached to a communication network (e.g., LAN) organize their activities. Typically, groupware supports the following operations:

- Scheduling meetings and allocating resources
- Email
- Password protection for documents
- Telephone utilities
- Electronic newsletters
- File distribution

Communication technologies used typically include the telephone, fax, videoconferencing, teleconferencing, web conferencing (e.g., Skype), chat rooms, instant messaging, phone text messaging (SMS), Internet telephone (voice over IP or VOIP), social media (e.g., FaceTime), email, and discussion forums. Communication is said to be "dyadic" when it occurs between two individuals, foe example, a telephone call. Teleconferencing, on the other hand, may have more than two participants interacting with one another in real time. Videoconferencing introduces a multimedia component to the communication channel as participants can not only hear (audio) but also see the other participants (visual). Desktop videoconferencing is similar but does not require a dedicated videoconference facility. Simple and inexpensive digital video cameras can be used to transmit images. The visual component is especially useful when demonstrations are presented to all participants.

Chat rooms are text-based but synchronous. Participants communicate with one another in real time via a web server that provides the interaction facility. Instant messaging is also real-time communication, but in this case participants sign on to the instant messaging system and they can immediately see who else is online or "live" at that same time. Messages are exchanged through text boxes. The SMS (Short Messaging System) allows text messages to be sent via a cellular phone rather than through the Internet.

Email continues to be one of the most frequently used communication channels in organizations. Although email messaging is dyadic, it can also be used in a more broadcast mode (e.g., group mailings) as well as in an asynchronous group discussion mode (by forwarding previous discussion threads).

Communication technologies are almost always integrated with some form of collaboration, whether it be planning for collaboration or organizing collaborative work. Collaboration technologies are often referred to as groupware or as workgroup productivity software. It is technology designed to facilitate the work of groups. This technology may be used to communicate, cooperate, coordinate, solve problems, compete, or negotiate. While traditional technologies like the telephone qualify as groupware, the term is ordinarily used to refer to a specific class of technologies relying on modern computer networks, such as email, newsgroups, videophones, or chat.

Groupware technologies are typically categorized along two primary dimensions (see table 8.2):

Table 8.2 Classification of groupware technologies

	Same time, synchronous	Different time, asynchronous
Same place, colocated	Voting	Shared computers

	Presentation support	
Different place, distant	Videophones Chat	Email Workflow

1. Whether users of the groupware are working together at the same time (real-time or synchronous groupware) or different times (asynchronous groupware)
2. Whether users are working together in the same place (colocated or face-to-face) or in different places (non-colocated or distance)

Coleman (1997) developed the taxonomy of groupware that lists twelve different categories:

1. Electronic mail and messaging
2. Group calendaring and scheduling
3. Electronic meeting systems
4. Desktop video, real-time synchronous conferencing
5. Non-real-time asynchronous conferencing
6. Group document handing
7. Workflow
8. Workgroup utilities and development tools
9. Groupware services
10. Groupware and KM frameworks
11. Groupware applications
12. Collaborative Internet-based applications and products

Email is by far the most common groupware application (besides, of course, the traditional telephone). While the basic technology was designed to pass simple messages between two people, even relatively basic email systems today include features for forwarding messages, filing messages, creating mailing groups, and attaching files to a message. Other features that have been explored include: automatic sorting and processing of messages, automatic routing, and structured communication (messages requiring certain information). There is some research to show that younger generations are now more email-averse, preferring to text over their phones or communicate via social media such as Instagram or SnapChat.

A Gallup poll (Newport, 2014) confirmed a truth that has become self-evident: text messages now outrank phone calls as the dominant form of communication among millennials. Many see the telephone as overly intrusive, even presumptuous. Additionally, task-oriented millennial employees just want to know what to do; reading emotions can be an unhelpful chore. Millennial workers tend to skip the small talk and "get right to the point" (Howe, 2015).

Newsgroups and mailing lists are similar in spirit to email systems except that they are intended for messages among large groups of people instead of one-to-one communications. In practice, the main difference between newsgroups and mailing lists is that newsgroups only show messages to a user when they are explicitly requested (an on-demand service), while mailing lists deliver messages as they become available (an interrupt-driven interface).

Workflow systems allow documents to be routed through organizations using a relatively fixed process. A simple example of a workflow application is an expense report in an organization: an employee enters an expense report and submits it, a copy is archived then routed to the employee's manager for approval, the manager receives the document, electronically approves it, and sends it on, and the expense is registered to the group's account and forwarded to the accounting department for payment. Workflow systems may provide features such as routing, development of forms, and support for differing roles and privileges.

Hypertext is a system for linking text documents to each other, with the web being an obvious example. Whenever multiple people author and link documents, the system becomes group work, constantly evolving and responding to others' work. Some hypertext systems include capabilities for seeing who else has visited a certain page or link, or at least seeing how often a link has been followed, thus giving users a basic awareness of what other people are doing in the system—page counters on the web are a crude approximation of this function. Another common multiuser feature in hypertext (that is not found on the web) is allowing any user to create links from any page, so that others can be informed when there are relevant links that the original author was unaware of.

Group calendars allow scheduling, project management, and coordination among many people, and may provide support for scheduling equipment as well. Typical features detect when schedules conflict or find meeting times that will work for everyone. Group calendars also help to locate people. Typical concerns are privacy (users may feel that certain activities are not public matters), completeness, and accuracy (users may feel that the time it takes to enter schedule information is not justified by the benefits of the calendar).

Collaborative writing systems may provide both real-time support and non-real-time support. Word processors may provide asynchronous support by showing authorship and by allowing users to track changes and make annotations to documents. Authors collaborating on a document may also be given tools to help plan and coordinate the authoring process, such as methods for locking parts of the document or linking separately authored documents. Synchronous support allows authors to see each other's changes as they make them, and usually needs to provide an additional communication channel to the authors as they work (via videophones or chat).

Synchronous or real-time groupware are exemplified by shared workspaces, teleconferencing, or videoconferencing and chat systems. For example, shared whiteboards allow two or more people to view and draw on a shared drawing surface even from different locations. This can be used, for instance, during a phone call, where each person can jot down notes (e.g., a name, phone number, or map) or to work collaboratively on a visual problem. Most shared whiteboards are designed for informal conversation, but they may also serve structured communications or more sophisticated drawing tasks, such as collaborative graphic design, publishing, or engineering applications. Shared whiteboards can indicate where each person is drawing or pointing by showing telepointers, which are color-coded or labeled to identify each person.

Twitter is a technology that is about as real-time as it gets. A major use of Twitter is to continuously answer the question "what are you doing now?" It is a mini-blogging service that allows users to send "tweets" or mini-texts of up to 140 characters in length to their user profile. This information is then conveyed to users who have signed up to receive the posts (typically a circle of friends or colleagues). Tweets can be received as web page updates, RSS feeds, SMS text on phones, through email, on Facebook, and so on. Twitter started out in life as an R&D project in podcasting (Glaser, 2007). Twitter has potential applications within a KM context. Bradley (2008) addressed this point and noted that Twitter is a people-based technology and can serve as a good alerting service for people who are working together, particularly if they are working together on time-critical work. Twitter can also serve as an ultra-rapid way of testing out ideas on a few trusted individuals—a quick forum for feedback in real time (e.g., a presenter who checks to see how the talk is going, a meeting coordinator who needs everyone in attendance ASAP, or a project manager trying to physically locate his team). One potential application for real-time tweets could be an expertise locator system—one that locates expertise in real-time as well as a means of meeting some of the expectations of millennial knowledge workers (Lee, 2003). Instagram has a similar set of potential KM uses except with images instead of text.

Video communications systems allow two-way or multi-way calling with live video, essentially a telephone system with an additional visual component. Cost and compatibility issues limited early use of video systems to scheduled videoconference meeting rooms. Video is advantageous when visual information is being discussed, but may not provide substantial benefit in most cases where conventional audio telephones are adequate. In addition to supporting conversations, video may also be used in less direct collaborative situations, such as by providing a view of activities at a remote location.

Chat systems permit many people to write messages in real time in a public space. As each person submits a message, it appears at the bottom of a scrolling screen. Chat groups are usually formed by listing chat rooms by name, location, number of people, topic of discussion, and so on.

Many systems allow for rooms with controlled access or with moderators to lead the discussions, but most of the topics of interest to researchers involve issues related to unmediated real-time communication including: anonymity, following the stream of conversation, scalability with number of users, and abusive users.

While chat-like systems are possible using nontext media, the text version of chat has the rather interesting aspect of having a direct transcript of the conversation, which not only has long-term value, but allows for backward reference during conversation, making it easier for people to drop into a conversation and still pick up on the ongoing discussion.

Wikis

Wikis are web-based software that supports concepts such as open editing, which allows multiple users to create and edit content on a website (for more information, see http://en.Wikipedia.org/Wiki/Wiki). A Wiki site grows and changes at the will of the participants. People can add and edit pages at will, using a Word-like screen, without knowing any programming or HTML commands. More specifically, a Wiki is composed of web pages where people input information and then create hyperlinks to another page or new pages for more details about a particular topic. Anyone can edit any page and add, delete, or correct information. A search field at the bottom of the page lets you enter a keyword for the information you want to find. Today, two types of Wikis exist: public Wikis and corporate Wikis. Public Wikis were developed first and are freewheeling forums with few controls. Recently, corporations have been harnessing the power of Wikis to provide interactive forums for tracking projects and communicating with employees over their in-house intranets.

A public example is Wikipedia (http://en.Wikipedia.org/Wiki/Main_Page), a free encyclopedia written, literally, by thousands of people around the world. Wikis exist for thousands of topics and if one does not exist for your favorite subject, you can start one on it and add it to the list.

Wikis support new types of communications by combining Internet applications and websites with human voices. That means people can collaborate online more easily, whether they are working together on a brief or working with a realtor online to tour office space in another city. Outside the office, it means customer service representatives can interact with customers more readily, which should advance e-commerce (Leuf & Cunningham, 2001). Cunningham, a programmer, who decided to build the most minimal working database possible, started the first Wiki in 1995. The idea was to provide a simple website where programmers could quickly and easily exchange information without waiting for a webmaster to update the site. He named the site “Wiki,” after the quick little Wiki-Wiki shuttle buses in Hawaii.

A public Wiki survives thanks to the initiative, honesty, and integrity of its users. Sites can be vandalized, derogatory remarks (called “flames”) can be posted, and misinformation can be published. However, a vandalized site can be restored, a flame can be erased, and information can be corrected by anyone who knows better. The community polices itself.

Corporate Wikis differ from public Wikis in that they are more secure and have many more navigation, usage, and help features. Corporate Wikis are used for project management and company communications, as well as discussion sites and knowledge databases. For example, a Wiki can be established for a particular project with the project team given access to update the status of tasks and add related documents and spreadsheets. Its central location makes it easy to keep everyone informed and up-to-date regardless of his or her home office, location, or time zone. A Wiki is more reliable than continually emailing updates back and forth to team members, it is faster than email since updates are available instantly, and it is more efficient than email since each team member does not have to maintain his or her own copies. Managers like Wikis because they can see what progress the team is making or what issues it is facing without getting involved or raising concern (e.g., a new way of doing of project management reporting).

For security reasons, corporations usually buy Wiki software, rather than lease space on the Internet, and set up the Wiki behind the company’s firewall as part of an intranet, or as an extranet if customers or vendors are allowed access. Also, corporations look for Wiki software that has authorization and password safeguards, roll-back versions so information can be restored to its former state, and easy upload capabilities for documents and images. Some Wikis notify users when new information is added, an especially nice feature for corporate projects where fast responses are required.

Social Media, Web 2.0, and KM 2.0

Social networking has rapidly become a part of everyday living and working, particularly for the Y or millennial generation (eMarketer, 2008). As noted by Jones (2001, p. 2), “knowledge management is inherently collaborative: thus a variety of collaboration technologies can be used to support knowledge management practices.” Social networks are dynamic people-to-people networks that represent relationships between participants. A social network can serve to delimit or identify a community of practice as it models the interaction between people. Wladawsky-Berger (2005) notes that social networks are “knowledge management done right” (p. 1) as they both address similar goals: to solve problems, to increase efficiency, and to better achieve goals.

Social network analysis (SNA; see http://www.insna.org) is a social science research tool that dates back to the 1970s and has become increasingly used in KM applications (Durkheim, 1964; Drucker, 1989; Granovetter, 1973; Lewin, 1951). Krebs (2008) defines SNA as the “mapping and measuring of relationships and flows between people, groups, organizations, computers, or other information/knowledge processing entities.” SNA can be used to identify communities and informal networks and to analyze the knowledge flows (i.e., knowledge sharing, communication. and other interaction) that occur within them (Brown & Duguid, 1991). SNA is one of the ways of identifying experts and expertise to develop an expertise location system. The basic steps involved are to develop a survey tool (e.g., a questionnaire) to collect the required data are to identify network members and their exchange patterns. Next, this data is analyzed using software such as Pajek (http://www.pajek.com) or UCINET (http://www.analytictech.com) to identify patterns of interaction and emergent relationships. The analyzed data can then be used to inform decision making based on the objectives (Scott, 2000), for example, for change management, to establish a baseline in order to later assess the effects of a technology introduction, or to improve upon the knowledge flow and connections.

Social media are increasingly integrated into KM toolkits. Unlike traditional Internet and communication technologies (ICTs), social media manage the content of the conversation or interaction as an information artifact in the online environment. For example, Wikis are a social media in which coauthors collectively build textual and visual websites. Google Docs manages documents, spreadsheets, and other files in a cloud computing environment which allows registered users to upload and share documents and changes from anywhere with Internet access. Video- and photo-sharing websites such as YouTube and Flickr use videos and images (respectively) to create social interaction. Social network websites such as Facebook represent links and nodes in the network through conversation threads. While these social media have been widely adopted publicly, organizations are only recently realizing their potential (Yates & Paquette, 2010, p. 6).

For example, during the 2010 earthquake in Haiti, the emergency response team consisted of the UN, the government of Haiti, and many other countries and NGOs, all interacting with one another through a knowledge management system. This system included social media such as Wikis and collaborative workspaces as the main knowledge sharing mechanisms (Yates & Paquette, 2010).

The combination of social media, blogging, Wikis, and other related technologies together define "Web 2.0," or the next generation of the web. Web 2.0 is a concept that began with an interactive conference session between Tim O'Reilly and Dale Dougherty that in turn led to the development of the annual Web 2.0 conference (O'Reilly, 2009; http://www.oreilly.com/pub/a/web2/archive/what-is-web-20.html). They defined Web 2.0 as something without a hard boundary but rather a set of principles that include:

- The web as a platform
- User control of your own data
- Services instead of packaged software
- An architecture of participation
- Cost-effective scalability
- Remixable data sources and data transformations
- Software that rises above the level of single device
- Harnessing of collective intelligence

A popular way of defining Web 2.0 is a form of concept analysis—the listing of examples for both Web 1.0 and Web 2.0. For example, Netscape is an example of Web 1.0, whereas Google exemplifies Web 2.0. Microsoft Outlook email is a Web 1.0, application whereas Gmail (http://www.gmail.com) is a Web 2.0 application. Other Web 2.0 examples include eBay, a digital marketplace (http://www.ebay.com), BitTorrent, a free open-source file-sharing application site for sharing large software and media files (http://www.bittorrent.com), Wikipedia, a user-authored encyclopedia site (http://www.wikipedia.org), as well as folksonomies, viral marketing, and open-source software sites. Many Web 2.0 sites contain RSS feeds,which allow someone to subscribe to a web page and be alerted to any changes. An RSS feed is much more reliable than a link to what could be an ever-changing web site.

Finally the harnessing of the collective intelligence is a key attribute of Web 2.0, which means that the collective (i.e., the set of users) determine what is of value, what is valid, and what is important (Surowiecki, 2004). The more people use a Web 2.0 site, the more the site automatically improves. A key feature of Web 2.0 sites is that the users of that site contribute the content.

IBM uses a decentralized social media approach to promote knowledge sharing and collaboration. The company has combination of internal and external blogs, SocialBlue (which is similar to a Facebook for IBM employees), and crowdsourcing "jams" in addition to being active on LinkedIn and Facebook.[4]

KM 2.0 is analogous to Web 2.0 and refers to a more people-centric approach to knowledge management. Companies are adopting KM 2.0 to varying degrees—mostly based on their underlying culture and how well it promotes transparency and is less concerned with control and availability of the underlying technologies. A surprising example is the Central Intelligence Agency (see box 8.2). Other examples include IBM, where a large collaborative online brainstorming session called InnovationJam was held that included over 150,000 people (Dearstyne, 2007). Participants were not only employees but also customers and business partners. The event ran for three days with different topics being addressed in different moderated forums. The best ideas generated were acknowledged and rewarded.

Box 8.2

An example: Intellipedia at the CIA

Web 2.0 technologies are enabling the CIA to share more information within their agency in addition to their intelligence counterparts (Wailgum, 2008). The events of September 11, 2001 have catalyzed a series of reforms in the intelligence community, especially when it became clear that key agencies were not able to connect the dots.

> After 9/11, we asked ourselves: why was no one able to connect the dots?" (David Ignatius, Associate Editor, *Washington Post*).

> Could 9/11 have been prevented? In a number of crucial cases, mishandled intelligence, bureaucratic tangles, and legal hurdles blinded the CIA and the FBI to clues right in front of them. Individually, none of these was a smoking gun. But combined they were a four-alarm fire. (Frank, 2004)

The CIA is well aware of the post-9/11 analyses and reports that described how 16 government intelligence agencies were unable to puncture internal and external silos, and as a result, critical information was not shared and was not aggregated to detect a pattern—and a substantial threat. The CIA's CIO, Al Tarasiuk, introduced the notion of Web 2.0 and KM 2.0 into the 61-year-old agency in the form of Intellipedia, modeled on Wikipedia. Intellipedia is a bottom-up system that allows all US analysts to share their information, their analyses, and even their insights with trusted peers over a secure network. The new system is essentially a Wiki for knowledge sharing that was implemented in 2006. There is no anonymity as users log on and are authenticated each time they use Intellipedia. There is a form of expertise location system integrated within this system as users can find out who has expertise on a particular topic, a particular country, and so forth. As of January 2014, Intellipedia contained around 269,000 articles with the Top Secret Intellipedia counting 113,000 content pages with 255,000 users. It is interesting to note that the most prolific user of Intellipedia is an employee who is preparing to retire, which indicates that such systems may also play a role in organizational memory and knowledge continuity (see chapter 11).

In the old Web 1.0 world, the content contained within Intellipedia would have been shared with a limited number of people and most likely through email (which only served to add to employees' information overload). Intellipedia defines and enables the US intelligence community and is a clear contrast to that which prevailed before—a need-to-know basis for knowledge sharing and one based on status, hierarchical relationships, and formal authority. The major goal of Intellipedia is to enable collaboration across silos to help participants solve complex problems and to connect all of the known dots. This requires that participants speak the same language (i.e., share the same vocabulary and define all the dots in the same way). This new way of working also requires the motivation to share, which in turn entails a change in organizational culture (see chapter 7). The major challenge is not with the technology but with a change in mindset of the individuals and the collective mindset that prevails as the organizational culture.

Lee and Lan (2007) suggest that traditional knowledge management (KM 1.0) is based on knowledge repositories—the storing and preserving of knowledge but in a largely static fashion. KM 2.0 represents a new paradigm and, much like the core attributes listed for Web 2.0, the authors propose corresponding attributes for KM 2.0 (p. 50). In building on a theme of collaborative intelligence, the following list of features may be considered as the objectives of knowledge contents development via Web 2.0.

- Contribution—every Internet user has the opportunity to freely provide their knowledge content to the relevant subject domains.
- Sharing—knowledge contents are freely available to others. Secured mechanisms may be enforced to enable the knowledge sharing among legitimate members within specific communities.
- Collaboration—knowledge providers collaboratively create and maintain knowledge content. Internet users participating in the knowledge content can have conversations as a kind of social interaction.

- Dynamic—knowledge contents are updated constantly to reflect the changing environment and situation.
- Reliance—knowledge contribution should be based on trust between knowledge providers and domain experts.

Once again, the best approach is one of inclusion rather than mutual exclusivity. KM 1.0 is mainly focused on preserving valuable knowledge that has been created. KM 2.0 is mainly concerned with user participation, knowledge flow and sharing, and user-generated content with much more rapid feedback and revision of the knowledge. The two can coexist in much the same way as taxonomies and folksonomies can coexist. KM 2.0 is closer to the everyday operational concerns of knowledge workers and serves as an excellent framework for collaboration and conversation with others. KM 1.0 (as discussed in greater detail in the next section) can then periodically access, assess, and incorporate the outputs of KM 2.0 and ensure that they are well preserved and well organized for future retrieval and reuse.

Networking Technologies

Networking technologies consist of intranets (intra-organizational network), extranets (inter-organizational network), knowledge repositories, knowledge portals, and web-based shared workspaces. Liebowitz and Beckman (1998) define knowledge repositories as an "on-line computer-based storehouse of expertise, knowledge, experiences, and documentation about a particular domain of expertise. In creating a knowledge repository, knowledge is collected, summarized, and integrated across sources." Such repositories are sometimes referred to as experience bases or corporate memories. The repository can either be filled with knowledge by what Van Heijst et al. (1997) call passive collection—where workers themselves recognize what knowledge has sufficient value to be stored in the repository—or active collection—where some people in the organization are scanning communications processes to detect knowledge.

Davenport and Prusak (1998) divide between three types of knowledge repositories:

1. External knowledge repositories (such as competitive intelligence)
2. Structured internal knowledge repositories (such as research reports, product-oriented market material)
3. Informal internal knowledge repositories (such as lessons learned)

A knowledge repository differs from a data warehouse and an information repository primarily in the nature of the content that is stored. Knowledge content will typically consist of contextual, subjective, and fairly pragmatic content. Content in knowledge repositories tends to be unstructured (e.g., works in progress, draft reports, presentations). Knowledge repositories will also tend to be more dynamic than other types of architectures because the knowledge content will be continually updated and splintered into varying perspectives to serve a wide variety of different users and user contexts. To this end, repositories typically end up being a series of linked miniportals distributed across an organization.

Most repositories will contain the following elements (adapted from Tiwana, 2002):

1. Declarative knowledge (e.g., concepts, categories, definitions, assumptions—knowledge of *what*)
2. Procedural knowledge (e.g., processes, events, activities, actions, manuals—knowledge of *how* or *know-how*)
3. Causal knowledge (e.g., rationale for decisions, for rejected decisions—knowledge of *why*)
4. Context (e.g., circumstances of decisions, informal knowledge, what is and what is not done, accepted etc.—knowledge of *care-why*)

The knowledge repository is the one-stop-shop for all organizational users to be able to access all historical, current, and projected valuable knowledge content. All users should be able to connect to and annotate content, connect to others who have come into contact with the content, as well as contributing content of their own. The interface to the repository or repositories should be user-friendly, seamless, and transparent.

Personalization in the form of personalized news services through push technologies, in the form of miniportals for each community of practice and so forth, will help maintain the repository in a manageable state. To this end, the use of a term such as a knowledge warehouse should be strongly discouraged—the knowledge repository should instead be visualized as a lens that is placed on top of the data and information stores of the organization. The access and application of the content of a repository should be as directly linked to professional practice and concrete actions as possible.

The knowledge repository typically involves content management software tools such as a SharePoint platform and will be run as an intranet within the organization, with appropriate privacy and security measures in place.

Knowledge portals provide access to diverse enterprise content, communities, expertise, and to internal and external services and information (Collins, 2003; Firestone, 2003). Portals are a means of storing and disseminating organizational knowledge such as business processes, policies, procedures, documents, and other codified knowledge. They will typically feature searching capabilities through content as well as through the taxonomy (categorized content). The option to receive personalized content through push technologies as well as through pull technologies (intelligent agents) may exist. Communities can be accessed via the portal for communication and collaboration purposes. There may be a number of services that users can subscribe to as well as web-based learning modules on selected topics and professional practices. The critical content will consist of the best practices and lessons learned that have been accumulated over the years and to which many organizational members have added value to.

The purpose of a portal is to aggregate content from a variety of sources into a one-stop shop for relevant content. Portals enable the organization to access internal and external knowledge that can be consolidated, analyzed, and used as inputs to decision making. Ideally, portals will take into account the different needs of users and the different sorts of knowledge work they carry out in order to provide the best fit with both the content and the format in which the content is presented (the portal interface). Knowledge portals link people, processes, and valuable knowledge content and provide the organizational glue or common thread that serves to support knowledge workers. First generation portals were essentially a means of broadcasting information to all organizational members. Today, they have evolved into sophisticated shared workspaces where knowledge workers can not only contribute and share content but also acquire and apply valuable organizational knowledge. Knowledge portals support knowledge creation, sharing, and use by allowing a high level of bidirectional interaction with users.

Portals serve to promote knowledge creation by providing a common virtual space where knowledge workers can contribute their knowledge to organizational memory. Portals promote knowledge sharing by providing links to other organizational members through expertise location systems. Communities of practice will typically have a dedicated space for their members on the organizational portal and their own membership location system included in the virtual workspace. The portal organizes valuable knowledge content using taxonomies or classification schemes to store both structured (e.g., documents) and unstructured content (e.g., stories, lessons learned, and best practices). Finally, portals support knowledge acquisition and application by providing access to the accumulated knowledge, know-how, experience, and expertise of all those who have worked within that organization.

Mashups were discussed earlier in this chapter as a form of portal. Both Mashups and portals do aggregate content coming from different sources. However, there are some significant differences between the two tools. Portals are a somewhat older, more established tool that serves to aggregate vetted and validated content to be stored for future use in an organization. The purpose of a portal is to preserve organizational knowledge and to make it available to all employees. Portals are well defined, they often adhere to standards, and they are updated according to an established schedule and only by those authorized to do so. A portal is thus more formal in some ways. A mashup on the other hand, is more of a Web 2.0 application. Users tend to have complete control and autonomy in what they choose to aggregate, and this is often shared with others in a limited way (e.g., often within their own community of practice). Mashups may have a limited lifespan as they serve a specific purpose, such as putting together a presentation. Mashups are not necessarily formalized, nor do they need to be centralized in order to be useful (Wong & Hong, 2007).

Knowledge Acquisition and Application Tools

A number of technologies play an important role in how successful knowledge workers are in acquiring (i.e., understanding) and applying (i.e., making use of) knowledge content that is made available to them by the organization. E-learning systems provide support for learning, comprehension, and better understanding of the new knowledge to be acquired. Databases of best practices, lessons learned, and stories can help to apply knowledge that was captured and codified from experts. Tools such as EPSS, expert systems, and decision support systems (DSS) help knowledge workers to better apply the knowledge on the job. Adaptive technologies can be used to personalize knowledge content push or pull. Recommender systems can detect similarities or affinities between different types of users and make recommendations of additional content that others like them have found to be useful to acquire and apply. Knowledge maps and other visualization tools can help to better acquire and apply valuable knowledge and a number of tools derived from artificial intelligence can at least partially automate processes such as text summarization, content classification, and content selection.

E-learning applications started out as computer-based learning (CBT) and web-based training (WBT) applications. The common feature is the online learning environment provided for learners. Courses can now be delivered via the web or the company intranet. The particular knowledge and know-how to be acquired can be scoped and delivered in a timely fashion in order to support knowledge acquisition. E-learning technologies also greatly increase the range of knowledge dissemination as knowledge that has been captured and coded or packaged as e-learning can be easily made available to all organizational members, regardless of any time or distance constraints.

Databases remain the core KM technologies. All knowledge processes require some form of storage system or repository and these are almost always organized as databases to allow for easy finding and retrieving. The tagging system, or taxonomy, serves to associate key descriptive terms for each knowledge item, again, based on what the experts have explained. Each tag can then serve as a search term (e.g., a lesson learned theme such as "lack of clear leadership") to a specific data range or specific business unit that was involved in the original event. Databases are of two major types: lessons learned and expertise location systems (Becerra-Fernandez & Sabherwal, 2010). Lessons learned is a broad term that encompasses best practices and lessons learned. Expertise locator systems contain profiles of employees (more like a yellow pages) based on their expertise, while databases contain short descriptions of recommended procedures (best practices), procedures to avoid in the future (lessons learned), and tacit knowledge that is often best conveyed in stories.

Decision support systems are designed to facilitate groups in decision making. They provide tools for brainstorming, critiquing ideas, putting weights and probabilities on events and alternatives, and voting. Such systems enable presumably more rational and even-handed decisions. Primarily designed to facilitate meetings, they encourage equal participation by, for instance, providing anonymity or enforcing turn taking.

Visualization technologies and knowledge mapping are good ways of synthesizing large amounts of complex content in order to make it easier for knowledge workers to acquire and apply.

Artificial intelligence (AI) research addressed the challenges of capturing, representing, and applying knowledge long before the term knowledge management entered popular usage. AI developed automated reasoning systems that could make use of explicit knowledge representations in order to provide expert-level advice, troubleshooting, and other forms of support to knowledge workers. Expert systems are decision support systems that do not execute an a priori program but instead deduce or infer a conclusion based on the inputs provided. Natural language processing also grew out of AI research. Linguistic technologies resulted in automating the parsing (breaking into subsections) and analysis of text. Common applications today are voice interfaces or natural language queries that can be typed in to search databases. Similar AI technologies can also be applied to analyze and summarize text or to automatically classify content (e.g., automated taxonomy tools). Many of the automated reasoning capabilities studied in AI research were encapsulated in autonomous pieces of software code, called intelligent agents or software robots (softbots). These agents act as proxies for knowledge workers and they can be tasked with information-searching, retrieving, and filtering tasks.

Intelligent Filtering Tools

Intelligent agents can generally be defined as software programs, which assist their user and act on his/her behalf, such as a computer program that helps you in newsgathering, acts autonomously and on its own initiative, has intelligence and can learn, and improves its performance in executing its tasks (Woolridge & Jennings, 1995). They are autonomous computer programs, where their environment dynamically affects their behavior and strategy for problem solving. They help users deal with information. Most agents are Internet based, that is, software programs inhabiting the Net and performing their functions there.

The following features are necessary to define a true intelligent agent (Khoo et al., 1998):

1. Autonomy—the ability to do most of their tasks without any direct assistance from an outside source, which includes human and other agents, while controlling their own actions and states
2. Social ability—the ability to interact with, when they deem appropriate, other software agents and humans
3. Responsiveness—the ability to respond in a timely fashion to perceived changes in the environment, including changes in the physical world, other agents, or the Internet
4. Personalization—the ability to adapt to its users' needs, by learning from how the user reacts to the agent's performance
5. Initiative—the ability of an agent to take initiatives by itself, autonomously (out of a specific instruction by its user) and spontaneously, often on a periodical basis, which makes the agent a very helpful and time saving tool
6. Adaptivity—the capacity to change and improve according to the experiences accumulated. This has to do with memory and learning: an agent learns from its user and progressively improves in performing its tasks. The most experimental bots even develop their own personalities, and make decisions based upon past experiences
7. Cooperation—the interactivity between agent and user is fundamentally different from the one-way working of ordinary software

There are many knowledge management applications that make use of intelligent agents (e.g., see Elst et al., 2004). This range includes personalized information management (such as filtering email), electronic commerce (such as locating information for purchasing and buying), and management of complex commercial and industrial processes (such as scheduling appointments and air traffic control). These tasks/applications can generally be grouped into five categories (Khoo et al. 1998):

1. Watcher agents, which look for specific information
2. Learning agents, which tailor to an individual's preferences by learning from the user's past behavior
3. Shopping agents, which compare "the best price for an item"
4. Information retrieval agents, which help the user to "search for information in an intelligent fashion"
5. Helper agents, which perform tasks autonomously without human interaction

In the age of computers, information is readily available on the Internet, whether it is useful or useless. There is so much data available that we often claim to be overloaded with information. Having too much data can cause as much trouble as having no data, as we must shift through so much information to get what we need. We can categorize this information overload problem into two divisions:

1. Information filtering: We must go through an enormous amount of information to find the small portion that is relevant to us.
2. Information gathering: There is not enough information available to us and we have to search long and hard to find what we need.

Information filtering is a particularly important function in KM, as users need a way of filtering this data into a more manageable situation. Knowledge workers (such as managers, technical professionals, and marketing personnel) need information in a timely manner as it can greatly affect their success. Tasks that are redundant or routine need to be minimized by some individuals that can otherwise spend their time more productively (Roesler & Hawkins, 1994).

Some companies receive so much email that they have to employ clerical workers to sift through the flood of email, answering basic queries and forwarding others to specialized workers. Others use intelligent filtering software such as GrapeVine, which reads a preestablished knowledge chart to determine who should receive what mail. Intelligent agent services can supplement but not replace the value of edited information. As information becomes more available, it becomes more and more crucial to have strong editors filter that information (Webb, 1995). There is so much content out there that the tools that filter content are going to be as important as the content itself (Wingfield, 1995). As stated by the Rutherford Rogers, “we are drowning in information but starved for knowledge” (Rogers, 1985).

An end user, required to constantly direct the management process, is the contributing factor to information overload. But having agents to do the tasks such as searching and filtering can ultimately reduce the information overload to a degree. Maes (1994) describes an electronic mail filtering agent called Maxims. Maxims is a type of learning agent. The program learns to prioritize, delete, forward, sort, and archive mail messages on behalf of a user. The program monitors the user and uses the actions the user makes as a lesson on what to do. Depending upon threshold limits that are constantly updated, Maxims will guess what the user will do. Upon surpassing a degree of certainty, it will start to suggest to the user what to do.

Maes (1994) also describes an example of an Internet news-filtering program called NewT. This program takes as input a stream of Usenet news articles, and gives as output a subset of these articles that is recommended for the user to read. The user gives NewT examples of articles that would and would not be read, and NewT will then retrieve articles. The user then gives feedback about the articles, and thus NewT will then be trained further on which articles to retrieve and which articles not to retrieve. NewT retrieves words of interest from an article by performing a full-text analysis using the vector space model for documents. Google Alerts performs much the same tasks in filtering through information to send you an email alert. Some additional examples of information filtering agents are shown in table 8.3.

Table 8.3 Sample information filtering agents

Name	Description	Reference
Copernic	An agent that carries out Net searches by simultaneously consulting the most important search engines on the web	http://copernic.com
Cybersitter	Allows customizable blocking of content on social networking sites, online games, FaceBook, chats and posts and emails.	https://www.cybersitter.com/
ANZSI	Automated website indexing software	https://www.anzsi.org/resources/reading-lists/indexing-software/
Mobicip	Intelligent real-time content filtering agents.	http://content.mobicip.com/online-safety/content-filtering

News agents are designed to create custom newspapers from a huge number of web newspapers throughout the world. The trend in this field is toward autonomous, personalized, adaptive, and very smart agents that surf the Net, newsgroups, databases, and so forth, and deliver selected information to their users. “Push” technology is strictly connected to news bots development, consisting basically in the delivery of information on the web that appears to be initiated by the information server rather than by the client. Some examples are shown in table 8.4.

Table 8.4 Examples of personalized news services

Name	Description	Reference
Facebook	Newsfeed is personalized based on what you provide as feedback	http://time.com/collection-post/3950525/facebook-news-feed-algorithm/
LinkedIn Today	News curated based on what your social networks are sharing	https://www.linkedin.com/feed/
News360	Identified what you like and then finds stories for you from the web	https://news360.com/
FlipBoard	news-reading app that lets you create your own personalized news aggregator by incorporating your preferred sources, blogs and social networks.	https://flipboard.com/

Information overload is a problem of the world today, but intelligent agents help reduce this problem. Using them to filter the oncoming traffic of the information highway can help reduce cost, effort, and time.

Information studies research has studied information-seeking behavior for over five decades now and this research can serve as an excellent theoretical basis for the study of the Internet as an information source and intelligent agents as mediators in this digital environment (e.g., Kulthau, 1991, 1993; Rasmussen et al., 1994; Spink, 1997, Wilson, 1981, 1994, 1999). Detlor (2003) used a case study to explore how knowledge workers made use of Internet-based information systems and found that information studies theory provides an appropriate framework for examining Internet-based information seeking behaviors. Detlor et al. (2003) made use of a similar conceptual framework to explore goal-directed behavior in online shopping environments. Choo, Detlor, and Turnbull (2000) investigated how knowledge workers use the web to find information external to their organizations as part of their daily work life. A typology of different complementary modes of using the web as an information source was identified and described (e.g., formal search, informal search).

Detlor (2004) adopts an information vantage point and views enterprise knowledge portals as more than tools to merely deliver content but instead as shared workspaces that can facilitate communication and collaboration among knowledge workers. Intelligent agents can play a significant role to improve the interaction between knowledge workers and knowledge portals for the successful completion of everyday work tasks. Empirical research studies on information seeking helps define a web use model based on information-seeking motives and modes. The advantage of using a theoretical framework as a starting point is that online behavior and preferences can be better understood, explained, and predicted. These online behavioral preferences can then be used to better design both online environments and mediators such as intelligent agents.

Personal Knowledge Management (PKM)

“Personal capital” is a term coined by Cope (2000) as a divergence from the traditional notion of capital, which is an asset owned by an organization. In fact, the future of KM will blur the boundaries between the individual, the group or community, and the organization. KM will become a pervasive part of how we conduct our everyday business lives. Personalized KM (PKM) will gain increasing importance given the ever-increasing momentum of information overload that we must deal with. In other words, some of the key principles, best practices, and business processes of KM that have to date been focused at the organizational level will filter down to be used by individuals managing their own personal capital.

PKM and traditional knowledge management differ depending on whether an organizational or personal perspective is adopted. Tools for personal information management are impressive and, if you think about email and portals, are already widely used. Newer tools such as blogs, news aggregators, instant messaging, and Wikis represent a new toolset for PKM.

The personal portal, what was once an enterprise portal, is now focused around the needs of the individual—all of a person’s information and application needs harmoniously brought together and arranged to suit them on their desktop—mass customization in front of your eyes! Again, the aims are laudable, but reality and theory are often miles apart. PKM brings many of the key principles of KM to bear on the personal productivity and specific work requirements of a given knowledge worker. Definitions of PKM revolve around a set of core issues: managing and supporting personal knowledge and information so that it is accessible, meaningful, and valuable to the individual; maintaining networks, contacts, and communities; making life easier and more enjoyable; and exploiting personal capital (Higgison, 2004). On an information-management level, PKM involves filtering and making sense of information, organizing paper and digital archives, emails, and bookmark collections.

Adaptive Technologies

Adaptive technologies are used to better target content to a specific knowledge worker, or to a specific group of knowledge workers who share common work needs. Customization refers to the knowledge worker manually changing their knowledge environment, for example, selecting user preferences to change the desktop interface, specifying certain requirements in content to be provided to them (language, format), or subscribing to certain news or listserv services.

Personalization, on the other hand, refers to automatically changing content and interfaces based on observed and analyzed behaviors of the intended end user. For example, many MS Office applications offer the option of dynamically reordering pop-down menu items based on frequency of usage (the ones used most often will be displayed on the top). One way of automatically personalizing knowledge acquisition makes use of recommender systems. Recommendations regarding content that is likely to be considered useful and relevant by a given knowledge worker may be based on a user profile of that knowledge worker (e.g., with themes checked off) or the recommendation may be based on affinity groups. Affinity groups make use of similarity analysis of users in order to develop groups of individuals who appear to share the same interests. Amazon uses affinity groups for example, when after ordering a book online, visitors to the site are provided with information on related books that others who have bought the same book have also purchased.

Communities of practice are affinity groups to some extent. Personalization technologies are often used to target or push certain types of content that is of interest to a given community. Community profiles can be established just as individual profiles and used in the same manner in order to better adapt content and interfaces to the community members.

Strategic Implications of KM Tools

Historically, the IT horse has always been placed before the KM carriage and it is crucial to think of KM tools in strategic terms. It is often said that if we hold a hammer in our hand, then all the problems we see look very much like nails. It is important to avoid this bias in knowledge management. Tools and techniques are a means and not an end. The business objectives must first be clearly identified and a consensus reached on priority application areas to be addressed. For example, an initial KM application will typically be some form of content management system on an internally managed intranet site. This is a good building block for subsequent applications, such as yellow pages or expertise finders and groupware tools, to enable newly connected knowledge workers to continue to work together.

A number of the techniques presented here address the phenomenon of emergence that can help discover existing valuable knowledge, experts, communities of practice, and other valuable intellectual assets that exist within an organization. Once this is done, the intellectual assets can be better accessed, leveraged, and made use of. KM tools and techniques have an important enabling role in ensuring the success of KM applications.

Practical Implications of KM Tools

A number of techniques and tools, while never having been specifically developed for or targeted to KM applications, have proven to be quite useful. A pragmatic toolkit approach is needed for KM as there is no single end-to-end solution that can be simply bought "off the shelf" in order to address all the critical dimensions of a knowledge management initiative. It is therefore important to understand what is out there already and what some of the new emerging tools are in order to adapt them and make use of them for KM purposes.

Key Points

- Content creation and management tools are used to structure and organize knowledge content for each retrieval and maintenance.
- Groupware and other collaboration tools are essential enablers of knowledge flow and knowledge-sharing activities among personnel.
- Data mining and knowledge discovery techniques can be used to discover or identify emergent patterns that could not have otherwise been detected. Some of these may provide valuable insights.
- Intelligent filtering agents are a KM technology that can help address the challenges of information overload by selecting relevant content and delivering this in a just-in-time and just-enough format.
- A knowledge repository will often be the most used and most visible aspect of a KM technology. What are important are not so much the containers but the content and how this content will be managed.
- Knowledge management technologies help support emergent phenomena involved in the creation, sharing, and application of valuable knowledge assets.

Discussion Points

1. Discuss the pros and cons of the major technologies used in:
    a. The knowledge creation and capture phase
    b. The knowledge sharing and dissemination phase
    c. The knowledge acquisition and application phase
2. Data mining technologies can be used on a number of different types of knowledge content. What are the major categories and what sorts of patterns would this technology detect?
3. Describe an application of blog technology within an organization. What potential benefits would accrue to the individual, the community of practice, and to the organization as a whole if blogs were implemented?
4. How would you categorize the different forms of groupware or collaboration technologies? What sort of criteria would you make use of in order to determine when and where each type would be the best means of sharing and disseminating knowledge? How would you adopt a cost–benefit approach to such a technology selection decision?
5. What role can a Wiki play in promoting group collaboration? What advantages does a Wiki offer when compared to a discussion forum?
6. What role is played by e-learning tools in knowledge management?
7. How can intelligent agents help knowledge workers find relevant knowledge content?
8. Describe how you would attempt to accommodate different user skill levels and expectations in the same organization. In particular, what type of tools would be recommended for the baby boomer versus the millennial generation of technology users?
9. Select one new emerging technology and list its potential uses for knowledge management. Make the connection between what the technology offers and each phase of the KM cycle. For example, are some tools better suited to knowledge capture or knowledge sharing?
10. Select any KM technology and describe how it may be applied at the individual, group, and organizational level. Would they require different degrees of standardization? Maintenance? Training?

Notes

1. See http://www.businessdictionary.com/definition/analytics.html.
2. See https://www.merriam-webster.com/dictionary/crowdsourcing.
3. See http://searchbusinessanalytics.techtarget.com/definition/data-visualization.
4. See http://www.socialmediaexaminer.com/how-ibm-uses-social-media-to-spur-employee-innovation.

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9 Knowledge Management Strategy and Planning

> You have to be fast on your feet and adaptive or else a strategy is useless.
> —Charles de Gaulle (1890–1970)

This chapter addresses the common building blocks that are developed in order to be able to apply and gain benefits from KM applications. The major steps involved in developing a knowledge management strategy are presented: the knowledge audit, the gap analysis, the elicitation of KM objectives, the short-term roadmap and the long-term KM strategy. The general KM objectives of innovation and reuse will be discussed in terms of how best to balance creativity with organizational structure. The use of organizational and KM maturity models in order to situate the current and desired future state of KM readiness of an organization will be discussed. Finally, different types of leadership and their roles in knowledge management are also addressed.

Learning Objectives

1. Provide examples of major KM objectives and how specific KM initiatives can be implemented to address them.
2. Illustrate the major elements of a KM strategy and discuss the processes involved in each step.
3. Outline the key steps in the evolution of an innovative new idea and the institutionalization of a best practice that forms the object of reuse.
4. Describe the major strengths and weaknesses of different maturity models in terms of how they can be used to assess progress toward KM goals.
5. Discuss and evaluate the different approaches that may be undertaken in order to achieve an optimal balance between creativity and organizational structure.
6. List the different types of knowledge assets that result from KM initiatives.
7. List the major phases involved in initiating organizational change and review how the organizational culture would have to evolve so that KM goals can be attained.

Introduction

This chapter introduces the addition of a sound KM strategy that is linked to the overall business objectives of the organization to the integrated KM cycle (see figure 9.1).

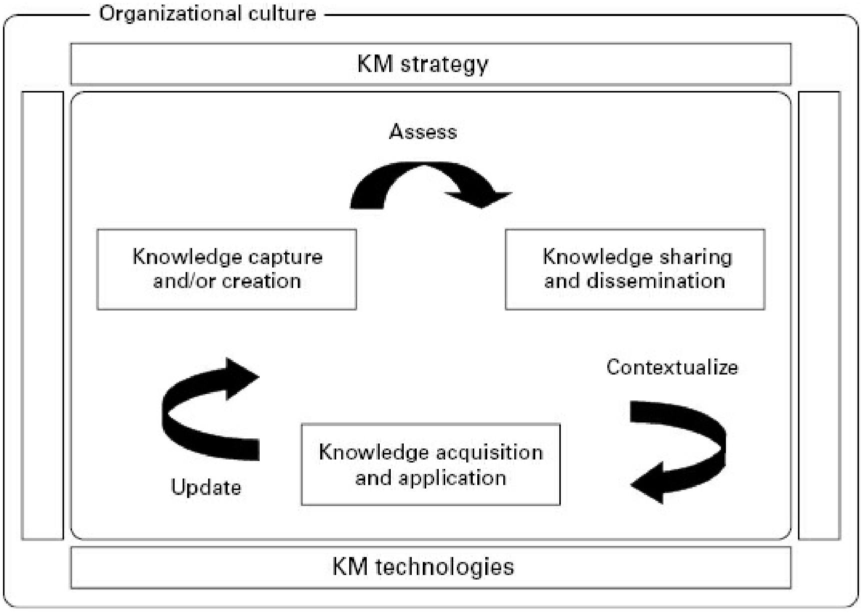

Figure 9.1 An integrated KM cycle

The two most commonly encountered objectives of knowledge management are innovation and reuse. Innovation is closely linked to the generation of new knowledge or new linkages between existing knowledge. It is a popular misconception, however, to think that innovation occurs in isolation—in fact, innovation rests firmly on a large body of accumulated experiences, both positive and negative, based on what has worked and what has not worked in the past. Creativity often involves lateral thinking such as seeing an analogy in a completely different context. Similarly, reuse is often mistakenly equated with dull, routine, and unproductive work. In actual fact, reuse forms the basis for organizational learning and should be viewed more as a dissemination of innovation.

An evolutionary framework begins to emerge, one in which new knowledge in the form of innovations eventually ends up becoming incorporated into organizational memory to form the object of reuse so that the benefits of this new knowledge and know-how can be spread throughout the organization. The KM strategy provides the basic building blocks used to achieve this organizational learning and continuous improvement so as to not waste time repeating mistakes and so that everyone is aware of new and better ways of thinking and doing. In addition, there will be a number of important knowledge by-products that should be recognized and inventoried as knowledge assets of the organization. These will typically include familiar, tangible items such as patents as well as "softer" or more intangible assets such as core competencies.

Sveiby (2001) developed a framework for categorizing the different types of KM initiatives. He uses three categories:

1. External structure initiatives (e.g., gain knowledge from customers, offer customers additional knowledge)
2. Internal structure initiatives (e.g., build a knowledge-sharing culture, create new revenues from existing knowledge, capture individuals' tacit knowledge, store it, spread it, and reuse it, and measure knowledge-creating processes and intangible assets produced)
3. Competence initiatives (e.g., create careers based on KM, create microenvironments for knowledge transfer and learn from simulations and pilot projects)

Lev (2001) uses different labels for the three main nexuses of sources of intangibles:

1. Discovery (innovation)
2. Organizational practices

3. Human resources

The sources of innovation and knowledge reuse consist of either internal or external discoveries, or stem from business practices or from knowledge workers' competencies. More often than not, improvements will result from some combination of these types of sources, as is illustrated in box 9.1.

Box 9.1
An example: The World Bank

The World Bank has distinguished itself as a KM leader due to the swiftness with which it was able to transform itself into the "knowledge bank" within only four years (Pommier 2007). One of the major concerns that drove this transformation was being able to answer queries faster and better—by drawing upon the collective knowledge of the Bank. In addition, the Bank faced the challenges of multiple databases and repositories, different IT groups and tools, inconsistent information, and poor documentation and control. The World Bank thus developed their KM mission statement: to develop a world-class repository of their development experience and their cumulative knowledge.

One of the major success factors behind this rapid transformation was due to an innovative technique, storytelling, which just happened to be developed by one of their own employees, their KM champion, Stephen Denning. In fact, Denning came up with the idea of a springboard story based on his years of frustration at trying to "explain" KM and why they needed it to senior managers at the Bank. His idea was a story that would help the audience—managers and decision makers—use the story as a springboard to leap to an intuitive understanding of KM. Here is the story Denning used:

> A health care worker in Zambia needed an antimalarial preparation using only materials he had on hand. He sent a query via the World Bank's website and he had a workable solution within 48 hours. He was able to harness the collective experience, expertise, and know-how of the World Bank to come up with the best possible answer in a timely way.

The World Bank KM program was off and running. The World Bank transformed itself into a knowledge bank through its strategic goal of putting knowledge at the core of the World Bank's work. The elements of this strategy included:

1. People: A focus on knowledge workers and connecting them via knowledge communities (communities of practice)
2. Culture: Shifting the culture from an individualistic focus to a team and knowledge-sharing culture
3. Accountability: Clear roles and responsibilities established for knowledge managers and coordinators
4. Technology: System to capture, organize, and disseminate knowledge to all stakeholders of the Bank
5. Process: Implement a series of small steps or quick hits and continually promoted awareness and buy-in through "relentless repetition"

The World Bank has implemented corporate portals, knowledge repositories (including image banks), a library of learning objects, video on demand and web casting content, a live database, an expertise location system, communities of practice (called"thematic groups"), after action reviews, peer learning, and field visits and site tours to enhance learning. The major focus was on the thematic communities to restructure the Bank. Today, there are about 123 thematic groups or communities of practice overseeing key areas such as poverty, community development, and rural information technology infrastructures.

A small KM Board comprised of five people oversees all communities of practice. This core KM team has overall coordination and facilitation responsibilities. They identify any synergies or redundancies among communities, they identify opportunities for cross-community knowledge sharing, they provide the link to organizational learning and corporate memory systems, and they assess the value of the outputs of each of the communities. A KM council is the governance body that provides overall KM policy formulation and has KM responsibility at the corporate level. In addition, knowledge sharing is one of the four key behaviors that are evaluated in performance evaluations. Usage and application of knowledge are behaviors that are rewarded—not numbers of hits or postings on the intranet site. This is the major contribution required from the Human Resources department. The World Bank spent roughly 3 percent of its total administrative budget on KM. Of this, less than 10 percent was on technology (web, telephone, email, and videoconferencing) and 2 percent was for the operating costs of the central KM unit. The rest went to financing the thematic groups and the knowledge support office (KSO).

Operational managers in the communities and the regions are responsible for implementing KM. Measurement, accountability, and budgets reside within the regions. Two major forms of support are required from senior managers: that community of practice leaders spend approximately 25 percent of their time on knowledge management activities and that communities are supported by KSOs that are best described as knowledge help desks.

The World Bank has established cost-effective, global connectivity with developing countries to facilitate collaboration between offices, extend operational and administrative information to staff at any location, and reduce the cost of doing business. For example, the Bank provides an electronic venue for dialogue and knowledge sharing among members of the development community. The Development Gateway is an Internet portal that supports knowledge sharing and interactions to address the digital divide and poverty. More than 13,000 staff in 80 countries are now linked together with high speed and high quality so that everyone has access to the same work tools and information. With the knowledge management system in place, the World Bank is able to provide not only new services but higher quality services.

A primary indication that the World Bank made effective use of its knowledge is the culture of organizational innovation and entrepreneurialism that was fostered partly as a result of knowledge management and sharing initiatives. Some of the key concerns of the World Bank, such as timeliness or speed of creation of new knowledge and access to knowledge-sharing methods and innovation, were also the focus of measurements undertaken. While it may be impossible to determine the contribution of KM with complete accuracy, as is the case with most intangibles, it is possible to talk about the contributing role of KM. In evaluating KM, a holistic approach was used in order to take into account human and social as well as technological critical success factors.

In 2000, the World Bank was found by the American Productivity and Quality Centre (APQC) to be one of the five global best practice leaders. By 2001, the World Bank received fourth place in the Most Admired Knowledge Enterprises Award and was recognized again in 2002, 2003, and 2004. The organizations in this study are recognized for their world-class efforts to managing knowledge that leads to superior performance. Knowledge sharing became a way of doing business at the Bank.

A knowledge management strategy should target one or more of these objectives but the strategy must go further than high-level goals. Robertson (2004) points out that a good KM strategy should identify the key needs and issues within the organization, and provide a framework for addressing these. A number of different types of business needs may trigger the need for KM. The most commonly encountered business drivers include:

1. Imminent retirement of key personnel
2. Need for innovation to compete in dynamic, challenging business environment
3. Need for internal efficiencies in order to reduce costs and effort (e.g., time to market a new product)

The resources and skills required to develop a KM strategy depend on the size and complexity of the organizational unit and on the depth of information gathering and analysis. The ideal mix of skills on the KM strategy team would be a KM expert, access to people who are knowledgeable about the organization, and a KM advocate who will *sell* the strategy to the senior member of management who mandated the strategy development.

Developing a Knowledge Management Strategy

A KM strategy is a general, issue-based approach to defining operational strategy and objectives with specialized KM principles and approaches (Srikantajah & Koenig, 2000). The result is a way of identifying how the organization can best leverage its knowledge resources. Once this fundamental KM strategy is defined, baselining and technology options may be explored. A KM strategy helps address the following questions:

1. Which KM approach, or set of KM approaches, will bring the most value to the organization?
2. How can the organization prioritize alternatives when any one or several of the alternatives are appealing and resources are limited?

Once the KM strategy is defined, the organization will have a road map that can be used to identify and prioritize KM initiatives, tools, and approaches in such a way as to support long-term business objectives. The strategy is used to define a plan of action by undertaking a gap analysis. The gap analysis involves establishing the current and desired states of knowledge resources and KM levers. Specific projects are then defined in order to address specific gaps that were identified and agreed upon as being high-priority areas.

A good KM strategy is comprised of the following components:

1. An articulated business strategy and objectives
   a. Products or services
   b. Target customers
   c. Preferred distribution or delivery channels
   d. Characterization of regulatory environment
   e. Mission or vision statement
2. A description of knowledge-based business issues
   a. Need for collaboration
   b. Need to level performance variance
   c. Need for innovation
   d. Need to address information overload
3. An inventory of available knowledge resources
   a. Knowledge capital: tacit and explicit knowledge, know-how, expertise, and experience in the minds of individuals and in communities or embedded in work routines, processes, procedures, roles, and artifacts such as documents or reports
   b. Social capital: culture, trust, context, the informal networks, and reciprocity (e.g., willingness to experiment, take risks, or be able to fail without fear of repercussions)
   c. Infrastructure capital: physical knowledge resources (e.g., LAN/WAN, file servers, intranets, PCs, applications, physical workspaces and offices, and the organizational structure)
4. An analysis of recommended knowledge leverage points that describes what can be done with the above-identified knowledge and knowledge artifacts and that lists KM projects that can be undertaken with the intent to maximize ROI and business value, for example
   a. Collect artifacts and exploit them (e.g., best practices database, lessons learned database)
   b. Store for future use (e.g., data warehouses, intelligence gathering for specific issue/problem, data mining, text mining)
   c. Focus on connecting; connect knowers to each other and to a problem through communities of practice or expertise location systems; hypothesize to carry out scenario planning and informal cross-pollination to produce new insights and breakthrough thinking

The major steps involved in developing a KM strategy are to first understand the organization in terms of its current state (as is) and its desired business objectives (to be). The analysis of the difference between the two states is often referred to as a gap analysis and the means of getting from the “as is” to the “to be” is often represented in the form of KM strategic road map. The road map typically represents a three- to five-year strategy with clear milestones or targets to be achieved throughout that time.

The current or baseline state of the organization is assessed using information gathered from a variety of sources such as key documents (e.g., annual report) and by interviewing key stakeholders (e.g., senior managers, human resources, information technology, and major business unit managers). It is at this point that existing KM initiatives will also be identified in the form of a knowledge audit or inventory.

Knowledge Audit

A knowledge audit service identifies the core information and knowledge needs and uses in an organization. It identifies gaps, duplications, flows, and how they contribute to business goals. A knowledge inventory (sometimes called an information audit or a knowledge map) is a practical way of coming to grips with “knowing what you know” by applying the principles of information resources management (IRM). A knowledge audit identifies owners, users, uses, and key attributes of core knowledge assets. Willard (1993) discusses five key activities of IRM:

1. *Identification.* What information is there? How is it identified and coded?
2. *Ownership.* Who is responsible for different information entities and coordination?
3. *Cost and value.* A basic model for making judgments on purchase and use
4. *Development.* Increasing its value or stimulating demand
5. *Exploitation.* Proactive maximization of value for money

A knowledge audit is often carried out in conjunction with a knowledge management assessment, which provides a baseline on which to develop a knowledge management strategy (Skyrme, 2001). This typically involves taking stock of current KM capabilities and is often carried out as part of a KM strategy formulation exercise.

A knowledge audit would result in the following types of results:

- Identification of core knowledge assets and flows—who creates, who uses
- Identification of gaps in information and knowledge needed to manage the business effectively
- Areas of information policy and ownership that need improving
- Opportunities to reduce information handling costs
- Opportunities to improve coordination and access to commonly needed information
- A clearer understanding of the contribution of knowledge to business results

An example from Northrop Grumman is provided in box 9.2.

Box 9.2
An example: Northrop Grumman

Northrop Grumman faced consolidation and downsizing during the late 1990s. The Air Combat Systems (ACS) group in particular was in danger of losing the expertise it needed to support and maintain a complex machine that would be flying—carrying precious lives and cargo—for years to come. So ACS instituted KM procedures designed to capture the so-called tacit knowledge (or know-how and experience) about the B-2 that was locked in its employees' heads. But before designing a program, ACS wanted to find out what barriers, if any, prevented employees from sharing knowledge with their peers. With a good picture of the knowledge culture attitudes, ACS would then have a better road map for designing a unit-wide KM program. They conducted a knowledge audit, surveying employees about their knowledge-sharing habits and polling nearly 5,000 employees with a 97-question survey (KM2) to determine their knowledge needs, sharing practices, and prejudices. The survey asked questions such as, "From your perspective, to what extent is the knowledge that you and your team generate reused by other teams?" This not only highlighted ACS's readiness for a formal KM effort but also pointed out areas where sharing was not happening. The Delphi group was hired to conduct the audit and derive a baseline pulse of the unit's knowledge-sharing culture. Participation was voluntary—employees were given a free lunch for giving thirty minutes of their time. The survey response rate was better than 70 percent (typically, mail-in surveys return a 10–30 percent response). Delphi consultants analyzed the preliminary results and targeted 125 employees for face-to-face follow-up interviews.

ACS had established a 10-person KM team to identify subject matter experts and capture the content of their expertise. After creating about 100 knowledge cells and identifying 200 subject matter experts within those cells, the KM council turned their attention to knowledge capture. The team created websites for each of the knowledge cells and logged information about the knowledge experts into an expertise location system called Xref, short for cross-reference. Using Xref, employees can search for information in any number of ways, including by employee name, program affiliation, or skill area. If, for example, the B-2 landing gear is locking up, one can find the landing gear expert through Xref. The knowledge audit helped ensure that this centralized database would not only be useful but would actually be used.

The results of the knowledge audit confirmed that employees were eager to share their knowledge in an automated, centralized system but that challenges, such as integrating the systems across lines of business, remained. The willingness of employees to participate in systems intended to minimize the impact of their own eventual layoff is, of course, highly dubious. Other key findings showed employees recognized the value of their fellow employees' expertise, they spent at least eight frustrating hours each week looking for information they needed to do their job (costing $150 million annually), only 6 percent of their knowledge was reused by others, and 31 percent believed that ideas generated by junior staffers were not valued and were likely to get smothered by ACS's bureaucracy.

ACS's knowledge strategy based on these results made use of three dimensions. (1) On the human side, the KM team set out to identify experts and CoPs to facilitate sharing among employees (e.g., the CoP of project managers on different ACS programs). CoPs exist informally—it is important to identify the ones that are strategically important, raise their visibility, provide funding, and support systems for them. (2) On the process side, the KM team focused on finding out how people captured, organized, and reused existing knowledge. A central repository was created to amalgamate knowledge previously found in personal employee files in order to share lessons learned. The F/A-18 fighter jet program, for example, now has a web-based system that capitalizes on years of technical expertise by tracking structural problems with the aircraft. When an issue arises—a cracked part, for example—the first thing an engineer does is search the tracking system's 900 previously encountered experiences. If it is a new problem, he inputs the relevant information using a PowerPoint template that can include pictures, drawings, and notes on the appropriate sections. Each week, engineers meet to discuss unresolved issues. Once it is resolved, it is automatically entered as a lessons learned. (3) The technology piece of the strategy serves as the glue lashing the KM initiative together—the homegrown Xref system, collaboration applications, and document management systems. The five technology areas are: portals, expertise location, knowledge capture, media management, and collaboration, which address the key barriers found in the knowledge audit: paper-based filing systems, disparate locations, and inability to locate internal expertise. Other initiatives, including portals that push personalized information, are in pilot phase. The KM team plans to conduct follow-up audits every 18 months or so to keep tabs on the evolution of KM initiatives and the knowledge-sharing culture.

A knowledge management program or system should never be implemented without a knowledge audit having been conducted. Most importantly, the precursor to spending a lot of money on knowledge management technology is a proper knowledge audit to determine exactly what tools and solutions are most appropriate to enable better knowledge management by the knowledge people in the organization. It is people that will be required to use the newly procured technology and adapt to the new KM system. It is therefore prudent that every attempt be made to consult with all or most knowledge people in the organization before any KM system is purchased and implemented. This is where the knowledge audit plays a pivotal role in a new knowledge management initiative. The company's knowledge people are the core of its knowledge audit and hence no knowledge person should be marginalized during the knowledge audit initiative/process.

Box 9.3
A vignette: How do we know they need KM?

More often than not, KM practitioners find themselves facing an organization that is convinced they need KM but cannot say why. In one large business unit, the stakeholders repeatedly insisted that knowledge sharing was blocked and no one knew whom to turn to for expert advice. They were convinced that "KM issues" were preventing them from carrying out one of the major mandates that was to assess the environmental health of a particularly sensitive area. Upon conducting an audit, the results quickly aggregated into one very strong theme: that of information management. Most respondents felt that they were great at sharing knowledge but they just could not get their hands on the data and information they needed. Some data sets were found to be over fifty years old but also still critically needed to do trend analyses—and these old data sets were on a medium that no one had a reader for. One was eventually tracked down in an archive and the data was transferred to more modern media for preservation. A second data set was sitting in cardboard boxes because the scientist in charge of the project had retired. Actually, the boxes were originally in the scientist's basement and his family contacted the company when he passed away, asking if they would like the boxes. The only drawback: the key needed to decode the data was nowhere to be found. A Library and Information Studies intern had developed the key as a classification and finding aid fifteen years earlier and no one had thought to make a backup of the key.

The knowledge audit results showed problems existed at the information access, preservation, and retrieval levels. Much like the old adage that one should "learn to walk before running a marathon," this particular organization did not have a good sense of where the immediate needs lay. KM was relegated to a more long-term strategy recommendation and the action plan addressed more pressing information management concerns, which will in turn be needed to provide a solid infrastructure for knowledge management.

It is of vital importance that an organization's knowledge management initiators or practitioners always seek to assess the company's current knowledge management health before proceeding to implement knowledge management. The knowledge audit serves the purpose of providing evidence-based information and knowledge of the audited units' current knowledge status or knowledge health. This evidence-based knowledge is the launching pad into a new knowledge management program. The knowledge audit is also extremely useful as a regular review and assessment of existing knowledge management practices in the company. Management and exploitation of corporate knowledge is intrinsically intertwined in the corporate knowledge culture, which is in turn determined and maintained by the corporate knowledge people. This is why a knowledge audit must be people-focused.

Stakeholder interviews can help identify key knowledge needs to yield a knowledge map (Robertson, 2004). Sample questions will typically include:

- What is your job role and major responsibilities?
- How long have you been working for the organization?
- Who do you communicate with most frequently on work matters?
- Do you have policies or guidelines for your work? If so, how do you access these?
- What information do you rely upon during a normal working day? Where do you obtain this?
- If you have a question, where do you go to find the answer?
- Who asks you what types of questions?
- What sort of orientation and refresher training have you received?
- How do you find out what is happening in the organization?
- What sorts of news do you read regularly?
- What type of knowledge is needed to do your work?
- How do you add value to the organization? Where do your knowledge artifacts reside?
- How could knowledge flow be improved, in your opinion?

- What would make your work easier?

A knowledge audit is typically carried out by interviewing individuals or groups or by administering a survey questionnaire. It is highly recommended that audit questions be prepared ahead of time even if the interview method is chosen. A comprehensive questionnaire can serve as either a web-administered survey or as an interviewing guide. Table 9.1 highlights some of the knowledge categories in a knowledge audit, such as what you need to know to do your job (e.g., a professor needs to know how to teach, conduct research, and supervise graduate students; a lawyer needs to know about legislation; a doctor needs to know about diagnostic techniques, and so on).

Table 9.1 Sample knowledge audit questionnaire

Question number	**Question text**
1.	List specifically the categories of knowledge you need to do your job.
2.	Which categories of knowledge listed in question 1 are currently available to you?
For each category of knowledge you specified in question 1, answer the following:	
3.	How do you use this knowledge? Please list specific examples.
4.	From how many sources can you obtain this knowledge? Which sources do you use? Why?
5.	Beside yourself, who else might need this knowledge?
6.	How often would you and the others cited in question 5 use this knowledge?
7.	Who are potential users of this knowledge who may not be getting the knowledge now?
8.	What are the key processes you use to obtain this knowledge?
9.	How do you use this knowledge to produce a value-added benefit to your organization?
10.	What are the environmental/external influences impacting this knowledge?
11.	What would help you identify, use, or transform this knowledge more effectively?
12.	Which parts of this knowledge do you consider to be (a) in excess/abundance? (b) sparse? (c) ancient/old/outlived its useful life?
Answer the remaining questions for knowledge you make use of in general:	
13.	How is knowledge currently being delivered? What would be a more effective method for delivering knowledge?
14.	Who are the experts in your organization housing the type of knowledge you need?
15.	In what form is the knowledge that you gained from the experts?
16.	What are the key documents and external resources that you use or would need to make your job easier?
17.	What are the types of knowledge that you will need as a daily part of your job (a) in the short term (1–2 years)? (b) in the long term (3–5 years)?
18.	What kinds of knowledge do you reuse? Can you think of examples where reuse would be beneficial but it is not being done?
19.	What types of questions do you have for which you cannot find the answers? Are these questions related to your job performance or to administrative procedures?
20.	What kinds of questions do you ask repeatedly?
21.	Do you know whom you should direct your question to?
22.	What kinds of questions are you asked? What do you do if you don’t know the answer?
23.	What mechanisms might be helpful for encouraging knowledge sharing and transfer in your organization?

24.	What aspects of your organization seem to provide barriers to effective KM? What constraints impede knowledge sharing and transfer?
25.	What are the main reasons why you could have made errors/mistakes on the job?
26.	If your organization has considered outsourcing in the last 5 years, (a) in what areas was outsourcing considered? (b) if outsourcing was rejected, why? (c) if outsourcing occurred, why?
27.	How much time do you spend looking for knowledge (a) in a given day? (b) in a given week?

Source: Adapted from Liebowitz et al. 2000, 6.

Knowledge mapping is an ongoing endeavor—not a one-time activity. The knowledge map is a navigation aid to explicit/codified information and tacit/uncodified knowledge (Grey, 1999). The map should provide an inventory and evaluation of intellectual or knowledge assets of an organization.

Once the "as is" portrait of the organization has been completed through information gathering and the knowledge audit, a gap analysis can be performed.

Organizational Maturity Models

Another type of knowledge audit looks at the overall maturity level or organizational readiness for KM. The notion of an optimal point or a threshold point that should be reached before effective knowledge management can be implemented is inherent in a number of organizational, KM, and community maturity models.

Maturity models have their roots in software engineering. The Carnegie Mellon Software Engineering Institute defines a maturity model as "a descriptive model of the stages through which organizations progress as they define, implement, evolve, and improve their processes. This model serves a guide for selecting process improvement strategies by facilitating the determination of the current process capabilities and the identification of issues most critical to quality and process improvement within a particular domain, such as software engineering or systems engineering" (Grenier, 2007, p. 1). There are a number of organizational and KM maturity models, most derived from the Capability Maturity Model, CMM (Paulk et al., 1995). The CMM was developed to better describe the phases of software development processes and the model was subsequently updated to the Capability Maturity Model Integration in 2000 (CMMI Project Team, 2002).

The Capability Maturity Model is an organizational model that describes five evolutionary stages (levels) in which an organization manages its processes. An organization should be able to absorb and carry its software applications. The model also provides specific steps and activities to get from one level to the next.

The five stages of the CMM are:

1. *Initial.* Processes are ad-hoc, chaotic, or not well defined.
2. *Repeatable.* Basic processes are established and there is a level of discipline to stick to these processes.
3. *Defined.* All processes are defined, documented, standardized, and integrated into each other.
4. *Managed.* Processes are measured by collecting detailed data on the processes and their quality.
5. *Optimizing.* Continuous process improvement is adopted and in place by quantitative feedback and from piloting new ideas and technologies.

CMM is useful not only for software development, but also for describing evolutionary levels of organizations in general. The CMM and the CMMI can be extended to cover knowledge management processes that can in turn serve to assess the current level of readiness of an organization for knowledge management. For example, the maturity model shown in figure 9.2 shows the major phases that an organization has to complete in order to integrate a new way of doing things, a new technology, or a new process. This is very relevant for KM initiatives as new processes and technologies will be introduced into the organization. These phases can help better track how well KM has been accepted as a way of doing business within the organization.

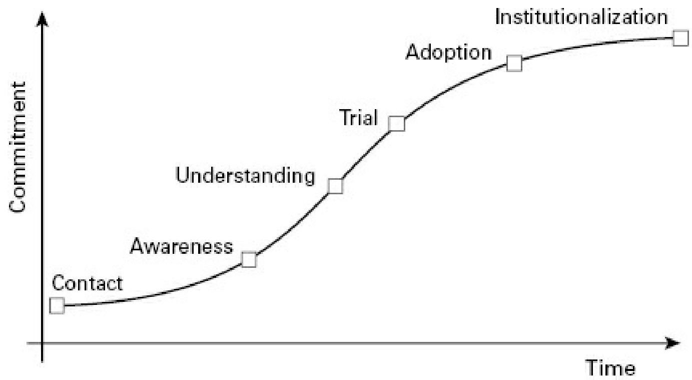

Figure 9.2 Organizational maturity model

Table 9.2 shows a maturity model based on CMM but adapted in particular to organizational change and organizational cultural dimensions. This model serves as a good organizational culture diagnostic in that it is a fairly straightforward task to establish the status quo a given organization is in. For example, if the organization exhibits multiple local cultures that do not, as yet, have much in common, then it would be advisable to select one or more of these microcultures as pilot sites for KM interventions. If, on the other hand, the organizational maturity stage were closer to a managed phase where there is more pervasive and cohesive culture, then it would be advisable to focus on tightly aligning the KM strategy to the overall business strategy and objectives of the organization.

Table 9.2 Stages of organizational maturity

Maturity phase	Description
1. Chaotic	• Noncohesive culture • Decision making in-flight • Leadership structure vague • Operation model undefined • Employees evaporating
2. Ad hoc	• Multiple local cultures, leadership structures, and operation models • Local decision making • Employee turnover high except in preferred classes of employees
3. Organized	• Similar local cultures • Local decision making based on corporate strategy • Local leadership linked to corporate leadership team • Corporate operation model pushed down to local level • Stable employee base
4. Managed	• Cohesive corporate culture and operation model • Corporate strategy drives operational tactics • Corporate leadership team coaches and empowers local leaders • Employees recruited and retained based on strategic direction
5. Agile	• Culture adapts strategically • Operation model changes dynamically based on environmental changes • Professionals compete to work for corporation

Source: Adapted from Fujitsu Consulting.

KM Maturity Models

There are currently a half a dozen or so knowledge management maturity models. One of the ones that have been implemented in a variety of organizations to date is the Infosys model (Kochikar, 2000) shown in table 9.3. The Infosys model is also consistent with the others in that it is based on the CMM approach. In fact, the Infosys model is denoted KMM in honor of the CMM on which it is based. The five levels are: default, reactive, aware, convinced, and sharing. The model associates a number of key results for each of the five levels.

Table 9.3 The Infosys KM maturity model

Level	Organizational capability	Characteristics/key result areas
1. Default	Complete dependence on individual skills and abilities	Unstructured on-the-job learning, accidental knowledge reuse, informal knowledge sharing, teamwork virtually nonexistent.
2. Reactive	Ability to perform tasks constituting the basic business of the organization repeatedly	People are aware of knowledge as an asset through formal training and mentoring, some pockets of knowledge sharing, sporadic knowledge reuse, and some teamwork.Process focus is on basic content capture.Technology is information management.
3. Aware	Restricted ability for data-driven decision making Restricted ability to leverage internal expertise. Ability to manage virtual teams well	People are educated on KM, some environmental scanning and knowledge dissemination Process of content structure management, taxonomy of knowledge. Knowledge technology infrastructure (e.g., portal).Dedicated KM group.
4.	Quantitative decision	Customized enabling.

Convinced	making for strategic and operational applications is widespread High ability to leverage internal and external sources of expertise. Organization realizes measurable productivity benefits through knowledge sharing Ability to sense and respond proactively to changes in technology and business environment	Value-added content. Quantitative KM processes (e.g., KM metrics such as percentage of content used, quality ratings). Knowledge infrastructure management for sustainable KM.
5. Sharing	Ability to manage organizational competence quantitatively Strong ROI-driven decision making Streamlined process for leveraging new ideas for business advantage Ability to shape change in technology and business environment	Expertise integration (content and expertise available organization-wide). Knowledge leverage through frictionless knowledge flows Innovation management and cohesive teamwork.

The Infosys model is much more closely linked to specific KM behaviors that can be detected at the organizational, group, and individual levels. It is possible to make much more fine-grained or specific types of organizational diagnoses in order to establish the current status quo of an organization. For example, if it is possible to detect that the majority of the KM effort appears to be devoted to the capturing of content, then KM initiatives aimed at promoting knowledge sharing would be considered to be premature at this stage. Instead, the KM objective targets reuse when the organization is at the reactive level of organizational capability. In time, however, as KM awareness is increased and knowledge flows appear between disparate groups, then the organization can be diagnosed as being at the sharing level of organizational capability. At the sharing level, KM initiatives such as corporate yellow pages or expertise location systems would be more appropriate priorities.

Paulzen and Perc (2002) have proposed a knowledge process quality model (KPQM) based on the major tenets of quality management and process engineering. The underlying premise is that knowledge processes can be improved by enhancing the corresponding management structures. The maturity model makes it possible to implement a systematic or incremental KM implementation. The authors make the assumption that since software development is a knowledge-based activity, it is valid to adapt these models for KM. The Paulzen and Perc (2002) model is essentially a modification of the Capability Maturity Model (CMMI Project Team, 2002) that addresses the specific characteristics of knowledge processes and KM systems. The maturity model consists of five phases: (1) initial, (2) aware, (3) established, (4) quantitatively managed and (5) optimizing, as shown in table 9.4.

Table 9.4 The KPQM maturity model

Maturity phase	Description
1. Initial	Knowledge process quality not planned, changes randomly (chaotic).
2. Aware	Need for quality has been recognized and initial structures have been put into place.

3. Established	There is systematic structure and definition of knowledge processes and they are specifically tailored to needs identified.
4. Quantitatively managed	Performance measures are used to plan and track knowledge processes.
5. Optimizing	Structures implemented to ensure continuous improvement and self-optimization of knowledge processes.

Note that there is a good fit with the organizational maturity models presented earlier. The major advantage of these models is that they enable organizations to progress in an orderly manner, without skipping any important stages, in order to achieve the desired end results of effective knowledge transfer, sharing, storing, and distributing of experiences, learning from past experiences, and so forth.

Table 9.5 shows the Forrester Group KM maturity model, which describes the different stages of maturity in terms of how people are supported throughout the knowledge management cycle. In the first phase, assisted, other people are needed in order for knowledge workers to find valuable content and connect with subject matter experts. In the second phase, self-service, employees are able to make use of KM systems such as knowledge repositories, in order to find content and link to experts by themselves. In the final phase, organic, knowledge management has ceased to be an “extra” burden but has instead become part and parcel of how the knowledge work gets done every day.

Table 9.5 Forrester Group KM maturity model

KM maturity model phase	Description	Typical KM initiatives
1. Assisted	• Culture adapts strategically • Operation model changes dynamically based on environmental changes • Professionals compete to work for corporation • Employees find info with the help of librarians	• KSO • Yellow pages • Communities of practice
2. Self-service	• Employees codify on their own without help • Employees find info using search engines	• Push technologies • Customized KM
3. Organic	• KM happens in the background—it is embedded in business • Info provided when needed (JIT, JET)	• Personalized KM

Source: Shevlin et al. 1997.

The Forrester KM maturity model is quite useful in determining the level of knowledge support that will be needed for effective KM to be established within a given organization. For example, an organization that is at the assisted phase stands to benefit greatly from an expertise location system and a knowledge support office (KSO), which is essentially a 24/7/365 (24 hours a day, seven days a week, 365 days a year) help desk for knowledge content. Employees typically have a 1-800 telephone number as well as an email address through which they can contact the KSO in order to obtain help in locating, accessing, and making use of valuable knowledge content.

CoP Maturity Models

Maturity models have also been applied to the community of practice lifecycle. A community of practice maturity model can serve as a good road map to show what steps need to be taken to move communities to the next stage. The CoP lifecycle model provides a good diagnostic to assess whether informal networks exist within an organization and if they do, whether they are recognized and supported by the organization. The lifecycle model (see figure 9.3) shows that a community needs to have attained the maturing and stewardship of knowledge levels in order to begin creating value for its members and for the organization as a whole. The lifecycle model is particularly useful for aligning any new KM roles and responsibilities that will be needed in order to optimize KM efforts throughout the lifecycle—e.g., knowledge journalist to help build identify and extract valuable content from community members; a knowledge taxonomist to help organize content once it is being produced at a steady rate; and a knowledge archivist to help distinguish between content that should be stored or that is no longer considered active.

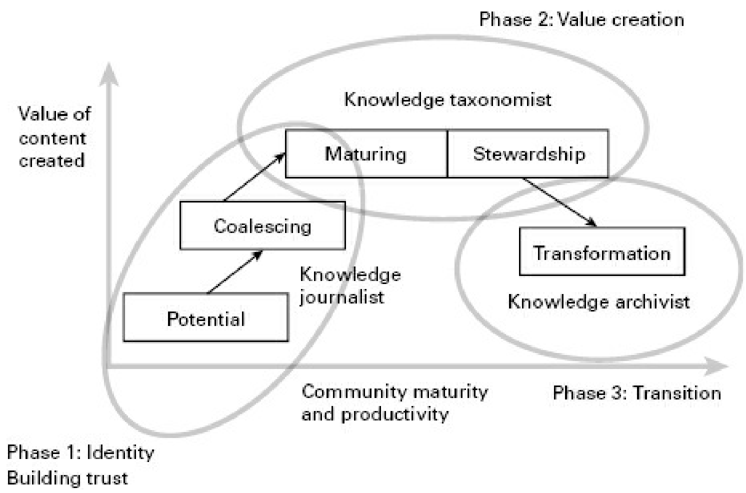

Figure 9.3 Community of practice maturity model

Organizational and KM maturity models help to assess the current level of knowledge sharing and knowledge activities within an organization. In situating a given company on a given maturity model, organizational change is greatly facilitated as it becomes easier to visualize what is needed in order to step up to the next level. It is important to note that there is a minimum level of maturity or readiness before KM stands a good chance of succeeding.

The major features of the six maturity models presented are summarized in table 9.6. Each can serve as a good framework for understanding how change is introduced and eventually adopted within knowledge-based organizations. The current state an organization is in can be diagnosed in order to better anticipate how both the organization, as a whole, and individual knowledge workers within that organization will react to KM initiatives. A better understanding of the level or phase of maturity of the organization will greatly help in better identifying the potential enablers and obstacles to the organizational cultural change(s) required for KM to succeed.

Table 9.6 Major features of six maturity models

Maturity model	Key features
1. Paulk organizational maturity	Represents the adoption of a new technology or process within an organization, which is a very good match for the introduction of new KM functions.
2. Fujitsu organizational maturity	Provides a fast and easy way of assessing how cohesive or pervasive a culture is within a given organization, which can provide valuable guidance in selecting either pilot KM sites, if the organization is in the earlier stages, or focusing on closely aligning KM with the overall business strategy.
3. Infosys KM	A model that is much more specific and allows diagnosis of specific KM behaviors such as content capture, knowledge sharing, and KM metricsGreater specificity allows for more refined targeting of priority KM initiatives.
4. Paulzen and Perc KPQM	The KPQM is quite similar to the Infosys KM model and also allows for incremental introduction of KM initiatives into an organization based on the phase of KM maturity.
5. Forrester Group KM maturity model	A model that focuses on how employees acquire relevant content that is particularly well suited for an incremental introduction of knowledge support services within an organization.
6. Wenger CoP lifecycle model	The CoP lifecycle model can also provide a good indicator of the cultural evolution of an organization, particularly as it pertains to the coalescing of informal networks of peers who regularly share valuable knowledge with one another.The CoP lifecycle model can also help identify key KM roles and responsibilities that should be introduced at each phase.

Gap Analysis

The difference between the existing and desired KM state of the organization is analyzed in terms of enablers and barriers to successful KM implementation. A good gap analysis should address the following points (Zack, 1999; Skyrme, 2001):

1. What are the major differences between the current and desired KM states of the organization?
2. List barriers to KM implementation (e.g., culture where "knowledge is power" or where individual possession of knowledge is consistently rewarded)
3. List KM leverage points or enablers (e.g., existing initiatives that could be built upon)
4. Identify opportunities to collaborate with other business initiatives (e.g., combine knowledge continuity goals with succession planning initiatives in HR)
5. Conduct a risk analysis (e.g., knowledge that will soon "walk out the door" due to imminent retirements or knowledge that is considered to be at risk because only a few individuals are competent in this area and very little of their expertise exists in coded or tangible knowledge assets)
6. Are there redundancies within the organization (e.g., the case of the right hand not knowing what the left hand is doing)?
7. Are there knowledge silos (e.g., groups, departments, or individuals that hoard knowledge or block fluid knowledge flows to other groups, departments, or colleagues)?
8. How does the organization rank with respect to others within the industry (e.g., are they early adopters of KM, KM leaders that are emulated by others, or are they just becoming aware of KM needs within their organization)?

One of the ways to perform gap analysis is to locate any gaps in knowledge. A good way to do this is to once again survey and/or interview key stakeholders to find out what types of knowledge they would *like* to have in contrast to what they *actually* have.

Next, the gap analysis will need a list of prioritized KM objectives to be addressed by the organization. This list is typically gathered through interviews with senior management and focus groups with the managers of all core business divisions. The sessions are a form of brainstorming where participants are encouraged to think "blue sky" thoughts, that is, to momentarily ignore constraints and reality checks and envision a more utopian version of their company. Typical questions would include: If all were possible, what would your ideal day be like? What are some of the thorns in your side that you would like taken care of immediately? What major changes would have an enormous impact on your company's efficiency and effectiveness?

The differences between the "as is" situation, as assessed by the first step in the audit, serves to paint a portrait of the status quo, warts and all. The second stage asks the stakeholders to put into words their visions for an improved version of their organization, one with an ideal culture, technological infrastructure, and skilled resources and, above all, with no constraints. After this brief respite, the stakeholders are then brought back to earth by asking them to now think about the feasibility, the cost–benefit, and the priority of each of these desired objectives.

The results of the gap analysis should be validated by returning to the stakeholders who were initially involved in the information-gathering and needs-analysis phases. The priorities should be determined by a consensus of the organization's key stakeholders. The result will be a KM strategy document that can be used as road map to implement short-term KM initiatives within the organization (those with the highest scores on feasibility, cost–benefit, and priority) as well as a longer-term KM strategy that will describe some of the longer, more complex initiatives.

Box 9.4

A vignette: What should KM focus on within our organization?

The knowledge audit and gap analysis phases of the KM strategy will help determine what the KM efforts should focus on within a given organization. While there are some high-level goals, such as efficiency or innovation, and some generic KM initiatives, such as implementing communities of practice or an expertise location system, each strategy will necessarily be unique. Every organizational context is different, so a "one size fits all" approach cannot work for a KM strategy. The audit or diagnostic phase ensures that the core characteristics of the organization are well understood and taken into account in proposing KM recommendations.

For example, in a public utility company, an extensive audit revealed that while explicit knowledge was formally shared quite extensively, there were few if any opportunities to meet to share knowledge informally. As a result, the lessons learned were edited so as to not cause any undue alarm, and by the time these reached the eyes of the CEO, the reports all read a bit like "something terrible happened, we were not 100 percent prepared, we dealt with it, all is now back to normal." In fact, the knowledge audit revealed that this organization worked exceedingly efficiently and effectively under normal operational conditions. In the context of an emergency, however, work teams no longer knew their roles, they could not collaborate in more dynamic, tacit ways, preferring to keep to "the book" or manuals and rules, and they often failed in carrying out their critical duties.

For this particular organization, an emphasis on tacit knowledge and informal ways of sharing this knowledge became a critical focus for the KM strategy. Employees were encouraged to meet and discuss project post mortems with peers before reporting more formally up the hierarchical levels of authority. Additional recommendations included short-term training of teams so that they could better perform in crisis situations through role playing and simulations in the short term, beginning the journey to cultural change by encouraging employees to send anonymous emails directly to the CEO, and rewarding employees for taking risks.

Another organization, an international aid outfit, revealed quite a different focus for KM during the course of their KM audit. This organization had branches around the world and operated in a highly complex environment: multiple locations, multiple languages, and multiple stakeholders, including funding agencies, partners in the various countries, and a high turnover rate due to two-year mandates. The audit revealed that tacit knowledge was being well shared throughout the organization, primarily through informal contacts using Skype and occasional face-to-face meetings. A number of bottom-up or grassroots communities of practice had emerged on their own, further linking geographically dispersed workers around a common mandate theme. In fact, this organization's evolution in KM terms mimicked that of the World Bank, which created over 100 thematic communities to better harness their expertise that they provided to third world countries.

The gap analysis showed that the critical KM missing in this organizational context was the formal capture and sharing of explicit knowledge. Meetings were often held without an agenda, attendees changed at the last minute, and the way of proceeding was quite chaotic to an outsider: the topics to be addressed were arbitrarily changed, priorities were suddenly announced, and discussions were very difficult to follow. Attendees often interrupted one another, there was no set time for the meeting to end, there was no one to chair or to take down the minutes. Employees explained that this was the "culture" of the place—where everyone was involved in everything and every decision was made by consensus. There was little systematic documentation of meeting results, very little reflection on completed projects, and what documentation did exist was often very difficult to track down. Reports were written for each project but the reports varied in structure and content as each was dedicated to an external audience. KM seemed to be invoked in order to fulfill very specific demands of external parties but rarely was the KM lens turned inward.

As a result, the organization had to focus KM efforts on the knowledge capture and codification side of things, to identify the types of knowledge they have and need to have, and how to render these more visible and therefore easier to access by others.

The KM Strategy Road Map

The final recommended strategy would typically cover a three- to five-year period, outlining the key priorities for each year. The road map addresses questions such as:

1. How will the organization manage its knowledge better for the benefit of the business?
2. Content (management of explicit knowledge) and communities (management of tacit knowledge) priorities
3. Identification of processes, people, products, services, organizational memory, relationships, and knowledge assets as high-priority knowledge levers to focus on
4. What is the clear or direct link between KM levers and business objectives?
5. What are some quick wins (i.e., early, relatively inexpensive KM successes)?
6. How will KM capability be sustained over the long term (e.g., defined KM roles)?

A typical KM strategy document will contain the results of the audit, an inventory of what exists, what KM initiatives were implemented or tried out, what types of knowledge exists, who uses this knowledge and how, and whether or not knowledge is being shared and disseminated throughout the organization. In parallel, it is also important to assess the current status of the two key enablers of KM: the technological infrastructure and the type of prevailing culture (or microcultures within different units) (Gonzalez and Martins, 2014). All of the pieces of the audit can then be integrated to provide a snapshot of the organization at this point in time and a high-level diagnostic: for example, the level of organizational readiness for KM (based on KM maturity models), whether or not they have an intranet or other means to ensure that everyone can connect with everyone else and access existing knowledge, as well as some of the potential obstacles that may cause some issues with future KM implementations. The prioritized "wish list" developed in the next phase serves to show where the organization would like to be in the short term (one to three years) and long term (three to five years). The gaps are thus the differences (measured by the width of the gap) between what is and what should be and the strategy recommendations outline how the company should close these gaps.

The table of contents of a good KM strategy document is shown in table 9.7. The strategy should contain both diagnostic and prescriptive content. In addition, the recommendations should not be so generic or abstract that it is not clear how they could be implemented. In other words, the recommendations should be packaged together with the resources needed for each recommendation, such as cost and human resources, along with the required skill set and training (KM roles and responsibilities, discussed in chapter 12) and a way of assessing whether or not implementation was successful (KM metrics, discussed in chapter 10).

Table 9.7 Recommended table of contents for a KM strategy

Section number	Section title	Comments
Metadata	Document history/information	Include information about authors, contact person, date last revised, authority owners, and distribution limits (usually not a public document).
1.	Executive summary	Maximum of 2 pages.
2.	Introduction	The organizational context, the business drivers that led to a KM requirement.
3.	KM audit—key findings	Thematic summaries from stakeholder interviews; inventory of what exists (intranet, KM projects, knowledge categories); assessment of KM maturity; potential KM enablers and obstacles—where they are now.
4.	KM objectives	Prioritized list, based on stakeholder consensus, on the company KM wish list—where they would like to be in the short and long term.
5.	Gap analysis—key findings	Assessment of how far apart the status quo is from the desired future state; analysis showing ranked gaps—from least to greatest.

6.	Recommendations	The way forward—the major priorities that need to be addressed, when and how and by whom.
6a.	Short term	Action plan for the next 1–3 years with cost-benefit analysis, resources, and metrics identified.
6b.	Long term	Strategic objectives with results projected in the next 3–5 years, clearly showing how this builds on the action plan.
7.	Conclusions	Identify next steps; include governance (who approves strategy, when will it be updated, assessed, etc.).
8.	Appendices	Include (as documents or links to intranet) all data gathered (ensure participant confidentiality—if conferred—is fully respected) so that the reader can dig deeper to find sources and justifications if needed.

Balancing Innovation and Organizational Structure

Klein (1999) discusses the importance of maintaining a balance between fluidity and institutionalization as the dynamic equilibrium that should ideally exist between innovation and organizational structure. The fluid intellectual domain consists of individuals with ideas originating and growing from a given person (intuition), personal networks that form outside formal organizational charts (CoPs), chance encounters that occur between people, and improvisation that ignores standard procedures to discover better ways of doing things. In contrast, the organization strives to structure work, to control processes, and to measure outcomes. Explicit knowledge is clearly defined in procedures, reports, memos, and databases. This knowledge is usually selectively shared through official chains of command or organizational hierarchies. How then to strike the right balance?

If the organization is too fluid, there will be no solid connection of knowledge work to business goals and it will be difficult to have clear accountability. If the balance shifts too much in favor of institutionalization, however, the organization risks becoming too formal, which can stifle innovation and the open communication necessary for creative work to take place (see figure 9.4).

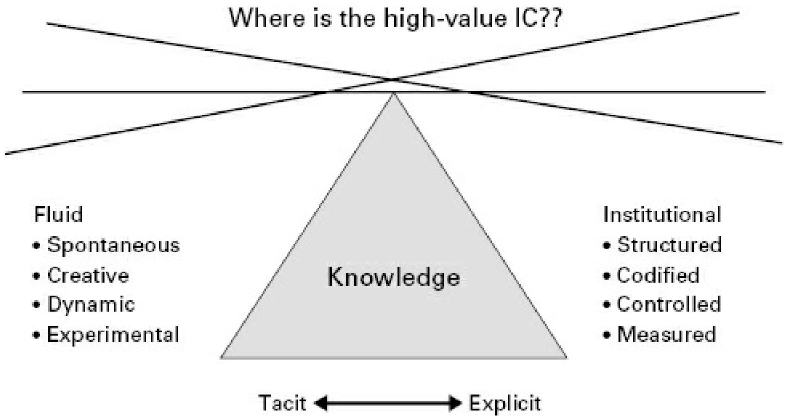

Figure 9.4 Balance between fluidity and institutionalization (adapted from Klein, 1999)

Some companies such as Buckman Labs, 3M, Kao in Japan, AES, and others have managed to strike the right balance (Klein, 1999). Some of their critical success factors were:

- Consistency between core values, business strategy, and actual work environment
- Value conferred on personal freedom, cooperation, and community
- Top leaders serving as good role models—“they walk the talk”

AES set up a task force to conduct a historical study of the company’s ten biggest mistakes. They also provided physical meeting space and time for people from different parts of the company to meet and share what they were doing and to get advice on problems

3M incorporated stories into their corporate training. They adopted the slogan “conservatism with creativity” and the company realized that 30 percent of revenues come from products that are less than four years old. Technology was used to connect knowledge workers to a database so they could share their expertise systematically. The 15% percent rule was used: 15 percent of employee time is set aside to pursue personal research interests. 3M also instituted a storytelling culture with such legends as “remember the time they tried to kill the Thinsulate idea …”).

KAO is a company that focused on organizational learning and based its approach on values derived from Buddhist principles. Continuous cross-functional interactions were encouraged and every meeting at KAO is open to all. The value-added network (VAN) is KAO’s digital memory. ECHO is a system that adds customer call information to VAN and they can receive about 250 calls/ per day. In this way, corporate experiences are preserved and made available for future customer interactions.

Buckman Labs developed K’Netix as their knowledge network. This knowledge repository is available in the 90 countries where Buckman has its offices. The users are both the sales and technical workforce. K’Netix connects the Buckman communities of practice. The KM application consists of email and forums residing in the knowledge repositories. Each forum has a message bulletin board, library, and virtual conference room.

In configuring for a balanced knowledge framework, successful companies such as these need to identify strategic business drivers: What is the business all about? This is the logical starting point to decide how to organize and manage intellectual assets. Companies need to identify products, services, cost, value, quality, and differentiating factors, and they need to characterize the environment in terms of competitive forces, regulations, and socioeconomic trends. The organization can then establish the knowledge core and interrelationships: What are the knowledge assets needed to maximize value for customers, shareholders, employees, and other stakeholders? Both tangible and intangible assets (e.g., values, culture, people, technology, business capabilities) need to be clearly identified, together with where this critical knowledge exists and where it goes (knowledge flow analysis). The knowledge flow can then be further analyzed to assess how fluid or how institutionalized the knowledge has become and whether any gaps in key competencies exist.

In summary, there is a need to continually monitor and rebalance, to reconfigure or expand an organization's knowledge assets as triggered by mistakes, changes in environment, changes in competencies, and/or changes in performance. It is important to remember that an organization is a complex adaptive system operating in a complex dynamic environment and the ultimate goal is that of a dynamic equilibrium between fluidity and institutionalization pressures. Just-in-time discipline can be applied, together with a focus on culture. The speed and accuracy with which knowledge is transmitted must be optimal. The best example of nonoptimal conditions is a reenactment of the telephone game—when the message that is transmitted to the first individual becomes progressively more garbled with each repetition. Other useful questions to ask are:

1. How changeable is the knowledge?
2. What is the useful half-life of knowledge?
3. What type of information technology is being used for knowledge sharing?
4. What about innovation support systems?

Types of Knowledge Assets Produced

Intellectual assets (IA) are the intangible and often highly valuable assets that can include brands, employee know-how, trade secrets, and technical information. IA also covers intellectual property (IP), those assets such as patents and trademarks that are formally protected by statute law. Generally, intellectual capital refers to the difference between a company's market value and its book value. It consists of organizational knowledge and the ability of the organization's members to act on it. Intellectual capital is often used synonymously with the terms intangible assets, intellectual assets, or knowledge assets.

Intellectual capital includes not only traditional intangible assets such as brand names, trademarks, and goodwill, but also new intangibles such as technology, skills, and customer relationships. It is the resources that an organization could—and should—make the most of to obtain competitive advantages.

Many present-day business managers are intrigued by the potential hidden value that the intellectual capital perspective suggests lies untapped within their businesses, but few know what kinds of value they could obtain from their company's intangible assets or how they might go about it. They just know that there is hidden value in their companies and that it is somehow wrapped up in the thoughts, skills, innovations, and abilities of their employees. They want to learn more about this value: how to harness it, direct it, and extract value from it (Sullivan, 2000).

Intellectual assets are intellectual materials that have been formalized, captured, and leveraged to produce higher value for the firm. As organizations recognize more fully the role that these assets play in marketplace success, efforts to more accurately identify and value the assets are becoming a top priority. While most managers readily recognize that their most important organizational investments are in talents, capabilities, skills, and ideas, often they must rely on surrogate, tangible-resource measures such as people, capital, inventory, and money for performance decisions.

Historically, the intangibility of intellectual assets has made them difficult to measure and manage. The accounting concept of "goodwill," which is simply the amount left after deducting measurable costs from the selling price, has and continues to be used by many organizations as a type of "miscellaneous" category where intellectual assets can be placed. A more organizationally appealing approach was introduced by Stewart (1997) where intellectual assets are classified as:

1. A semipermanent body of tacit and explicit knowledge about a task, person, or organization
2. The capital resources (human, structural, and relational) that augment this body of knowledge

This classification scheme, if applied properly, produces intellectual asset measures that can be targeted for KM value assessment.

Bolita (2001) states that with more than half the value of U.S. corporations now considered intellectual assets, organizations are increasingly looking for ways to identify, quantify, and capitalize on those intangibles. The value of intellectual assets will increase over time for most successful organizations. An organization's intellectual assets are computed a number of ways (none of them precise). The difference between a company's book value and the value of all its fixed assets is one measure. The Coca-Cola Company (http://www.thecoca-colacompany.com) is often cited as a reference model for evaluating intellectual assets. Discounting the extensive value of the sugar, water, bottling facilities, and distribution system, the bulk of the company's value lies in the formula to make Coke and the brand awareness the company has established.

Documents, recordings, or images—all different structured data types—may represent intellectual capital. Those data types embody the knowledge and a substantial portion of the value of a company. Quantifying an organization's intellectual property should therefore begin by making it as tangible as possible. By converting ideas, processes, concepts, and business intelligence into archived documents, CAD drawings, database entries, procedure manuals, or even patents, organizations are much better able to count intellectual assets in their bottom line.

Edvisson and Malone (1997) propose that knowledge assets can be placed in one of these categories:

1. Human capital, or all the brainpower that "leaves at 5 PM." Human capital represents the knowledge inherent in employees and contractors, and it is difficult to calculate. The best way of assessing it is to calculate the potential inherent in human knowledge—the value that has not yet manifested itself.
2. Structural capital, or all the brainpower that "stays after 5 PM." Structural capital includes

policies and procedures, customized software applications, training courses, patents, and the like. The financial community can more easily calculate the value of structural capital because it has physical properties.

3. Customer capital (also called relationship capital), or all the corporate relationships with customers and prospects. The value of customer relationships can be calculated in terms of the business they have provided and the trend in those relationships. (The value of future relationships or lapsed contracts is difficult to calculate.)

Organizations can take an inventory of these assets and, in some cases, can sell them to others. (For example, organizations can sell training courses and license patents.) Identifying and extracting intellectual assets is the process of determining the obvious and nonobvious assets that a company owns. Often, as a company goes through a systematic process of inventorying its known assets, it finds many surprises. For example, a company might start an inventory by listing its patents and patentable discoveries. It then becomes clear that some of the company's most valuable intellectual assets are in the form of processes or know-how that are not patentable.

Examples that should be included in an inventory of intellectual assets are product formulas, manufacturing processes, new product plans, packaging specifications, product compositions, research direction, test methods, alliance relationships, business plans, strategic direction, vendor terms, competitive analysis, customer lists, marketing plans, sales projections, budgets, financial projections, pricing analysis, and employee lists.

Intellectual assets also come from widening the aperture of the lens used to see intellectual assets. For example, by looking to contractors and consultants who develop intellectual assets for the company, the company is likely to discover assets it owns that had not been considered. In the process that links identifying intellectual assets to extracting them for profit, a company will often see opportunities to create new intellectual assets. A company can cultivate creativity to create assets, which can be identified and extracted for profit to the organization.

Lev (2001) views intangible assets as nonscarce. Deployment of an intangible asset is possible at the same time in multiple uses. Intangibles increase in value when used. This is also referred to as scalability. The value of intangibles increases when the scale in which they are used increases. Intangibles are not subject to diminishing returns as are tangible assets, but have increasing returns. Intangibles also have strong network effects. Although not exclusively applicable to intangibles, network effects are characteristic for intangibles in the sense that intangibles often form the core of important networks.

Intangibles create future value. All intangibles are future-oriented and because of this they are ignored by traditional accounting systems based on conservatism and materialism.

Intangibles are difficult to manage and to exclusively control. Taking full advantage of the tacit knowledge residing in employees is more difficult than exploiting the value of a building or a machine to its maximum. Copying or reengineering intellectual assets is often relatively easy, and we have limited ability to protect using property rights. Cost accounting systems are not well geared toward intangible assets and are even wholly inaccurate for managing intangible assets–intensive corporations. Intangibles cannot be owned (except legal property rights). Intangibles investments are therefore typically more risky due to the fact that intangibles play the most dominant role in early stages of the innovation process. Proper management can deal with this, that is, R&D alliances and diversified innovation project portfolios.

Intangible assets are nonphysical and therefore inherently difficult to trade. Legal protection is weak. There are large sunk costs, low marginal costs. Open exchanges for intangibles are in their infancy. Intangibles cannot directly be measured. Valuing intangibles is difficult. Intangibles are not evidenced by financial transactions (as tangibles are).

The Role of Leadership and Different KM Leadership Styles

A number of leadership styles have been identified in the management literature. For example, Daft (1995) lists autocratic versus democratic, task-oriented versus people-oriented, and contingencies. Leadership plays an important role in KM as it helps determine the types of interactions that will take place, including knowledge-sharing interactions. Leadership helps shape the culture and plays a key role in establishing incentives and disincentives for organizational behaviors. Aldulaimi (2015) notes that leadership can:

> Impact onto organizational effectiveness, because the way knowledge is organized, knowledge management activities are coordinated, and the extent to which knowledge management practices are embedded in the daily work processes influence the effectiveness and efficiency of organizational performance. (p. 20)

Donate and de Pablo (2015) note that a new type of leadership, called knowledge-oriented leadership, may be required in order to address the two major goals of KM: efficiency and innovation. The authors note that leadership may foster KM or hinder it, depending on whether leaders encourage knowledge sharing or knowledge hoarding and cooperation or competition, respectively. Some studies indicate that a more participatory (less directive) style is more conducive to KM as are leaders who favor mentoring and facilitating roles (Yang, 2007; Singh, 2007). Knowledge-oriented leadership is a leadership style that includes all the major KM processes: leaders play an active role in knowledge creation, sharing, dissemination, preservation, and application. A final component is that KM leadership include not only a tolerance of errors, but of risk taking, admitting errors, and being allowed to learn and improve. This type of leadership is much more likely to lead to both efficiency gains and innovative results.

Key Points

- Knowledge management auditing is often the first step in any KM initiative as it serves to inventory what knowledge-intensive resources exist within a company. This provides a snapshot of the "as is" or current state of the organization with respect to KM and helps in measuring progress toward organizational culture change and other KM goals.
- The two most commonly encountered KM application goals are reuse and innovation.
- A good KM strategy will diagnose the existing status of the organization, compare this with what stakeholders want to achieve in the future, and come to an assessment of how far apart the two are: a gap analysis.
- A short-term horizon of one to three years is best for detailed recommendations—an action plan that includes cost, resources, and measurement of components.
- The proposed KM strategy should not only clearly address business objectives (not KM objectives) but should also be compatible with the prevailing cultural and technological enablers of the organization.
- It is crucial that a balance be maintained between fluidity and institutionalization in a given organization.
- Traditional leadership styles may not be best suited for KM; instead, leaders need to be participatory, act as facilitators, be less directive, and allow people to make mistakes and learn from them.

Discussion Points

1. Compare and contrast KM applications that are driven by an objective of reuse ersus. those driven by an objective of innovation.
2. What are the major steps involved in developing a KM strategy? What sorts of information is needed in order to recommend a KM strategy to an organization? List the major categories of stakeholders who should be involved in the strategy formulation process.
3. What are some of the pros and cons of a web-based questionnaire versus face-to-face interviewing when conducting a knowledge audit (refer to chapter 4)?
4. Why is it important to conduct an audit before eliciting stakeholder objectives?
5. How would we go about assessing the cultural readiness of an organization with respect to planned KM interventions? How would we modify our KM implementation strategy based on the results of such an assessment?
6. What are some of the maturity models that can be used to situate a company with respect to its KM culture? Discuss the strengths and weaknesses of each of these maturity models.
7. What are some criteria that may be used to prioritize both KM objectives and KM recommendations?
8. What are the major differences between the short-term and long-term strategies? How do they fit together?
9. Why is it important to maintain a balance between fluidity and institutionalization? What are some of the mechanisms that can be used to achieve this balance? How can different leadership styles upset this balance?
10. List and provide examples for some different types of knowledge assets. What are some typologies that can be used to categorize them?
11. What is the relationship among human, structural, and relationship capital?
12. Why are intellectual assets difficult to manage?

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10 Evaluating Knowledge Management

Price is what you pay. Value is what you get.

—Warren Buffet (1930–)

This chapter addresses the major ways in which the value of KM is assessed. The major types of KM measurement frameworks are introduced: intangible asset assessments, benchmarking, the balanced scorecard method, house of quality, and the results-based assessment metric. The approaches to the evaluation of intangible assets are described. In addition, the various ways in which the value produced by communities of practice and knowledge networks are discussed.

Learning Objectives

1. Identify the major types of value that KM can create for organizations, groups, and individual employees.
2. Understand the major advantages and shortcomings of the KM metrics.
3. Apply the benchmarking, house of quality, and balanced scorecard methods and the results-based assessment framework to knowledge management performance measurement systems.

Introduction

This chapter discusses different metrics frameworks to monitor progress toward organizational goals. An additional dimension is now part of the integrated KM cycle: that of measurement or assessment of KM value (as shown in figure 10.1).

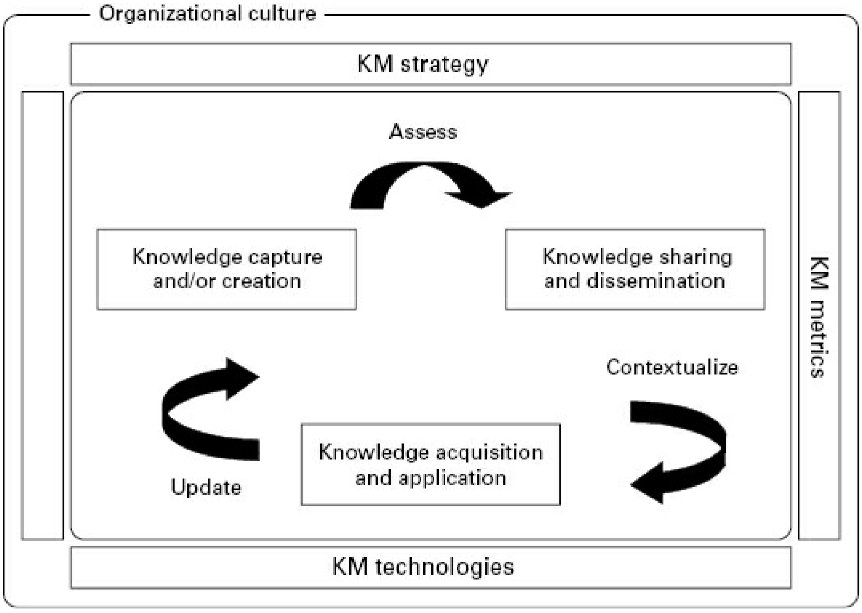

Figure 10.1 An integrated KM cycle

There are a variety of methods to assess how well KM is succeeding (milestones and formative evaluation) and how well KM has helped attain organizational goals (outcomes and summative evaluation). Progress and attainment of a variety of KM goals can be measured including:

- Increasing revenue
- Decreasing costs
- Increasing operational efficiencies
- Increasing standardization
- Improving customer loyalty
- Improving customer service
- Improving employee loyalty (decreasing turnover)
- Enhancing the reputation of the company
- Creating more collaboration and synergy
- Innovating to create new products, new services, and/or new revenue streams

KM metrics include quantitative, qualitative, and anecdotal methods. Each method presents different advantages and disadvantages and, often, a combination of different measure may be called for.

The best place to start is with a KM measurement strategy that answers the five basic questions:

1. Why are we measuring?
2. What are we measuring?
3. For whom are we measuring?
4. When are we measuring?
5. How are we measuring?

The justification for an assessment of how well KM had done is often to be able to show the value that has been added by the KM. Most KM initiatives must provide some evidence of at least contributing toward organizational goals. If, for example, a company wanted to improve knowledge sharing so that best practices were spread more rapidly and more broadly, then this should be assessed in some way. Some possibilities may be that better and quicker knowledge sharing has reduced the number of errors, has speeded up problem solving, or has complemented formal training to improve upon employees' skills. Note that KM is never to be presented as a silver bullet that will solve all organizational woes—hence the term "contributes toward." Causality is extremely difficult to prove in a complex organizational environment, but while desired results may not be attributed completely to KM, there should be a way of at least partially attributing the success to KM.

Another frequent reason why KM is measured is to convince management and stakeholders that KM is adding value to the organizational equation. This form of justification will help with the resource allocation and budgeting—costs are unfortunately all too visible whereas KM benefits tend to be rather opaque and long term. Finally, there are two general types of evaluations: formative (or in-progress feedback) and summative (which is provided upon completion). Formative KM assessment can help revise project plans and goals and identify areas that need to be improved while there is still time to effect changes. A summative evaluation is much like a report card—the work has been "handed in" and the results have been assessed.

What do we want to measure? KM assessment should focus on meaningful measures that relate directly to specific targets and objectives. The level of granularity should be detailed enough that the results provide a means of acting upon them. For example, a large organization wanted to know if the four communities of practice they had supported and invested in had resulted in some benefits. They decided to measure member satisfaction. The old adage "be careful what you wish for" led to an assessment that read "97 percent of employees are highly or very satisfied with their membership in their CoP." There are a number of problems with this approach: we know that people are happy being members but did we measure the right dimension? A better question would have been: "Could you provide specific examples to illustrate how your participation in a CoP has helped you to do your job better?" A different organization did in fact include this question and found results such as: "I had no notion that a group on the other side of the country was working on the very same sorts of problems as I was—we are now collaborating together and have established a new thematic CoP; I was able to access up-to-date information that I did not even know existed because of the CoP news alert I received."

The question "Who are we measuring for?" while at times obvious, does deserve some attention. Typically we need to be aware of who is concerned by the success or failure of the KM initiatives and what their expectations are. Expectations can lend themselves to a form of gap analysis: the higher the expectations, the more difficult the measurement and the greater the gap between what stakeholders would like KM to do and what KM actually does. There are typically three main categories of stakeholders:

1. Program funders, who are interested primarily in financial measures, what the return was on the KM investment and how long it took for the KM investment to be "paid back" (referred to as the breakeven or payback period).
2. Managers, who are mostly interested in how the KM tools and processes are working and how much they are being used by their staff (referred to as adoption rate).
3. Employees/participants,who are more concerned with practical and operational issues such as how does this improve (or make worse) my everyday life at work?

It is therefore crucial to identify all stakeholders' objectives and ensure the KM metrics will answer each of their concerns (another reason why often more than one metric is required for a given KM project).

Next, the question of when to measure needs to be considered. The organizational context is one of the first things to consider: is the organization in a stable state? If yes, then the assessment can be conducted. If, however, there is instability then you should wait to do the assessment. For example, if there is an imminent merger with another company, a major reorganization planned, or a downsizing where a great number of employees are concerned about job security—any one of these would be cause to wait for a KM assessment. Measuring KM when the organization is in crisis mode will yield unrepresentative results. For example, during a downsizing, one would not necessarily expect knowledge sharing to be at the top of an employee's list of priorities. The data collected will be skewed or biased because the organization is not in its natural state.

For stable organizations, there are at least four possible points at which assessment can occur (adapted from APQC 2001). These four points refer to the different general phases of a KM project (or really, any project), namely:

1. Preplanning
2. Start-up
3. Pilot project
4. Growth and expansion

A KM assessment can (and ideally should) be done at all four stages. The preplanning stage assessment will provide a good baseline measure: a starting point against which subsequent changes may be measured and compared. If we know from where we are starting, then we have a better chance of measuring how far we got. In the start-up phase, we can track basic progress toward KM goals, and during a pilot project phase we can focus on measures that show how KM is impacting on the business. During the final growth and expansion phase, we can apply more formal metrics to monitor KM health and progress. The final stage will usually consist of a combination of different metrics in order to show the value added across the organization and for its different stakeholders.

As to how we should measure KM, there are a variety of anecdotal (e.g., one-off stories or anecdotes garnered from employees) to quantitative (e.g., statistical and mathematical analyses of large data sets such as a survey questionnaire administered to 200 people) to qualitative measures (more in-depth interpretative approaches, such as interviewing ten people several times to gather narrative data that is then thematically organized). Quantitative measures assign a numerical value to an observable phenomenon and provide concrete evidence such as causality or financial metrics. Examples would include usage metrics from the company intranet, the time spent accomplishing a task with and without KM (the latter being a baseline), and time saved (e.g., on product development or in answering client queries). Qualitative measures provide more context and details about the value (e.g., perceptions), which are often difficult to measure quantitatively. Qualitative measures can serve to augment quantitative ones by providing more interpretation and more meaning with respect to the data. Anecdotal data consists of "serious stories," for example, an interviewee describing a lesson they learned or an innovation they made use of. All stakeholders love stories and they often help make a metrics report or presentation "more human."

KM Return on Investment (ROI) and Metrics

There are a variety of methods to assess how well KM is succeeding (milestones and formative evaluation) and how well KM has helped attain organizational goals (outcomes and summative evaluation). Roche (2013) highlights a number of approaches to evaluating the return on investment (ROI) of KM. Most KM metrics include quantitative, qualitative, and anecdotal methods. Each method presents different advantages and disadvantages and, often, a combination of different measure may be called for.

Many businesses are finding that in order to gain buy-in from senior management, they need to prepare and present a solid KM business case. Unfortunately, traditional accounting standards do not provide the guidance necessary in valuing all intangible assets (Lev, 1997; 2001). The International Accounting Standard Number 38 named "Intangible Assets" discusses only patents, copyrights, goodwill, and R&D costs (IASC, 1998). Nothing is mentioned about employee knowledge, best practices, or investments in training. Despite the difficulty in valuing such intellectual capital, it remains one of the more important KM techniques to learn and to apply in practice (Brown & Woodland, 1999). Traditional financial statements would not show the loss of intellectual capital, and the subsequent impact to the company, if a thousand employees were suddenly to leave the company (Roos & Roos, 1998). However, KPMG's research indicates that, after losing key employees, 43 percent of organizations experienced damage to a main customer relationship, 50 percent lost knowledge of best practice information, and 10 percent lost significant income (Warren, 1999).

Most current approaches place a value on intellectual capital in the following way: for publicly traded companies, the value of intellectual capital (IC) is the difference between the market capitalization and the book value (summation of assets less depreciation) of the company (Roos & Roos, 1998; Skandia, 1998; Chatzel, 2000)). For example, Intel's market capitalization in 1997 was $110 billion while its financial book value was $17 billion. This hidden value of $93 billion is stated as the value of Intel's intellectual capital (Sveiby, 1997b). Roos and Roos (1998) made a similar comparison with Microsoft. A study by the Brookings Institute shows that this "missing value" grew from 38 percent of a company's market capitalization in 1982 to 62 percent in 1995 (Dzinkowski, 1999).

Adams (2008) and Adams and Oleksak (2010) outlined a series of approaches to the measurement of intangible assets as they argue that different tools are needed than those used for traditional tangible assets. The authors developed the ICounting tool as a complement to traditional accounting tools[1]. Employees and teams can develop their own frameworks to capture the value of their intangible assets. A holistic perspective has to be adopted, one that includes collaboratively created assets as part of the knowledge audit or inventory. Next, each inventoried intangible asset is given a unique name and then a combination of quantitative and qualitative, as well as financial and nonfinancial, measurements are conducted. Qualitative and even anecdotal data is appearing in financial spreadsheets at an increasing pace. The only requirement is that these data be verified to be consistent and reliable. For example, Adams (2008) recommends having employees rate the value of their intangibles in relation to those of their peers. The same question can be asked of external people such as partners and other stakeholders in order to have a more comprehensive assessment. This is one example of how the measurement of intangibles can be such as formalized as traditional approaches to tangible assets.

The general approach to evaluating KM value consists of identifying a series of processes that knowledge goes through and assessing the value created at each step. The reuse of knowledge is a particularly important step to measure. When knowledge is captured, it is easier to share and preserve. When knowledge is coded, it is easier to find and reuse. When knowledge is shared and disseminated, all employees benefit from best practices and lessons learned to improve individual and organizational performance. When knowledge is preserved, it becomes possible to learn from the past to improve and to innovate. When knowledge is applied—then the greatest value is realized.

Skandia, a Swedish insurance company, has made strides to quantify their intellectual capital through further exploration. Using work that won the 1992 Nobel Prize in Economics, Skandia has divided IC into several subsets: customer capital, human capital, and organizational capital (Roos & Roos, 1998; Mouritsen et al, 2001). In Skandia's annual Intellectual Capital Prototype Report (1998), these terms are defined with supporting details regarding how calculations of value are made. Skandia's advancements, as well as efforts by KPMG () (Andriesson, 2005), Buckman Laboratories, and McKinsey & Company (Davenport, 1996), are providing tools by which management can determine the company's present IC value and foresee future IC growth (or shrinkage). These tools are being used by Deutsche Bank to give loans with only IC as collateral (Henry & King, 1999).

The Skandia Intellectual Capital model is called the Skandia Navigator (Wall et al., 2004). Four key dimensions of business form the core of this model:

1. Financial focus, represented in monetary terms
2. Customer focus, a financial and nonfinancial measure of the value of customer capital
3. Process focus, addressing the effective use of technology within the organization
4. Renewal and development focus, which attempts to capture the innovative capabilities of the organization

All four dimensions are in turn related to a human focus, which is a measure of the organization's human capital. This model is quite similar to the balanced scorecard method (BSC) discussed later in this chapter. The Skandia Navigator can be thought of as a combination of Sveiby's (1997a) Intangible Assets Monitor with the BSC.

The valuation of IC is receiving much attention in today's literature. However, the cost of implementing KM techniques is not as clear. McKinsey & Company has an objective of spending 10 percent of revenues on developing and managing knowledge (Davenport, 1996). By not clearly understanding the "intellectual liabilities," or cost of KM, it remains difficult for companies to calculate any balance sheet effects. Buckman Labs estimates that companies spend 3.5 percent of revenues on KM (Davenport, 1996). The founder of Buckman Labs, Robert Buckman, estimates that the first benefits from KM were seen as an improved speed of new product development (Angus, 2003), which increased to 30–35 percent, from 13 percent to 18 percent a year.

The shift toward knowledge-driven business models has created a strong need for knowledge management metrics. The KM measurement process will therefore consist of the following major steps:

1. Define the business objective(s) addressed by the KM initiative or project.
2. Define the stakeholders and determine what they need to know.
3. Determine which measurement framework(s) are best to align KM measures with the business objectives.
4. Modify the framework(s) based on what you need to measure.
5. Decide on a data collection and analysis strategy.
6. Get management to sign off on your measurement strategy.
7. Implement measures and present the results in a form that is most appropriate for each stakeholder.

Three popular approaches, benchmarking, balanced scorecard method and the house of quality are presented next.

The Benchmarking Method

Benchmarking is the search for industry-wide best practices that lead to superior performance (Camp, 1989). It usually consists of a study of similar companies to see how things are done best in order to adapt these methods for their own use. This technique is best summed up by the Hindu proverb: "know the best to become the best." In fact, benchmarking, which is the term preferred by KM, is really a form of competitive intelligence, the term favored by information professionals.

Benchmarking as a tactical planning tool originated with Xerox Business Systems in the late 1970s. Japanese affiliates were selling better quality copiers for less than the manufacturing costs of similar products in the USA, and Xerox wanted to know why as well as whether or not they could emulate them. Similarly, one of the first experiments in benchmarking was in the production logistics area (warehousing, picking, packing, and shipping) when Xerox Business Services benchmarked with L. L. Bean, a clothing manufacturer who had one of the best logistics operations in the world.

Benchmarking is a fairly straightforward KM metric that often represents a good starting point. There are two general types of benchmarking: internal benchmarking, which involves comparisons against other units within the same organization or a comparison of a single unit over different time periods, and external benchmarking, which involves a comparison with other companies.

Box 10.1

A vignette: Benchmarking from within

In one engineering organization, the senior management team wanted to implement an after action review (AAR) for completed projects. They were unsure of where and how to begin—with projects in progress? How far back to go when the employees concerned may no longer be with the company? What should they document? They had a whole series of questions and not a lot of models to work from. They decided to do some benchmarking—both external, with organizations of similar size and mandates as theirs, and internal, as they had subsidiaries around the world. The internal benchmarking results proved the most valuable—one of the subsidiaries, in the Netherlands, had been doing AARs for three years. They had templates and a good process for conducting the AAR meetings with a facilitator. They even had a rule of thumb: an AAR had to be conducted no later than three months after project completion, and once ten projects were completed, they were compared to identify any commonalities. Once thirty projects were completed, the AARs were sent to the KM team to be further analyzed in order to extract lessons learned that could have organization-wide interest. The senior managers were quite impressed that their learning curve had all but disappeared. They adapted the existing questionnaire and meeting process and requested a teleconference with their colleagues overseas. In this way, an internal benchmark revealed existing best practices within the same organization that could be easily transferred and reused by others.

Spendolini (1992) further describes three different types of benchmarking:

1. *Industry group measurements:* The measurement of various facets of your operation and comparing these to similar measurements. Often the measures have little to do with productivity, customer satisfaction, or best practice. Many industry groups publish comparative data either privately (for members of the group or service only) or publicly, or both. The Institute of Internal Auditors' GAIN (Global Audit Information Network) provides this kind of data privately to subscribers. The Institute also publishes biannual salary surveys and occasionally special studies of external audit fees and research on effective audit departments (best practices).
2. *Best practice studies:* The studies and lists of what works best. These are useful to benchmarking research, but they are not useful as metrics. What works best for an entity in its specific environment may not work the same way in another environment. These studies can be useful stimulators, but they are not benchmarks per se. There are books, consultants, and public accounting firms that report internal audit best practices gathered from research and consulting practice. The IIA published a book for audit committees that were a study of best practices.
3. *Cooperative benchmarking*: The measurement of key production functions of inputs, outputs, and outcomes with the aim of improving them. In an internal audit, we would study, for example, comparisons of costs per audit hour, time elapsed to distribute final report, percentage of recommendations accepted. Cooperative Benchmarking is done with the assistance of the entity being studied (the benchmark partner). Often the entity chosen as a benchmark is one that has best practices in the area of interest or has won a major national or international quality award. Internal audit departments are increasingly interested in this method. A version of cooperative benchmarking is collaborative benchmarking. In the collaborative method, both entities study each other and work together to improve. Some audit departments are now doing this.
4. *Competitive benchmarking:* The study and measurement of a competitor without their cooperation for the purposes of process or product quality improvement. The latter is called reverse engineering. A version of competitive benchmarking is a commission granted a third party to study a group of competitors and share the results with all. The third-party consultant is the only one who knows what data belongs to which entity (you obviously know your own, but not necessarily anyone else's).

It should be noted that in the long term, this approach lacks sufficient value and flexibility, which leads to other measurement tools and techniques eventually being brought in to measure the effectiveness of KM. Benchmarking is essentially a comparison that is undertaken with key leaders in the industry in order to identify any best practices that the company can emulate in order to improve their own organizational effectiveness. Carla O'Dell at the American Productivity and Quality Center (APQC, http://www.apqc.org) pioneered this technique. Benchmarking is a good way of avoiding reinventing the wheel by looking at what has worked and what has not worked for other companies operating in comparable environments or industrial sectors.

The benefits of benchmarking are not limited to improvements in process or the promotion of reuse. Tiwana (2000) lists the following potential benefits:

1. Overall productivity of knowledge investments
2. Service quality
3. Customer satisfaction and the operational level of customer service
4. Time to market in relation to other competitors
5. Costs, profits, and margins
6. Distribution
7. Relationships and relationship management

Benchmarking can help an organization evolve to higher maturity levels to become a learning organization by identifying where it stands with respect to KM in relation to the competition.

Arthur Andersen developed a knowledge management assessment tool (KMAT) that is essentially a benchmarking questionnaire where responses by a given company can be easily compared against industry standards in order to come up with a relative standing or ranking for the company on specific indicators. The KMAT was developed by the American Productivity & Quality Center and Arthur Andersen in 1995 to help organizations self-assess where their strengths and opportunities lie in managing knowledge. The tool is divided into five sections: the KM process, leadership, culture, technology, and measurement. A subset of the items and information in the KMAT, with a simplified scoring system is available (http://docs.lib.purdue.edu/cgi/viewcontent.cgi?article=1425&context=iatul).

The first step in benchmarking is to identify the short list of companies that you will be comparing. Recent trends toward globalization indicate that international companies should not be automatically excluded from your short list. In the end, it is a fairly subjective decision as to which companies and which criteria you will be benchmarking against. Some typical targets include: innovation metrics (How fast are new products developed? How much is invested in R&D?), customer loyalty, KM integration, leveraging of IT, and quality management.

Tiwana (2000) adapted Spendolini's (1992) key benchmarking steps in order to arrive at a better fit with KM. These key steps can be summarized as:

1. Determine what to benchmark: which knowledge processes, products, services? Why? With what scope?
2. Form a benchmarking team.
3. Select benchmarking short list—which companies will you be benchmarking against?
4. Collect and analyze data.
5. Determine what changes should be made as a result of the metrics obtained.
6. Repeat when an appropriate amount of time has lapsed to measure progress.

Benchmarking is of greatest value when a company has clearly identified its strategic objectives and they have thought long and hard about which best practices might or might not be transferable and effective within their own particular context, with its own KM drivers and constraints.

The Balanced Scorecard Method

The balanced scorecard method (BSC) is a measurement and management system that enables organizations to clarify their vision and strategy and translate them into action. It provides feedback around both the internal business processes and external outcomes in order to continuously improve strategic performance and results. The BSC is a conceptual framework for translating an organization's vision into a set of performance indicators distributed among four dimensions: financial, customer, internal business processes, and learning and growth. The "balance" in the balanced scorecard refers to the way a balance is maintained between:

1. Long-term and short-term objectives

2. Financial and nonfinancial measures
3. Internal and external perspectives
4. Lagging and leading indicators
5. Objective and subjective measures
6. Performance results and drivers of future results

Indicators are maintained to measure an organization's progress toward achieving its vision; other indicators are maintained to measure the long-term drivers of success. Through the BSC, an organization monitors both its current performance (finances, customer satisfaction, and business process results) and its efforts to improve processes, motivate and educate employees, and enhance information systems—its ability to learn and improve. A high-level balanced scorecard is shown in figure 10.2.

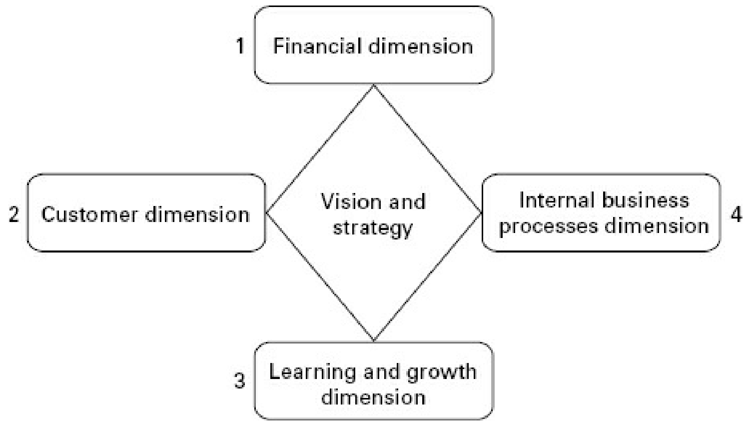

Figure 10.2 High-level balanced scorecard

Variations in the basic design are common. Typical changes include changes in the categorization of perspectives (innovation and learning, or employees, in place of learning and growth, for example) and the number of perspectives (adding stakeholders as a separate, fifth perspective, for example). Balance is achieved through the four perspectives, through the decomposition of an organization's vision into business strategy and then into operations, and through the translation of strategy into the contribution each member of the organization must make to successfully meet its goals.

The financial dimension typically includes measures such as operating income, return on capital employed, and economic value added. The customer dimensions deals with such measures as customer satisfaction, retention, and market share in targeted segments. The internal business process dimension includes measures such as cost, throughput, and quality. The learning and growth dimension addresses measures such as employee satisfaction, retention, skill sets, and so forth.

The major steps in applying the BSC metric aer:

1. Translate the KM vision and strategy into measurable goals.
2. Validate these through the establishment of a consensus on the concrete, short-term, specific goals.
3. Communicate and link: measure as you go through the objectives and look at how well the reward system is linked to these objectives: are employees trained, motivated, and rewarded to use KM as part of their everyday work?
4. Do a reality check—be sure that you are being detailed enough that you can measure something to assess how well these objectives are being met.
5. Incorporate learning and feedback into your metrics—do a formative and a summative evaluation.

Each dimension of the BSC can be further expanded to include objectives, metrics, targets, and initiatives, as shown in table 10.1. Objectives are the major goals to be achieved (e.g., profitable growth). Metrics are the parameters that will be monitored in order to measure progress toward these stated goals (e.g., growth in net margin). Targets are the specific thresholds to be met for each metric (e.g., 2 percent or greater growth in net margin). Finally, initiatives describe the actions, projects, programs, and so on, to be put into place in order to be able to meet the stated goals.

Table 10.1 Sample BSC implementation

	Objectives	Metrics	Targets	Initiatives
Financial				
Customer				
Internal processes				
Learning and growth				

The balanced scorecard method was originally intended to be a performance improvement metric but it quickly became apparent that it also serves as an effective strategic management system (Kaplan and Norton, 1992; 1993; 1996). It is applicable to both profit and nonprofit organizations as well as to both private and public sector companies. The BSC offers a number of significant advantages, including the translation of abstract goals into action items that can be continuously monitored. It provides objective measures of the current situation and also helps in initiating the changes required to move from the current to the desired future state of the company. The major shortcoming is that unlike benchmarking, this is a much more difficult technique to use. Each BSC must be developed *from scratch* as it is customized to individual organizations. Some templates and automated tools have begun to be become available to help in the implementation of a BSC from, for example, Six Sigma[2]mQPR.3and BSC Designer4 (many others can be found at http://www.predictiveanalyticstoday.com/open-source-balanced-scorecard-software).

The House of Quality Method

The house of quality was originally developed to show the connections between true quality, quality characteristics, and process characteristics. This was done using the Fishbone Diagram, with true quality in the heads and quality and process characteristics in the bones. In 1988, Hauser and Clausing developed an evaluation matrix metric that measures how customer needs are linked to business processes and internal decisions of an organization. A simplified matrix is shown in figure 10.3.

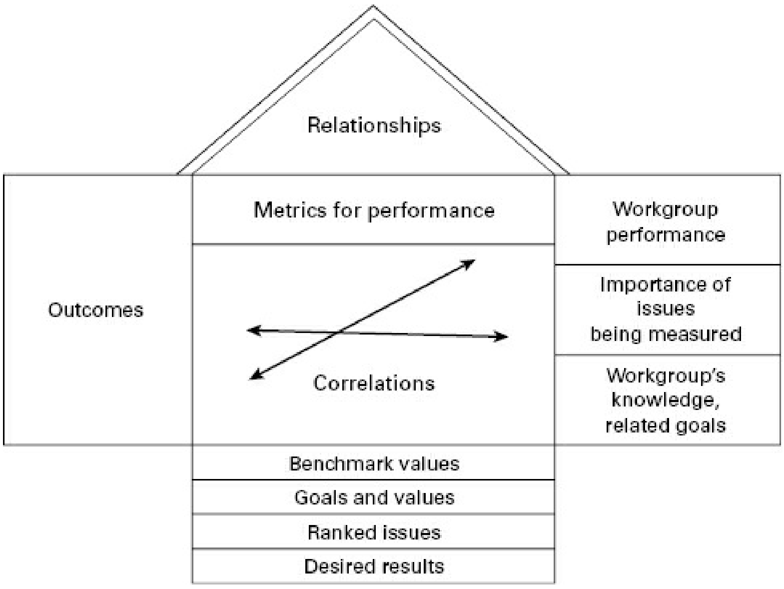

Figure 10.3 High-level house of quality matrix

This technique is also referred to as quality function deployment (QFD; Mazur, 1993) as it links the needs of the customer with marketing, design, development, engineering, manufacturing, and service functions (see also the Quality Function Deployment Institute, http://www.qfdi.org). It can be used for service and software products as well.

The house of quality has as its key elements: desired outcomes, priorities attached to these outcomes, and appropriate metrics for each outcome. The overwhelming focus is on maximizing customer satisfaction asmeasured by metrics, such as repeat business and market share. It focuses on delivering value by seeking out both spoken and unspoken needs, translating these into design targets, and communicating this throughout the organization. Furthermore, it allows customers to prioritize their requirements, tells us how we are doing compared to our competitors, and then directs us to optimize those features that will bring the greatest competitive advantage.

As with the BSC, the desired outcomes need to be specific enough—concrete, detailed, and therefore measurable. For example, a desired outcome of "better collaboration" is difficult to assess. A better desired outcome would be to "improve knowledge sharing to a level where at least 20percent of an employee's work is based on existing knowledge provided by peers and/or the knowledge repository in the next three years." This second statement can be measured more directly and compared to an existing baseline, by administering knowledge audit questionnaires for knowledge (as described in chapter 9) and through usage statistics for the repository.

These goals and objectives are placed to the left of the house. Ideally, these desired outcomes should be short- to mid-term and observable. Some further examples are:

- Increase the number of communities of practice by three
- Decrease the number of customer complaints by 50 percent
- Decrease the number of unsolved problems by 60 percent
- Decrease the time to market for newly developed products and services by 40 percent

Priorities are next assigned to each of these goals by placing weights to the right of the house. Useful metrics can then be listed on top of the house (the ceiling). At the center of the matrix, we will see the level of correlation between the metrics and the performance outcomes. These can be numerical correlations or low-, moderate-, or high-type values. By analyzing these correlations, we can zoom in on those aspects of KM that are more likely to have an impact on overall company performance and thus will contribute more significantly to progress made toward the stated goals.

Some popular house of quality metrics used for KM projects include:

- The expense of reinventing solutions per year (or rework)
- The information/knowledge seeking time spent on average per employee
- The number of ideas that were implemented from the suggestion box per year
- Time spent on systematic capture and codification of know-how for future use when a project is completed (e.g., post mortems and AARs)
- The percentage of employees who are aware of what KM exists within their organization (e.g., a lessons learned database)

A blank house of quality template is available from MS Office online templates (https://support.office.com/en-us/article/Create-a-Six-Sigma-flowchart-or-House-of-Quality-diagram-26296A8F-F511-4A31-91E9-211D8EF304CE#bm3). Advice on interpreting, analyzing, and reiterating the house of quality design is provided in the form of a checklist by Mazur (1993; http://www.mazur.net/works/9checks.pdf).

Tiwana (2000) recommends using indicators and other useful parameters from the Skandia Intellectual Capital annual report instrument as house of quality outcomes in order to analyze KM effectiveness. These indicators include:

- Competence development expenses ($ per employee)
- Employee satisfaction
- Time spent on systematic packaging of know-how for future reuse when a project has been completed
- Training expenses per employee
- Information gathering expenses per existing customer
- Total number of patents held
- Employee attrition rate
- Dollar figure value of loss per employee who leaves (and who leaves for a competing firm)
- Expense of reinventing solutions per year
- Number of ideas implemented compared to those suggested (e.g., suggestion box)

The Results-Based Assessment Framework

The results-based management accountability framework (RMAF) has become a framework for widely used general performance assessment, particularly within the Canadian federal government. The Canadian Treasury Board (http://www.tbs-sct.gc.ca/eval/pubs/RMAF-CGRR/guide/guide_e.asp) has published guidelines on its development and application that have led to a fairly high degree of adoption and standardized use of this instrument. A number of other organizations such as UN agencies, USAID, and Fujitsu Consulting also implement this metrics framework. The terms “results map” or “results chain” are often used as shorter synonyms or more generic terms. There is a fairly easy adaptation that can be made to apply this metric to knowledge management. The advantage in doing so lies with the emphasis RMAF places on realistic results, monitoring of expected results, reporting, and describing measurable changes. In addition, explicit linkages are used to show how each activity contributes to each expected outcome. Figure 10.4 outlines the major components of the RMAF metric (adapted from Plan net, 2003).

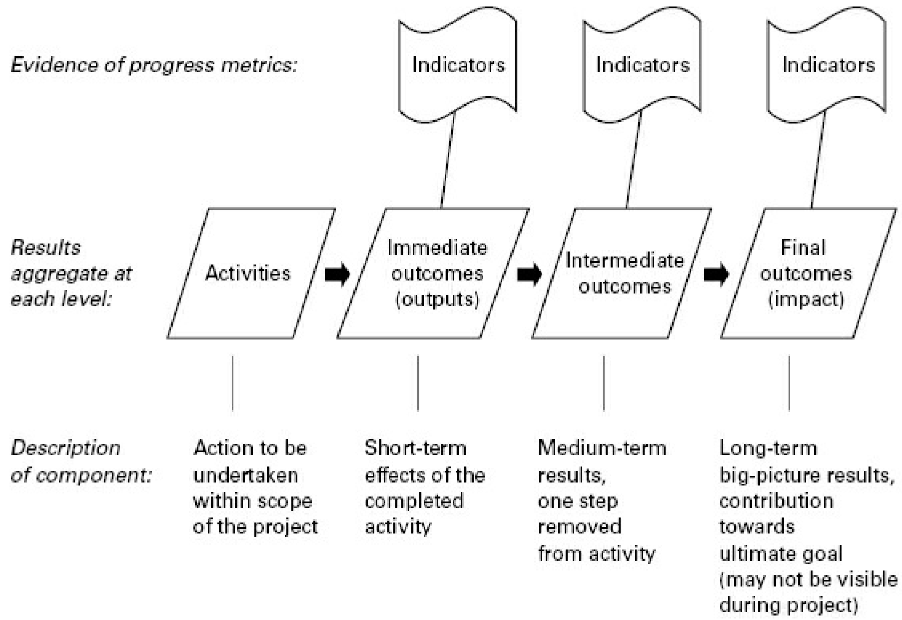

Figure 10.4 High-level RMAF

The major attributes of a results chain are:

- *Results chain:* Explores how resources and activities connect with changes (flow type)
- *Activities:* Actions to be undertaken within the scope of the project; outcomes (a.k.a. outputs): short-term effects of the completed activity
- *Intermediate outcomes:* Medium-term results, one step removed from activity
- *Final outcomes (a.k.a. impact):* Long-term big-picture results, contribution toward ultimate goal (may not be visible during project)
- *Indicators:* Evidence of progress, metrics
- *Results:* Aggregate at each level

Identifying all of the desired impacts, outcomes, and outputs and then connecting these with existing and planned KM initiatives develops the results-based metric. In this way the contributions expected from KM toward attaining organization goals can be easily visualized and progressively monitored via the indicators that are chosen. The impacts are often very long term so the focus in this metric will be primarily at the output and outcome levels. Figure 10.4 shows a logic model or visual representation of the goals and how to attain them. An alternative data collection tool can be a document-based template, where stakeholders are asked to input the activities, outputs, outcomes, and impacts (long-term outcomes) directly on this template. Table 10.2 shows a sample results map template.

Table 10.2 Sample template for data collection using the results map metric

Organization: Business unit: Project name:			Purpose: Date: Date last revised:	
How?		What?		Why?
Inputs	Activities	Outputs	Outcomes	Impacts
Indicators				
Assumptions and anticipated risks				

The results-based metric is easily adapted to include KM activities and outputs that can then in turn be connected to expected outcomes and impacts. This metric makes it almost impossible not to link or align the KM efforts with the overall organizational goals. There is a very strong return on investment focus and, while causality still eludes us, there is a very visual way of at least capturing the expected contributions KM can make toward business goals. Metrics in general and KM metrics in particular are still a long way from being an exact science. However, the result map makes it much easier to define indicators and outcomes at the most useful level of detail. Result maps or chains provide a good means of working with clear and well-defined results that is to the benefit of the KM team and the organizational stakeholders. An example of this approach applied to the assessment of a KM program is described in Dalkir and McIntyre (2011).

Measuring the Success of Knowledge Networks

Finally, there are a number of metrics that are particularly well suited to measuring the value created by communities of practice and knowledge networks. In general, there are three types of value that can result (Krebs, 2008):

1. *Structural value*: The creation of connections in a network; the amount of time spent in interacting with others; the flow of knowledge among network members (typically measured using social network analysis [SNA] techniques)
2. *Relational value:* The maintenance of connections; their longevity; the degree of reciprocity in network interactions (typically assessed through surveys and anecdotes)
3. *Cognitive value:* The commonality or cohesiveness of the network (which can be assessed through SNA and interviewing techniques)

Stories are a good way to illustrate the links between community activities, performance outcomes, and value. Some sample questions to elicit such stories would be:

- "What would have not happened without this CoP in place?"
- "Did you save time because you had access to the community resources, including other people? Did you find the answer to a question more quickly or did you solve a problem more rapidly?"
- "Has your decision-making confidence increased since you have become a member of this CoP?"

Social network analysis (SNA) is a good tool to map out the patterns of network interactions (who interacts with whom? what knowledge products are exchanged? what is the frequency or density of each interaction? are there interactions you would have expected to be present, e.g., people working on projects together, that were not in evidence?). SNA can also be very useful in establishing a baseline measure for a given CoP and be used to track changes over time (such as greater coalescence, fluctuations in activity levels) as well as to identify "hidden experts." Hidden experts are readily visible in a social network map as they appear as a node at the center of dense connections—a traffic cop of sorts,who appears to be instrumental in maintaining good knowledge circulation throughout the community. These valuable *nodes* tend to be the "go to"people in an organization—people who can quickly connect you to other people or to valuable content because they just know who knows what and where the useful knowledge resides.

Finally, time-use studies can also be used to measure productivity and time saved by CoP members. A time-use study is usually done with a self-report survey instrument that asks people to report on the time they spend solving problems, making decision, searching for information, processing information, coordinating, and interacting with others. Participants are typically asked to keep this tabular checklist on their desks and to jot down their answers every day for a period of time (a week minimum to a month maximum). Time use should be measured either before and after a community of practice has been implemented or, alternatively, at regular intervals in order to track changes over time.

A community of practice can also be evaluated on its health, on its outcomes, and on the impact it has had on the organization (Fontaine & Millen, 2004; Lesser & Storck, 2001; McDermott, 2002) Health refers to the number of participants, the frequency and quality of knowledge sharing between them, and the level of community activity in general. For example, the number of community meetings held would be one indicator of the health or activity level of the community. Outcomes measure the individual and group benefits derived from CoP membership, such as personal knowledge and learning, strength of relationships, and access to information of the other members. Outcomes are usually detectable when a community has reached a certain level of maturity or coalescence. The impact dimension measures the return on investment (ROI); the return on time (ROT) spent on community activities (or time saved by being a community member), increased innovation, and increased organizational capability. Impact is often not measured directly or mathematically although some formulae do exist to "operationalize" this metric.

Table 10.3 summarizes some of the major CoP metrics used at the individual, group, and organizational benefit levels (adapted from Fontaine & Millen, 2004).

Table 10.3 Benefits of a CoP to an individual, to the community, and to the organization

Type of benefit	Measurable value

Individual (how does an individual participating in a CoP benefit?)	Skills and know-how increased
	Increased personal productivity
	Increased job satisfaction
	Enhanced personal reputation
	Increased sense of belonging
Community (how does the collective benefit?)	Increased availability and access to knowledge, expertise, and resources
	Easier to reach a consensus
	Faster problem solving
	Enhanced community reputation and legitimacy
	Increased trust between members
Organization (how does having this CoP benefit the host organization?)	Improved operational efficiency
	Increased cost savings
	Increased avoidance of problems
	Improved quality of service
	Increased speed of service
	Increased employee retention/decreased turnover

Key Points

- Traditional metrics tend to be financial in nature and difficult to adapt to KM activities and outcomes.
- The costs of KM are too visible and too easy to measure while the benefits tend to be soft, intangible, and much more long term in nature. This makes the return on investment (ROI) and the payback period difficult to assess.
- A good measurement strategy should be formulated before measuring anything—one that addresses the who, what, when, why, and how of metrics.
- The value added or created at each step of knowledge processing needs to be measured, with particular attention paid to reuse.
- There are a number of fairly sophisticated KM measurement techniques now that can help assess how well an organization is progressing. These include benchmarking, the balanced scorecard method, the house of quality matrix, and the results-based metric.
- Even though a community of practice is a grassroots-driven, organically evolving, and somewhat elusive entity, there are a number of indicators that can be used to assess the health and value created by the CoP.
- It is generally recommended that a combination of different metrics be used in order to assess the entirety of a KM project or program.

Discussion Points

1. Why are traditional accounting-based measures not entirely suitable for KM?
2. What are some of the key challenges in developing a measurement strategy?
3. What are the major benefits of drawbacks of quantitative, qualitative, and anecdotal measures?
4. KM metrics remains an issue, as it is often only too easy to measure the costs of implementing KM whereas the benefits prove too elusive to measure. Discuss this KM issue: what are some of the methods and measures that can be used to make KM benefits less elusive?
5. Explain how you would approach intellectual assets in developing KM applications. What are some of the key challenges? Why can't we use a single measurement method when dealing with intellectual assets?
6. Identify the type of value that can be created at each KM process stage. Provide a concrete example of each.
7. Compare and contrast the three KM metrics of benchmarking, BSC, and house of quality. What are their major advantages and major drawbacks in monitoring progress toward strategic KM and business goals?
8. What does the results-based approach offer that other methods do not?
9. How would you go about assessing the value of a CoP:
   a. To an individual?
   b. To the community?
   c. To the host organization?

Notes

1. See http://www.smarter-companies.com/page/icounts.

2. See http://www.isixsigma.com/me/balanced_scorecard/.

3 See http://www.balancedscorecard.org/Resources/About-the-Balanced-Scorecard.

4 See http://www.bscdesigner.com/software-tool-to-implement-balanced-scorecard.htm.

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11 Organizational Learning and Organizational Memory

> Failure is just a resting place. It is an opportunity to begin again more intelligently.
> —Henry Ford (1863–1947)

This chapter addresses the processes involved in organizational learning, or how an organization can continually improve over time by learning from its successes (best practices and innovations) and its failures (lessons learned). In order to be able to learn, the organization must be able to document milestone events and *remember* them through access to an organizational memory. The major processes involved in organizational learning are outlined and a review of organizational memory models is undertaken. Lessons learned (and their counterparts, best practices) are one of the major types of content stored in organizational memory systems as they represent the analysis of how tasks or projects were carried out. This chapter outlines what lessons learned are, how they are processed and, most importantly, how they can be applied to create incremental and more global improvements in the organization.

Learning Objectives

1. List the major benefits of documenting experiential organizational learning in the form of an organizational memory.
2. Outline the major barriers to good organizational memory management.
3. Define corporate amnesia and reasons why this may occur.
4. Outline the key steps in the evolution of an innovative new idea and the institutionalization of a best practice that forms the object of reuse.
5. Describe each stage of the lessons learned processing cycle.
6. Understand the key questions that need to be answered to elicit and document lessons learned.
7. Explain how once documented, a lesson learned can become institutionalized and generate organization-wide value.
8. Compare and contrast the components of leading organizational learning models.

Introduction

Organizational knowledge is being lost at an alarming rate as businesses continue to downsize, to outsource, and to draw from a pool of increasingly mobile knowledge workers. The average length of time a highly skilled and experienced employee spends at a particular company has shortened considerably. Increased turnover may be due to downsizing, retirement, and high mobility in a given industry or it may even be intentional (e.g., rotations in the military or limited-term mandates). Knowledge has often been referred to as "the knowledge that leaves at the end of the day" and companies are said to "lease" knowledge but not own it. Knowledge in this case refers mostly to the tacit knowledge that resides in the knowledge workers themselves and has not been documented to any great extent. Uncaptured knowledge is therefore at risk of being lost to the organization. In fact, organizational forgetting may be denoted as a form of "corporate amnesia" (Kransdorff, 1998). There is a high cost to the firm of losing know-how that resides within the minds of individual employees who depart. In an era of knowledge workers, learning organizations, and service economies, individuals are increasingly responsible for value creation.

Although many organizations have succession plans in place (see chapter 12), the process usually involves transferring know-how from the departing employee to their successor but the whole process has to be repeated again for the next departure. Organizations need to capture this know-how and transfer it to a stable, easily accessible, cumulative knowledge base—an organizational memory—to retain and make accessible valuable knowledge gained through the experiences of all knowledge in a continuous and uninterrupted manner. The possibility of a critical mass of employees all retiring at the same time has been anticipated as baby boomers reach retirement age. A proactive approach is needed for organizations to effectively manage their organizational memory in order to prevent the loss of essential knowledge, particularly knowledge that resides predominantly in the heads of their knowledge workers and less in documents, procedures, and other tangible forms. More often than not, it is this difficult-to-articulate know-how that is of greatest value in organizational competitiveness and viability.

The National Aeronautic and Space Administration (NASA), for example, has publicly admitted that the knowledge of how to put a man on the moon has been lost. The lessons that were learned and the innovations that were sparked cannot be found in the collective organizational memory of NASA. This means that NASA's organizational memory cannot be used as a resource to plan a more effective mission to send another manned flight to the moon or to Mars. A well-designed and well-managed organizational memory does not only combat corporate amnesia, it also ensures knowledge continuity—the effective transfer of know-how among peers and to future generations of knowledge workers. A better understanding of the nature of organizational memory, what it should include (content), how it can best be retained (technological containers), and how the accumulated lessons learned and best practices can be used by newcomers (connections), will help mitigate the cost of lost, forgotten, or untransferred knowledge and know-how.

Box 11.1

An example: NASA organizational memory

NASA is unfortunately well known for its challenges in populating and maintaining valuable knowledge in its organizational memory. There has been much publicity over the loss of knowledge with respect to manned space flights. To make matters worse, there was also a recent admission by NASA that it was no longer able to locate the original recordings of the landing on the moon—they exist but the people who know where they are located are long gone from NASA.

Petch (1998) notes that NASA has "forgotten" how to put a man on the moon. The Apollo mission documents—millions of pages of plans—have been reduced to microfiche. But missing is the critical set of plans. Twenty-five years ago someone threw away the blueprints for the Saturn booster, the only rocket with enough thrust to send a manned lunar payload on its way. The Apollo missions were completed and project directors were moving offices. No other set of Saturn blueprints has been found to date.

The Columbia disaster showed that the lessons learned from the Challenger accident either went unlearned or were forgotten once learned. NASA has a culture that is resistant to criticism and to change—no one else could possibly understand what the agency does; only NASA possesses the unique knowledge about how to safely launch people into space. These attitudes are coupled with ineffective communication and a tendency to accept only opinions that agree with their own. The bureaucratic structure kept important information from reaching engineers and managers alike, stifling the spread of critical knowledge.

Even when documents endure they can devoid of meaning—human context is often needed. A computerized knowledge base was designed by Dr. Richard Ballard (NASA website http://km.nasa.gov/) which imposes a rational structure on existing sources of knowledge, then automates the capture and communication of future text-based knowledge. This knowledge base is unique in that it uses semantic nets and representational modeling. It combines data retention with contextual relationships that provide meaning to information, and that may stop the liquidation of knowledge assets, prevent future knowledge loss, and provide above-the-line profit opportunities, to be thought of as group memory or organizational intelligence.

How Do Organizations Learn and Remember?

Organizational learning (OL) can be defined as learning what worked and what did not work from the past and effectively transferring this experientially learned knowledge to present-day and future knowledge workers. Organizational learning is therefore a process through which an organization is said to improve over time—by making innovations available for reuse and by taking steps to ensure that mistakes do not occur again or that someone else begins from scratch, not realizing they are redoing work that has already been done. We can say that OL has occurred if we can easily find success stories and lessons learned from the past and from other offices around the world. This implies a documentation process of what has worked and what has not, a technological container (e.g., SharePoint or a knowledge repository) to allow us to plug in to this collective experience of the organization, and the ability to obtain help in reusing or putting this collective knowledge to work—so each can better perform their job.

The technological container (referred to above) represents organizational memory (OM). The OM is a centralized technological system (often an intranet) where we can find all the by-products of OL: primarily the best practices and the lessons learned. An OM is largely made up of the accumulated and aggregated experience of all the knowledge workers of that organization. The role of an organizational memory is to preserve valuable knowledge for future access and reuse—for example, from employees who leave the organization to new hires who join the organization. OM is thus "the means by which organizational knowledge is transferred from the past to the present" (Stein & Zwass, 1995).

The underlying assumption is that organizations capable of learning will be more efficient, more effective, more competitive and more viable than those that cannot (Senge, 1990; Garvin, 1993). A learning organization (LO) is a type of organization, one that has successfully implemented the processes of organizational learning. Typically, an assessment is done on an organization and if it meets the required features of an LO, then it is said to be a learning organization. For example, Senge (1990) lists five key attributes that a learning organization should have. His book, *The Fifth Discipline*, was one of the first to identify the core competencies a learning organization should have as:

1. Mental models
2. Shared vision
3. Personal mastery
4. Team learning
5. Systems thinking

Mental models (refer to chapter 4) are the coherent set of understandings or models that allow individuals to make sense of their world and to make decisions accordingly. A mental model can consist of experiential learning, things learned "the hard way," perceptions, values, beliefs—all assembled in a personalized manner by each individual. Shared vision refers to rendering parts of the individual mental models visible so that they can be shared with others in the organization, understood by others, and perhaps even appropriated by others. The process of sharing can and often does lead to a modification of existing models so that the individuals involved can come closer together with respect to a shared mental model of their organization. Personal mastery refers to a set of values and attitudes such that individuals are committed to lifelong learning—which in turn enables the organization to engage in lifelong learning. The implicit assumption behind this core competency is that the individuals' mental models are not so rigid as to prevent any new knowledge (i.e., learning) to be incorporated or added (which may trigger a change or updating of the original mental model). Team learning is the organizational values and attitudes that actively foster individual learning such as investment in training. An organization that supports individual learning is much more likely to be capable of organizational learning. Finally, systems thinking, the fifth discipline, refers to the perception or definition of an organization as a gestalt, an integral entity that cannot be reduced to a series of components. The organization must be seen, studied, and treated as a whole where all the parts are seamlessly connected to one another. Systems thinking is also an excellent way of viewing KM: as an intact system made up of processes, people, culture, technology, and so forth.

Argote (2013) notes that although learning can occur at a variety of levels—from individual, group, and organizational to interorganizational levels—in order for organizational learning to take place, there has to be a memory. Acquired knowledge must be preserved in a repository of some kind so that this knowledge can be "remembered"—found, accessed, retrieved, and reused in the future. Only when learning is embedded in the organization can the value of experiential knowledge be realized.

> For organizational learning to occur, the individual would have to embed the knowledge in a repository such as a database, routine, or transactive memory system. By embedding the knowledge in a supra-individual routine, the knowledge would persist even if the member who acquired the knowledge left the organization and other members could access the knowledge. (p. 20)

As Argote (2013) notes, there is consensus among researchers that organizational learning consists of changes in organizational knowledge due to experience. The author builds on the organizational learning model developed in Argote and Miron-Spektor (2011) in which experience and organizational context interact. "Knowledge results from the organizational learning processes that interpret experience. ... Knowledge embedded in the organization affects future learning." (p. 49). The theoretical framework consists of a cycle through which task performance experience is transformed into learning. Knowledge flows both into and out of the organization, which changes context and affects future learning. As organizational tasks are completed, experience is accumulated. It is important to note that tasks do not necessarily need to be successfully completed in order for organizational learning to occur. In fact, it could be argued that more learning stems from unsuccessful attempts. Organizational learning takes place with a context defined as the organization and its environment (e.g., competitors, governments, educational institutions) as shown in figure 11.1.

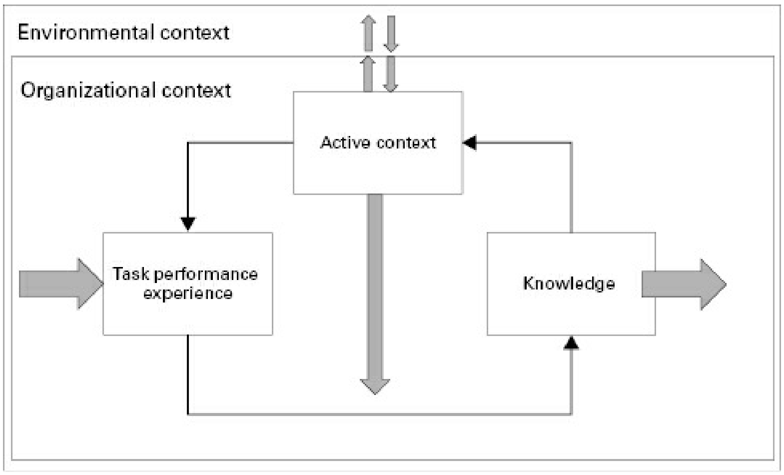

Figure 11.1 Argote model of organizational learning

The organizational context consists of culture, technology, governance, goals, incentives and disincentives, and strategy, as well as relationships with other organizations. Organizational learning occurs when people, tasks, and tools to perform these tasks interact with one another. Individual employees store knowledge but they also interact with other employees to transfer knowledge across the organization. Knowledge may also be embedded in specific products and services which can flow out to the environment. Finally, knowledge is also embedded in the culture of the organization. The arrows in figure 11.1 represent the organizational learning processes.

The Management of Organizational Memory

Knowledge is the key asset of the knowledge organization (Conklin, 2001). Organizational memory extends and amplifies this asset by capturing, organizing, disseminating, and reusing the knowledge created by its employees. There are good reasons to pursue the creation of organizational memory. Organizations routinely forget what they have done in the past and why they have done it. These organizations have an impaired capacity to learn, due to an inability to represent critical aspects of what they know. Ott and Shafritz (1994) coined the term "organizational incompetence" to refer to the lack of organizational capability to learn or as an antonym of organizational intelligence.

Organizational memory is not just a facility for accumulating and preserving but also for sharing knowledge. As knowledge is made explicit and managed, it augments the organizational intellect, becoming a basis for communication and learning. Organizational memory contributes to the overall governance and compliance with regulatory guidelines. An organizational memory can also help increase the transparency of the organization as well as how knowledge workers perceive this transparency. Once valuable knowledge content has been entered into organizational memory, it can be shared among individuals working alone, by teams needing a project memory, and by the organization as a whole for "between-team" coordination and communication. Given the nature of organizations and the competitive environment within which they exist, organizational learning and the accumulation of knowledge will be source of immediate health as well as long-term survival (McMaster, 1995, p. 113).

Box 11.2
Example: lessons learned and best practices in teaching

A specialized school for students with severe behavioral problems undertook to build a repository of lessons learned and best practices. The primary motivation was driven by the fact that there was a high turnover among teachers employed by the school. The average stay was about two years and most left due to burnout, as the responsibilities are quite demanding. A number of best practices and lessons learned were gathered and preserved. Templates were developed and used in order to facilitate this knowledge capture process and access was provided through each student's profile. This is an example of a nontraditional KM application—one that is not situated in a for-profit commercial organization. The same principles and methods apply and can be successfully used to create a corporate memory. The greatest benefit will be that the wheel will no longer have to be reinvented each time a new teacher works with the same student. The new teacher will have access to all of the accumulated successes and failures of the various techniques that have been tried out by each previous teacher working with the same student.

A frequently encountered barrier to effective organizational memory is that the usual approach to organizational memory—preserving documents—fails to preserve the context that gives the documents meaning, the very thing that allows them to be useful in the future, when the context has changed. Because current notions of organizational memory assume a repository of artifacts, they focus on preserving, organizing, indexing, and retrieving only the formal knowledge, as it is stored in documents and databases. For some tasks, formal knowledge alone is sufficient; for example, when it is time to write the new annual report, you might start with last year's annual report as a template. However, most knowledge work addresses problems for which there is no clear and agreed upon definition of the problem, and, indeed, for which the problem itself is apt to change over time. Decision making is characterized by making lots of assumptions, educated guesses, and decisions under conditions of uncertainty. Decisions must frequently be revised or even retracted. Problem resolution requires both traditional linear techniques and a heavy dose of social interactions: conversations, meetings, presentations, phone calls, email, and so on. The primary goal is not always to find a right answer but to find a solution and an understanding of the problem that has broad ownership.

In this context, formal documents are simply not rich enough to support knowledge work. For example, a team may come together for many meetings in the course of resolving a problem, but the practice of creating and circulating meeting minutes is a relatively laborious instrument for creating continuity and coherence among these meetings. Meeting minutes are summaries that often represent only one person's point of view, and they usually capture only a small part of the conversations that took place. Projects can often stretch into months and years, so some form of project memory will be needed. An explicit project memory provides more continuity among these sessions, allowing the group to pick up where it left off, with a minimum of repetition and loss of important issues. As team membership changes over time, or as the project is handed off to a completely new team, the project memory can in principle reduce the likelihood of false starts and duplication of previous work.

New team members must come up to speed on a large amount of information before becoming productive. Often, this occurs by exchanging tacit knowledge informally as other team members try to fill in the new member. The situation is even more challenging when teams are only temporary and/or when not everyone is located in the same place. An example would be a group such as Doctors without Borders, who are a cohesive team in a given place but only for a limited period of time. Another example would be distributed teams working on the same project but located in different countries. A group memory can complement informal interactions by aggregating important content in a repository of some sort—a project organizational memory.

A shared memory for the project team can create coherence within the mass of formal and informal project knowledge. The shared memory often takes on the form of story about what occurred, a living document that tells the story of the project. It preserves the context of the work as it evolves. This project memory is most naturally represented in the form of a web of information that includes facts, assumptions, constraints, decisions and their rationale, the meanings of key terms, and, of course, the formal documents themselves.

Another challenge for an effective organizational memory system that includes informal knowledge is that informal knowledge tends to lose its relevance, and thus its value, over time. Informal knowledge, being more contextual, is even more dynamic in this way. An organizational memory system should therefore, like human memory, have the capacity to recall whatever is relevant and salient to the moment. Closely related to this is the problem of the sheer size of organizational memory. There will be ever-increasing volumes of corporate knowledge accessible online, which will make it even more difficult to pinpoint those particular items that are relevant to users.

To summarize, the obstacles to an effective organizational memory system fall into two categories, cultural and technical. The cultural barriers include the following:

- A cultural emphasis on artifacts and results to the exclusion of process
- Resistance to knowledge capture because of the effort required, the fear of litigation, and the fear of loss of job security
- Resistance to knowledge reuse because of the effort required, and the low likelihood of finding relevant knowledge

The technical barriers include:

- How to make the knowledge capture process easy or even transparent
- How to make retrieval and reuse easy or even transparent
- How to ensure relevance and intelligibility (i.e., through sufficient context) of retrieved knowledge

Box 11.3

A vignette: corporate amnesia

A large mining company was examining its predictive maintenance procedures. This form of maintenance relies upon scheduled parts changes and “tune-ups” that take place according to expected useful life spans of the various types of equipment used, as opposed to waiting until something fails and brings the whole operation to a costly stop. In the case of one particular type of valve used in the refinery, technological advances had resulted in the use of a new type of polymer that was just now available. The question was: could this new polymer be used to cap the valves? Could it withstand the high temperatures that the valve would be subjected to during operations? At first, this seemed to be an easy, almost trivial question. Engineers began looking for the equipment specification documents. These proved, however, more elusive than expected. When, after about six weeks, they were found, they were located not within the company but within the archives of a design firm that had been subcontracted to design that particular piece of equipment—roughly twenty-five years earlier. Unfortunately, nothing in the specifications helped answer the question. The use of a polymer would represent a significant cost savings but the team was reluctant to go ahead. The conventional wisdom said that “a slow dime is worth more than a fast penny,” in other words, we may save a few pennies now but if the polymer melts under the high temperatures, the whole refinery will have to be shut down, costing many, many, more dollars to the company. Finally, after about six months of searching, the HR department of the design company tracked down the original design engineer who had worked on the equipment. He was happily retired and playing golf in Florida but was still receiving a pension and that is how they found an address for him. Luckily for the mining company, this engineer was a bit of a pack rat and/or nostalgic: he had kept his original hand-drawn specifications with his own annotations. It was by checking these annotations that he was able to confidently answer “no—the polymer would not be a safe alternative—metal should continue to be used.” The next question posed by the mining team was: now, where can we write down this valuable information down? Where is the company “book” where they can look this up when the next five-year cycle comes up?

Organizational Learning

The key processes required to both populate an organizational memory and to retrieve valuable knowledge for reuse from the same memory consist of the same steps as in the KM processes (refer to chapter 2). The knowledge content to be processed, however, is defined much more narrowly as the key successes and key failures that have a sufficient degree of generalization. If a particular innovation or failure is too specific, then this content will typically reside in the group memory—either a project database or a community of practice archive. Aggregated results from a diverse set of projects, on the other hand, can be analyzed thematically to identify recurring themes. An organizational lesson learned or best practice is one that has broader applicability—it is not limited to a particular context or particular event and offers reuse potential to an organization-wide audience.

Secchi et al (1999) define a lesson learned as knowledge or understanding gained by experience. The experience may be positive, as in a successful test or mission, or negative, as in a mishap or failure. The Project Management Institute (PMI) Project Management Body of Knowledge (PMBOK) defines lessons learned as the learning gained from the process of performing the project. The Society for Effective Lessons Learned Sharing (SELLS) defined lessons learned as "the knowledge acquired from an innovation or an adverse experience that causes a worker or an organization to improve a process or activity to work safer, more efficiently, or with higher quality" (Kitimbo, 2015).

These diverse definitions highlight some key attributes of lessons learned:

- They can be learned from both successful and unsuccessful events.
- They can be at the operational, tactical, and/or strategic levels.
- They need to be validated in some way.
- They need to be applied by people other than those involved in the original event.
- They must be significant enough to pass a cost–benefit analysis (in other words, the effort required to document them must be warranted as they will have a large enough impact on the organization).

In practice, this means that a lesson learned must represent something new, something that was not encountered before, either in a positive way or a negative way. If everything went according to plan or was a routine operation, then there are no lessons to be learned. If something unanticipated occurred however, despite the consequences, there is one bright side: the individuals, the team, and the organization can learn from the surprising event. By following the lessons learned process, it is possible to analyze what happened, why, and what we want to do differently the next time it happens.

Others refer to post-project reviews or project postmortems. They are particularly prevalent in knowledge-intensive industries such as consulting firms and R&D units (Zedtwitz, 2002). While they can be done at the various project phases, the term tends to be reserved for the final review upon project completion. The main objective should be to capture lessons that can be used to enhance future projects. Project lessons learned serve as an important bridge between individual and organizational learning as the analysis is on root cause or causal factors—the "why" in what went wrong.

What then, is the difference between a lesson learned and a best practice? The term best practice is often associated with a success, an innovative discovery, or tried-and-tested method for accomplishing a task (positive experiences), whereas a lesson learned more often implies the documentation of a critical mistake or failure in order to avoid repeating it (negative experiences). However, as the definitions given above illustrate, lessons learned ideally address both positive and negative experiences.

In general two types of learning occur in organizations; top-down and bottom-up.

1. Top-down learning is a strategic learning method whereby management, at any given level, decides that a certain piece of knowledge is vital to the organization and must be learned by its employees.
2. Bottom-up learning happens in the actual "doing" of tasks; it is experiential learning and results from both positive and negative events (O'Dell and Grayson, 2001).

Lessons learned are concerned with capturing the results of bottom-up learning, as they are a distillation of valuable employee experiences.

The Lessons Learned Process

Effective knowledge management processes involves the identification, creation, acquisition, dissemination, and reuse of knowledge assets to provide a strategic advantage. The lessons learned process has a similar cycle of activities, although there is less agreement on what these specific stages should be. Figure 11.2 (adapted from US GAO, 2002) describes one approach to the core processes:

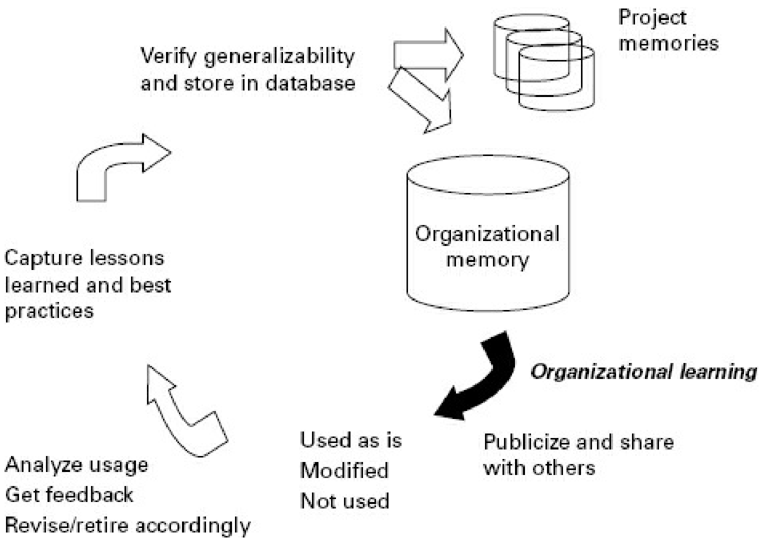

Figure 11.2 Lessons learned process

1. Collection: Capture of lessons through structured or unstructured processes, such as after-action or project reviews, meetings, training evaluations, etc. Capture may be done at all levels: individual, community, and organization.
2. Verification: Lessons are verified before dissemination to ensure that they are valid and applicable. This process may involve subject-matter experts or additional research, and the lessons are typically verified to ensure that they meet or exceed a set of defined criteria outlined in established standards.
3. Storage: Once approved, lessons are stored in an accessible database in a format that allows for easy search and retrieval of information. Some storage issues include categorization, indexing, formatting, and structure.
4. Dissemination: Active dissemination of lessons is essential for getting value out of a lessons learned program; lessons are of little benefit unless they are accessed and reused. Dissemination can be active (lessons are pushed to potential users) or passive (users access a repository to retrieve lessons).

Milton (2010) outlines five stages:

1. Reflect on the experience and discuss what happened as a team.
2. Identify key learning themes (positive and negative).
3. Analyze and try to ascertain root causes for any divergence in the actual event compared to what was originally planned.
4. Generalize from this analysis (can it apply to other situations in the organization? Can the learning theme be abstracted a bit more?).
5. Apply the lesson learned (change a procedure, a guideline, a decision).

Note that unless the fifth stage is completed, the lesson can also be said to be identified, not learned. Milton also adds the very important first step of reflection.

The PMBOK integrates the lessons learned activities as part of the responsibility of all project managers: to document them following project completion and also to consult them before beginning a new project. The following steps are defined in the lessons learned process:

1. Identify lesson learned.
2. At project's end, conduct lesson learned session.
3. Document lesson learned and corrective action taken in central project repository.
4. Disseminate lesson learned to other projects if appropriate.
5. Incorporate project lessons learned into organization lessons learned.
6. Archive project lessons learned with along with historical project data.

The focus is necessarily on projects but as clearly stated in step five, project lessons learned need to be integrated ("archived") into the organization-wide repository of lessons learned.

Another major source that is often referred to is the US Army Lessons Learned process (CALL, 2015). In her blog[1], Nancy Dixon notes that the "US Army Lessons Learned system has evolved over 40 years to become a model lesson learned system. What began as an AAR process in the 1970s has become a robust system of identifying, collecting, analyzing, transferring, and moving lessons learned at all levels of command." In this model, the following major stages of processing a lesson learned are involved:

1. Collection
2. Repository
3. Transfer process
4. Implementation
5. Analysis and data mining

One of the most important contributions of this model is to not neglect second order analyses. This means aggregating a number of events and analyzing them as a whole in order to identify patterns that would not be apparent in any single lesson learned. Data mining techniques can be used to find trends across units and across periods of time and to ultimately identify any gaps in knowledge.

King (2009) emphasizes a number of additional steps to "refine" lessons learned. Value is added at each one of these steps:

1. Explain
2. Document
3. Cull
4. Clean
5. Index
6. Standardize
7. Organize
8. Distill
9. Integrate
10. Revise
11. Evaluate for appropriateness
12. Prune
13. Select for inclusion in memory

Refinement is an important process in the life cycle of lesson learned. Typically, the KM team will be tasked with these refinements. The "explain" and "document" stages refer to the transformation of tacit knowledge in the lesson learned into explicit knowledge. This is not as straightforward as it sounds, as the tacit knowledge is often sensitive (e.g., someone made a mistake or there was a conflict). The documentation has to be done in such a way to avoid assigning blame or even clearly identifying the person or the event. The remaining steps involve preparing the lesson learned so that it is in an appropriate format (e.g., easy and quick to read) and assessing whether or not it merits being added to the organizational memory.

Lessons learned are both a type of content and a process. As content, they represent the explicit codified knowledge that documents an event (such as a project) and what was learned from having participated in this event. As a process, lessons learned are part of a reflective activity that the organization makes time for and provides space for to encourage analyzing what was done well and what could have been done better. The overall objective is to improve organizational efficiency and effectiveness, but lessons learned can also lead to innovations.

There is an interesting parallel between the organizational learning literature and the knowledge management literature. In KM, there are two major goals identified for KM processes: efficiency through reuse and innovation through creativity. In OL, the terms "exploitation" and "exploration" are used to describe intra- and inter-organizational learning processes. "Exploitation is about creating reliability in experience, and thrives on productivity and refinement. Exploration is concerned with creating variety in experience, and thrives on experimentation and free association" (Holmqvist, 2004). As KM cannot occur without change and organizational improvement cannot occur without OL, the two fields of study and practice are definitely highly complementary. King (2009) notes that "Organizational learning (OL) is complementary to KM … [it] has to do with embedding what has been learned into the fabric of the organization" (p. 3).

The overarching goal is organizational learning, to fully integrate what has been learned into the way things are now done in an organization. Leavitt and March (1988, in King, 2009) note that in order to learn, we need a way of "encoding inferences from history into routines that guide behavior" (p. 18). This is exactly what happens in organizations: new routines are established following lessons that were learned in order to introduce and solidify new ways of doing things; policy manuals are revised, training content is updated, ICT systems are updated, and even reward systems, promotion criteria, and hiring priorities can be targeted. When done well, lessons learned can be continuously implemented to ensure there is continuous improvement in the organization.

Methods for Managing Lessons Learned

Kitimbo (2015) outlines a number of approaches that can be used to complete the steps in the LL processing lifecycle. Major types include after action reviews, project post mortems, and reporting systems. The after action review (AAR) was the original means of identifying lessons learned in the US Army. AARs continue to be standard operating procedures and are typically initiated immediately after (or as soon as possible after) an important activity or mission.[2] Project post mortems (PPMs) have also become a best practice in project management and an analysis of each project upon completion is now a required component of the Project Management Body of Knowledge or PMBOK.[3] Similar to AARs, in a PPM an analysis is carried out whenever a project is completed. In some organizations, a group of projects is also analyzed to identify any common themes. Reporting systems tend to be situated at the operational level and require participants to complete analytical reports after each activity they participated in. There is at least one field in this report that asks about anything having gone wrong, or almost having gone wrong, and asks the person to think about why what happened transpired the way it did. A good example of this is the Near Miss Reporting System, where US national firemen and law enforcement personnel can submit a report after each call they answer.[4]

In all approaches, there are some basic questions to be answered. and while they may vary in their formulation somewhat, the intent remains fairly consistent:

- What was planned?
- What actually occurred?
- In cases where the two differed, did we do better (innovation or best practice) or worse (lesson learned) than expected? What are some possible reasons why?
- What would we do differently based on this experience? What should we keep doing? What should we avoid repeating in the future?

The PMBOK provides the following questions to document a project's lessons learned:

1. What was learned about the project in general?
2. What was learned about project management?
3. What was learned about communication?
4. What was learned about budgeting?
5. What was learned about procurement?
6. What was learned about working with sponsors?

7. What was learned about working with customers?
8. What was learned about what went well?
9. What was learned about what did not go well?
10. What was learned about what needs to change?
11. How will/was this incorporated into the project?

These questions can be asked of individuals or in groups (or a combination of both). Individual interviews may be required if there was a lot of dissent and differing views or if people are simply no longer collocated. Group interviews typically involve interviewing the team that worked together on the event. In some cases, it may be a good practice to not have the direct authority present during the group interviews (e.g., the project manager or senior military officer) to allow people to speak more freely and without fear of any reprisals. The PMBOK recommends acting quickly to obtain feedback as soon as possible before people begin to forget what happened.

Formal lessons learned sessions are traditionally held during project close-out, near the completion of the project. However, lessons learned may be identified and documented at any point during the project's life cycle. Darling et al (2007) recommends viewing the lessons learned process as "an ongoing learning process rather than a one-time meeting, report, or post mortem." She suggests gradually implementing the process by beginning to collect lessons learned from a subset of projects. The best way is to find the "early adopters"—those managers who are already convinced of the benefits of lessons learned and have already put in the time, effort, and attention to taking the lesson through all the processing stages. The author also suggests breaking up the process into smaller chunks: instead of waiting until the very end of a project, collect lessons learned after each key milestone. In addition to making the analysis easier, there is the added advantage of being able to influence the project while it is still going on.

Similarly, Schindler and Eppler (2003) also recommend that lessons learned be a continuous process instead of a single review. Regular gathering of lessons learned will increase employees' motivation to participate because they will be able to see the benefits applied to their projects while they are still working on them. The events are more recent and therefore can be more easily remembered (as recommended by the PMBOK). The process will be less costly and less time consuming as all team members are still present and available. In this way, important lessons can be regularly captured after important project milestones.

Lessons Learned Systems

Schindler and Eppler (2003) note that experiential learning is necessarily a personal experience by the individual who was involved in the event or project. People solve problems during the course of their work. Unfortunately, these are not usually part of the resultant documentation such as a report. In fact, almost all formal documents omit any description of failures or errors that had to be corrected (with the possible exception of journals kept by researchers). This type of individual learning is typically only shard through employees' informal networks. A lessons learned system is a central repository where these tacit experiences can be documented as lessons learned and be made available to all employees in a more deliberate and systematic manner. Zedtwitz (2002) surveyed R&D-intensive companies and found that although all participating companies conducted lessons learned reviews, most did so on an ad hoc basis or after a particularly major project. Most lacked formal guidelines on how to conduct a lessons learned review. The most popular means of sharing knowledge from one project to another appeared to be through the movement of people—when team members were assigned to other projects—and through written documentation.

Weber et al. (2001) surveyed lessons learned processes and systems to better understand their capabilities and limitations. The authors developed a classification system of lessons learned systems which can help in comparing and contrasting their functionalities. Originally, lessons were simply documented as guidelines, but the process soon evolved to include validation of relevancy, accuracy, and importance. The goal of these systems is to preserve valuable knowledge that may be otherwise lost so that employees who encounter similar challenges will not have to start again from scratch. Instead, each employee will be able to leverage the experiential knowledge that has been gained by all the other employees over the years.

As with all knowledge management, the basic technology is a database. Lessons learned, corporate memories, stories, best practices—these are all stored in some form of database. Typically, there is one entry (e.g., one lesson) per database entry in order to make it more easily searched. Weber et al. (2001) found that most systems were built as standalone databases and most used basic hierarchical taxonomies with keyword search functionalities. Few made use of push technologies, remaining passive repositories that depend on people to think of using them. In general, the metadata (the description of the content) was not rich enough to permit easy finding, retrieving, and reusing of lessons. The more descriptive and extensive the metadata, the more likely someone will find what they are looking for. For example, a lesson may be tagged with information about the type of problem, the root cause, the type of business unit involved, the time period covered, the type of media (e.g., a video or text), and so on. Each one of these tags can then be used to search for lessons.

Benefits of Lessons Learned

There is a benefit in making the time (and space) for reflective thinking. Most organizations are too busy doing to think about what they are doing. Reflective observation is an excellent practice to be able to evaluate the efficiency (how well are we doing this?) and effectiveness (should we be doing this or something else?) of all organizational activities, whether they be mundane or routine operational tasks or a five-year strategic planning exercise.

Hewlett-Packard (HP) has always been viewed as an organization that conducts a more systematic lessons learned process. They gather root causes for project problems and then identify how they can avoid them in future projects. Lesssons learned are part of their company-wide project management process. They have also dedicated resources including meeting facilitators (Zedtwitz, 2002). Most companies rely on personal networks, personnel rotation, temporary project assignments, and team handover procedures to ensure lessons learned are disseminated throughout the organization. In this way, a best practice or innovation (i.e., a better way of doing things) and lessons learned (i.e., things to be avoided in the future) are shared with all employees. The employees learn, the project managers learn, and the organization is said to learn because these lessons learned have now become integrated into standard procedures.

Schindler and Eppler (2003) note that “the systematic retention of project experiences enables a company to compare its various projects more systematically and document its most effective problem solving mechanisms” (p. 216). In the short term, project risks are decreased when lessons are learned. In the long term, an effective lessons learned process and system will lead to a more competent organization that has a greater chance of surviving and competing. Organizations can prevent significant costs associated with losing knowledge when employees go on to other mandates either within the organization or go to another organization. Rework can be avoided and mistakes will not be made again as long as lessons are learned.

Williams (2008, p. 249) outlines the following benefits of lessons learned:

1. Project managers learn how to manage experientially as they learn to reflect on their projects and consult other projects’ lessons learned that are relevant.
2. Lessons learned can contribute to the feasibility and risk assessment of other projects and help managers plan them better.
3. The project management process is improved.
4. Management decision making is improved.
5. Lessons learned can be used for benchmarking.
6. Lessons learned can lead to innovations such as new products and services.
7. The organization’s strategic focus may be adjusted.

Some Challenges

It appears to be difficult to successfully implement lessons learned and this is due to a variety of factors. One of the first barriers to be encountered is at the lesson learned elicitation stage. While this was discussed in chapter 4, there are additional issues with lessons learned: we are asking people to publicly admit that everything did not go perfectly according to plan. No matter how much reassurance we provide, it is perfectly reasonable to expect participants to be very defensive, lacking in trust, and expecting to be judged in some manner. Trees (2014) notes that the manner in which a lessons learned session is conducted is “hugely important and often overlooked.” The environment should not be confrontational in any way and participants should be made to feel comfortable, at ease and above all, safe. It is often a good idea to start with the positive—what went well, what went better than expected. When addressing what went wrong, the tone must again be positive even though we are discussing something negative. The goal is to improve, to avoid costly mistakes, and to change how things are done.

Another good practice is to prepare everyone for the session, the agenda, the time needed, what is expected of everyone, the goals of the session, and the roles of all participants. A neutral facilitator is often preferred, especially if the issues are particularly challenging. The facilitator is not a member of the team and may not even be an employee of the organization. Facilitators are therefore perceived as not having any stake in the outcome or as being in any position of authority over the participants. A scribe may also be present to take notes and record the session. All participants should be aware of this and give their formal consent.

A second common problem is that lessons are often identified and documented but they are not applied. This is a failure to institutionalize this valuable content and often organization lack the time or even the know-how to fully integrate lessons learned. It is also fairly complex as integration can occur in multiple business units. For example, training materials and sessions may incorporate real-life lessons learned. In parallel, specific policies and/or procedures will need to modified. If there is a best practice/lesson learned database, then it will need to be updated and employees made aware that there is new content. And—the most difficult of all organizational changes—people will have to change not only their behavior (which is hard enough) but often also their attitude or mindset (which is extremely difficult).

This was the problem encountered at NASA when they undertook a comprehensive review of the effectiveness of their lessons learned following a series of shuttle catastrophes. The strongest recommendation was that their lessons learned on technical issues were strong but they neglected "soft" factors such as management, communication, and cultural issues[5]

The review of NASA's policies, procedures, and systems in place for the lessons learned process assessed their effectiveness as it appeared that organizational learning was not taking place. There is a policy in place that requires NASA project managers to review existing lessons learned, available in their Lessons Learned Information System (LLIS), and apply these lessons where they are relevant to current and new projects. There are over 900 lessons on topics ranging from program management to technical cause of failure. The public can access LLIS at https://llis.nasa.gov/llis/search/home.jsp.

NASA managers are also required to submit any significant lessons learned they identify and document to the LLIS. Managers are provided with guidance so that they can select "good" or significant lessons learned. These criteria include: "a real or assumed impact on operations; valid in that it is factually correct; and applicable in that it identifies a specific design, process, or decision that reduces or eliminates the potential for failures and mishaps, or reinforces a positive result."[6] In order to foster the application of lessons learned, NASA also uses its training, program reviews, and any periodic policy revisions to be offered as opportunities to make employees aware of the lessons and hopefully encourage them to make use of them.

However, the survey showed that this was not occurring on an organization-wide basis. Responses to the GAO survey showed that employees were not aware of the LLIS. Project managers stated there was insufficient time to talk about let alone document lessons learned. The culture appeared to represent an obstacle to the sharing of lessons learned that did manage to get documented.

The GAO report recommendations were that the lessons learned processes and systems at NASA be strengthened by:

1. Articulating the relationship between lessons learned and knowledge management through an implementation plan for knowledge management.
2. Designating a lessons learned manager to lead and coordinate all agency lessons learning efforts.
3. Establishing functional and technical linkages among the various center-level and program-level lessons learning systems.
4. Developing ways to broaden and implement mentoring and storytelling as additional mechanisms for lessons learning.
5. Identifying incentives to encourage more collection and sharing of lessons among employees and teams, such as links to performance evaluations and awards.
6. Enhancing LLIS by coding information and developing an easier search capability to allow users to identify relevant lessons, including more positive lessons, providing a means to disseminate key lessons to users; and soliciting user input on an ongoing basis.
7. Tracking and reporting on the effectiveness of the agency's lessons learning efforts using objective performance metrics.

A follow-up study[7] was undertaken in 2012 to see if these recommendations had been successfully implemented. Information was collected from employees, projects, programs, directorates, and all supporting organizations and their personnel. The findings were, once again, that NASA project managers did not routinely use the LLIS to look for lessons learned they could use and to submit lessons learned they had documented. An alarming result was that the lessons learned processes and policies were found to have weakened since the last report had been completed. At the time of the last review, managers were required to submit lessons after each important project milestone. In 2007, the policy was revised and no longer explicitly states that project managers need to identify or archive lessons learned until project conclusion or closeout.

Lessons learned policies were not found to be consistent across different units. The report also noted that the resources available for lessons learned were not comparable across the different units. Finally, the monitoring of LLIS activities was found to be insufficient. The same problem appeared to remain: although they were clearly directed to do so by formal requirements and guidance, managers did not consult or contribute to the LLIS. An analysis showed that there had been minimal input to the LLIS for the six-year period from 2005 through 2010, with the exception of the Jet Propulsion Laboratory (JPL). Most units contributed an average of one lesson per year. This was in contrast to JPL where twelve lessons on average were contributed each year (Lipowicz, 2012).

The reasons given for not using the LLIS were that the content was out of date, the system was not user-friendly, and it was very difficult to find anything that was relevant to their projects. The lack of time due to project deliverable deadlines was also mentioned. It would be interesting to see why JPL seems to be doing so much better. An internal benchmarking exercise might be able to shed some light on their best practices to see if these could then be migrated to the rest of NASA.

It should be emphasized that these challenges are not unique to NASA. The example is provided here because there has been extensive reviews and analysis of the lessons learned process at NASA, one of the early adopters of LLIS. In addition, the reports are publicly available and have been much discussed by knowledge management academics, researchers, and practitioners.

Zedtwitz (2002) identified four main categories of obstacles to successfully implementing lessons learned, which he grouped in to four main themes:

1. Psychological barriers
2. Team-based shortcomings
3. Epistemological constraints
4. Managerial problems

Psychological barriers refer to reluctance to look back into what happened in the past. Employees may not be motivated to talk about a project failure, especially if they were at all involved in the reason it failed. We tend not to remember everything and we tend to prefer remembering positive events rather than negative ones. Also, some people may not see the value in revisiting the past and prefer instead to just get on with their work.

Team-based shortcomings refer to how well the team worked together. Team members may not have necessarily gotten along well, they may have had incompatible working styles, communication may have been poor or roles not clearly defined. This could be due to a number of factors such as that teams were assigned so people could not choose who they wanted to work with. The skillset of team members may not be complementary and/or there may be a lack of familiarity with others' areas of expertise, thus creating a lack of credibility and making trust very difficult to establish.

Epistemological constraints refer to cognitive challenges such as difficulty in trying to abstract or generalize from a specific incident to a broader scope lesson to be learned. People often get lost in the technical details of what happened and have difficulty seeing how anything from one project could possibly apply to another. In addition, the root causes may be very tacit and therefore difficult to articulate. For example, there may be a consensus among team members that "poor leadership" was to blame. What does this mean in concrete terms? Unless it can be articulated, it cannot be documented and there cannot be any learning from this particular event.

Managerial problems have already been mentioned and they are mostly related to lack of time to reflect, lack of lessons learned guidelines, failure to comply with guidelines, and lack of managerial support. Managers need to be good role models and participate in the process themselves (although not always in the same session as their direct reports). Managers need to make the time and space available, which in turn communicates clearly that they value the exercise and they see it as part of the work employees do.

Similar obstacles are noted by Schindler and Eppler (2003) including:

- Time pressure to complete the project and go on to new assignments
- Unwillingness to learn from the mistakes of others
- People may be overly modest and not talk about what they did well and/or fear reprisals when

talking about what they did not do well.

- The process is not done well—the time needed is underestimated, there is little or no facilitation, and the session becomes unraveled and focused on assigning blame;
- Employees find it difficult to contribute lessons to the system due to unclear instructions and there is no censure if they don't contribute (no reward if they do).
- Participants don't see any personal benefit in the process.

Williams (2008) also conducted a survey of project managers in the IT, manufacturing, finance, and consulting/business management industries. He found that while the majority responded that they had formal procedures for lessons learned, only 12 percent said these were adhered to. The more mature the project management function was in the organization, the more frequently lessons learned were addressed. Roughly one-third of the organizations had a dedicated department for lessons learned, responsible for capturing lessons, ensuring compliance to standards, and transferring learning to future workers. The people involved in the process tended to be project management and technical staff. The most popular approach was a meeting or workshop (78 percent), followed by individual interviews and project audits. Methods used to transfer lessons included documentation, moving people to other projects, presentations, conferences, corporate training, lessons learned systems, CoPs/networks, mentoring, and writing the lessons into procedures. The transfer process appeared to be the most problematic, which in turn led to the benefits being hard to identify. Organizations with mature project management practices tended to do lessons learned activities regularly rather than as a reaction to a specific event. The reasons cited for failing to learn from lessons included lack of time; lack of management support; lack of incentives, resources, and guidelines; as well as the organizational culture.

Organizational Learning and Organizational Memory Models

Huysman and de Wit (2002) identify three fundamental stages in knowledge processing: (1) internalization, where knowledge is learned and understood by the knowledge sharers; (2) externalization, where knowledge is exchanged or reused and new knowledge can be derived from the shared knowledge; and (3) objectification, where shared knowledge is accepted and institutionalized as organizational knowledge. Keong and Al-Hawamdeh (2002) define knowledge sharing as "the deliberate act in which knowledge is made reusable through its transfer from one party to another" (p. 49). Alavi and Leidner (2001) note, "to be credible, KMS [The authors use the term KMS for Knowledge Management Systems] research and development should preserve and build upon the significant literature that exists in different but related fields" (p. 107). Knowledge processing is highly dependent on having access to this content in the first place, which firmly roots it in the territory of information studies.

Employees cannot benefit from the accumulated experience of an organization unless that valuable experiential learning has been captured, coded, and made accessible through the organizational memory. Organizational learning and organizational memory systems are therefore integral components of KM that aim to facilitate the access, use, and reuse of valuable knowledge resources (Dieng-Kunz and Matta, 2002). Examples of valuable knowledge resources would be an innovation (improved practice, policy), a post mortem to identify why a particular project failed (which is subsequently documented as a lesson learned), and a library of reusable knowledge objects that others may easily incorporate into their work (such as a company profile, a tool to show which topics are most active in a discussion forum, or a starter kit to get you up and running on a new process or technique). The value of these knowledge resources lies in the fact that they have been digitized (rendered explicit), and that people other than the creators find them useful and timesaving for their own work.

Knowledge *access* refers to the ability to know about existing knowledge and to easily find it from collective organizational knowledge systems such intranets (used to preserve and make available organizational knowledge to individuals). Knowledge *use* refers to the manner by which organizational members (e.g., policymakers, practitioners, and researchers) use policy, evidence, and experience as knowledge. The subconcepts for knowledge use are: (1) distribution of knowledge through different modalities such as newsletters, bulletins, policy briefs, and web-based resources to targeted audiences; (2) sharing of knowledge through interpersonal communications and dialogues via emails and discussion forms; (3) application of the knowledge as new policies, guidelines, or practice routines (Lau, 2004). Majchrzak et al. (2004) specify two types of knowledge resource reuse**:** the reuse of knowledge for routine tasks (e.g., use of templates, boilerplates, and existing solutions) versus reuse that stimulates knowledge synthesis and innovation (e.g., searching a database to find new ideas to add to existing knowledge). Knowledge reuse demonstrates that knowledge is being retrieved from organizational memory (Markus, 2001) and provides an excellent indicator of the value of that resource. Knowledge reuse promotes peer-to-peer learning and helps avoid situations where people reinvent the wheel by doing work that was already done by others. Companies typically create both social and technical networks to promote such reuse (Huysman and de Wit, 2002).

Research to date indicates that organizations need better guidelines to improve their knowledge processing practices concerning valuable and reusable content (Patriotta, 2004). Alavi and Leidner (2001) undertook a comprehensive review of knowledge management (KM) systems used to "support and enhance the organizational processes of knowledge creation, storage/retrieval, transfer and application" (p. 114) and concluded that "while much theory exists … little empirical work has been undertaken" (p. 126) and that "research is needed to address several important issues regarding knowledge storage and retrieval" (p. 128).

Given the lack of integrated theories for conceptualizing knowledge use and reuse, the field of information studies offers a number or relevant models and concepts that can guide the inquiry. This research calls for a user orientation because knowledge use will be examined at the micro and individual level. One relevant user-oriented model is Wilson's model of the information user who experiences an information need, which may encompass cognitive and emotional needs, and will place demands on information systems and information sources (Wilson, 1981, 1999, 2000, 2006). If the need is successfully fulfilled, information will be used to some extent and ultimately information transfer and/or information exchange will take place. It is easy to draw a parallel model with knowledge users' needs and demands on knowledge infrastructure and knowledge resources for learning and innovating. On the other hand, information users will use information systems and services only if they perceive some value-added dimension such as system noise reduction, quality, adaptability, and time and cost savings (Taylor, 1986). Similarly, a knowledge user will make an effort to use a knowledge resource if they perceive that the resource will add some value to existing knowledge.

Choo's theory on organizational knowing is also highly relevant. Choo (2001, 2003, 2006; Choo et al. 2006) views organizational knowing as mediated (with rules, roles, and technology), situated (located in time and space), provisional (often tentative), pragmatic (oriented toward goals), and contested (sometimes affected by conflicts). More importantly, organizational knowing involves various processes of sense making, knowledge creation, and decision making, which all work as a cycle and which, by definition, affect knowledge use and reuse.

Crossan et al. (1999) presented a model of organizational learning called "the 4I framework" that identified four key processes (intuiting, interpreting, integrating, and institutionalizing) as being critical to organizational learning (introduced in chapter 4; see also figure 4.3). This model was further refined with respect to the first three steps but the fourth step, institutionalization, has not been explored extensively (Crossan & Bedrow, 2003). The fourth or institutionalization step is a prerequisite for the complete processing of knowledge resources.

The major components of Wilson's user-oriented model, Choo's sense-making model, and the 4I model of organizational learning should ideally be integrated in order to provide a sound theoretical framework for organizational learning and organizational memory—one that also integrates the diverse fields of management studies, information studies, and knowledge management.

Assessment Frameworks

There are a variety of frameworks that can be used to assess organizational learning, in much the same way as maturity models can be used to assess the state of KM within an organization (discussed in chapter 9). These organizational learning frameworks serve to evaluate the organizational readiness or baseline state of a given organization with respect to organizational learning processes, organizational memory containers, and enablers of these, such as technology and culture.

One framework, proposed by Probst and Buchel (1997) looks at the following organizational factors:

1. Knowledge—the number of organizational learning instruments
    a. Number of techniques for facilitating learning
    b. Number of techniques for breaking down barriers
    c. Process-oriented use of techniques
2. Ability—the learning level
    a. Ability to cooperate and participate
    b. Ability to communicate and achieve transparency
    c. Ability to analyze problems and solve complex issues
    d. Ability to store knowledge
3. Intention—the willingness to learn
    a. Creates a structure which imparts meaning
    b. Builds on an ethical basis
    c. Wants to create a shared value system

Marquardt (2002) proposes three dimensions to consider in building the learning capacity of an organization:

1. Speed of learning: how quickly the organization is able to complete each learning cycle (planning, implementing, and reflecting)
2. Depth of learning: degree of learning the organization achieves at the end of each cycle, which it achieves by questioning assumptions and improving its capacity to learn in the future
3. Breadth of learning: how extensively the organization is able to transfer the new insights and knowledge derived from the iteration of the learning cycle to other issues and parts of the

organization

Table 11.1 summarizes some of the characteristics of a learning organization and associated best practices (adapted from the work of Senge et al., 1994 and Argyris & Schon, 1996).

Table 11.1 Key characteristics and associated best practices of successful learning organizations

Characteristic	Definition	Associated best practices	Positive by-products
Self mastery—individual	The ability to honestly and openly see reality as it exists; to clarify one's personal vision	1. Positive reinforcement from role models/managers 2. Sharing experiences 3. More interaction time between supervisory levels 4. Emphasis on feedback 5. Balance work/non-work life	Greater commitment to the organization and to work; less rationalization of negative events; ability to face limitations and areas for improvement; ability to deal with change
Mental models—individual	The ability to compare reality or personal vision with perceptions; reconciling both into a coherent understanding	1. Time for learning 2. Reflective openness 3. Habit of inquiry 4. Forgiveness of oneself 5. Flexibility/adaptability	Less use of defensive routines in work; less reflexivity that leads to dysfunctional patterns of behavior; less avoidance of difficult situations
Shared vision—group	The ability of a group of individuals to hold a shared picture of a mutually desirable future	1. Participative openness 2. Trust 3. Empathy toward others 4. Habit of dissemination 5. Emphasis on cooperation 6. A common language	Commitment over compliance, faster change, greater within group trust; less time spent on aligning interests; more effective communication flows
Team learning—group	The ability of a group of individuals to suspend personal assumptions about each other and engage in "dialogue" rather than "discussion"	1. Participative openness 2. Consensus building 3. Top-down and bottom-up communication flows 4. Support over blame 5. Creative thinking	Group self-awareness; heightened collective learning; learning "up and down" the hierarchy; greater cohesiveness; enhanced creativity
Systems thinking—group	The ability to see interrelationships rather than linear cause and effect; the ability to think in context and appreciate the consequences of actions on other parts of the system	1. Practicing self mastery 2. Possessing consistent mental models 3. Possessing a shared vision 4. Emphasis on team learning	Long-term improvement or change; decreased organizational conflict; continuous learning among group members; revolutionary over evolutionary change

Zedtwitz (2002) assessed the maturity level of an organization, as reviewed in chapter 9. These maturity models can also be used to assess the organizational readiness to successfully implement a complete lessons learned cycle. If the key success factors are not there, than the first priority is to make sure they are fully functional. Otherwise, as described in the longitudinal analysis of NASA's lessons learned system, there will be repeated failure to successfully learn from the valuable lessons. Any one of the maturity models can be used to assess where the organization is with respect to a lessons learned process. The author, for example, uses the standard Carnegie-Mellon University capability maturity model (CMM) with five levels: initial, repeatable, defined, managed, and optimized (Paulk et al., 1995).

In the initial phases, lesson learned are done in an ad hoc manner and their quality depends mostly on the skills and motivation of the individuals who conduct them. The process tends to be a reactive one, triggered when a major problem occurs rather than in a proactive or planned manner. Most organizations appear to be at this level (McIntyre et al., 2015). In the first level, "initial,"most of the learning occurs at the individual level. In the second level, "repeatable," the lessons learned process is more standardized and there are policies and procedures in place for conducting them. At this point, team or group learning begins to take place. In the "defined" level, the lessons learned process is well documented, standardized, and fully integrated in project management practice (e.g., as prescribed in the PMBOK). Training, maintenance, and supervision responsibilities are identified and assigned. At this level, we begin to see the benefits of lessons learned as they begin to contribute to organization improvement. It is at the third level that organizational learning begins to be possible.

The fourth level, “managed,” is the first level at which both a lessons learned process (including policies, procedures, and compliance) and a lessons learned system are implemented (i.e., a repository of lessons learned available to everyone in the organization). Lessons learned are company-wide and there has been a cultural change (if it was needed): there is an attitude that failure is acceptable, it happens, we don’t need to assign blame but we need to understand why it happened and what we can learn from the event. This means the organization has the appropriate rewards and censures in place. There cannot be any repercussions to admitting that things did not go according to plan. Some companies even reward such admissions. Honda, for example, gives out an award to the team whose projects failed but who also learned and were able to share what they learned successfully with others in the company (Zedtwitz, 2002).

The final level, “optimized,” indicates that lessons learned are organization-wide and they are conducted in a proactive and consistent manner. The organization has embraced a learning culture and there is plenty of time allocated for reflective activities. It is possible now to clearly trace the impact of lessons learned on quantitative and qualitative organizational improvements.

As with all maturity models, a lessons learned maturity model approach can be used to situate a given organization at a particular level, say level 1, and then identify what needs to be in place to advance to the next level. In this case, the priority would be to clearly define a lessons learned process and provide guidelines on how the process should be conducted. The key word in lessons learned is “learned.” The goal is not to amass a large volume of lessons learned in a repository somewhere but to ensure that each lesson learned that is produced (as an output) is an input to one or more projects or procedures in order to improve upon them. Impact is the best assessment of any lesson learned and even if there are fewer of them, it is not the number that counts but how the organization learned from the lesson.

Key Points

- Organizational learning is the process of applying knowledge from the past to present-day work challenges. Learning organizations are those organizations that have succeeded in implementing OL and OM.
- Organizational memory systems are containers that serve to identify, preserve, and make available valuable lessons learned and best practices.
- Lessons learned and best practices are flip sides of the same coin—they represent the accumulated results and learning from trial and error experiences that the organization has accumulated.
- Corporate amnesia is a risk when no systematic approach has been applied in creating organizational memory systems.
- Managing organizational memory often means overcoming barriers to the processing of experiential knowledge accrued by knowledge workers over time.
- A lesson learned is defined as organizational learning from work experiences of its members.
- A lessons learned process has a number of steps in which a lesson is identified, collected, analyzed, selected, and then preserved in organizational memory.
- The most important prerequisite to learning from these lessons is that employees must be aware these lessons exist, and they actively seek them out and learn from them.
- All lessons learned are stored in a database that forms the foundation of an organizational repository that is available to all employees.
- The key benefits of lessons learned is that they form the backbone of a learning organization: learning occurs from both successes and failures to ensure increased competency, performance, and sustained competitive advantage for the organization, its teams, and its individual employees.
- The major challenges are motivating people to participate, getting management to support, and transforming tacit experiential knowledge into an explicit form that can be easily found and reused.

Discussion Points

1. What are some of the key challenges in developing and managing an organizational memory system? Outline some of the key obstacles that may be encountered and how you would address each one.
2. What does the term corporate amnesia refer to? How would you characterize the costs involved with corporate amnesia? Provide some examples to illustrate your points.
3. What is the difference between OL, LO, OM, and organizational memory systems (OMS) or organizational memory information systems (OMIS)?
4. How would you decide whether a particular knowledge content should go into a record management system, database management systems, a file or document management systems, the intranet or portal, the backup files, the archives, or the organizational memory system? What major criteria are used to identify a lesson learned or best practice that is "worthy" of being preserved in OM?
5. How would you decide whether something is a lesson learned or a best practice? What additional work is involved in documenting a lesson learned so that it does not lead to blame or to an inadvertent disclosure of private or confidential content?
6. Discuss how you can learn from an unsuccessful project.
7. What is the difference between a best practice and a lesson learned?
8. Why are lessons often identified but not learned?
9. What are some of the key steps involved in a lessons learned process
10. What are some techniques used to elicit lessons? What are their strengths and weaknesses?
11. How would you motivate someone to contribute to a lessons learned system? How would you motivate them to use the content that is already there?
12. What type of metadata would you add to a lesson learned in order to make it more findable and (re)usable?
13. Name the major ways in which knowledge can be lost to an organization. Link these causes to the knowledge processing cycle (see chapter 2). What are some good methods to deal with such knowledge loss after the fact (in a reactive fashion)? How would you institute a more proactive approach to preventing knowledge loss?
14. How would you assess the success of your OM systems—e.g., a lessons learned, best practice, or story database? What sorts of tools would you use? Who would be involved? How would you act on the feedback you collected? What are some ways in which you could boost the adoption rate of the content?
15. Compare and contrast some of the leading theories on organizational learning and organizational memory. Why are there so many with so little intersection—what do you think may have caused this fragmentation? How would you go about trying to put the various pieces together in order to better understand the processes of OL?
16. How would you integrate OL objectives within a KM metrics framework? What sorts of organizational goals would be addressed and what would the KM contributions be? (Refer to chapter 10.)

Notes

1. See http://www.nancydixonblog.com/2011/02/a-model-lessons-learned-system-the-us-army.html.
2. See http://usacac.army.mil/cac2/AOKM/repository/AOKM_FactSheet_AAR.pdf.
3. See http://www.pmi.org/learning/library/lessons-learned-project-lessons-6993).
4. See http://www.nationalnearmiss.org.
5. GAO Report: "NASA: Better Mechanisms Needed for Sharing Lessons Learned" GAO-02–195, January 30, 2002. http://www.gao.gov/new.items/d02195.pdf.
6. Ibid.
7. "Review of NASA's Lessons Learned—Information System," March 6, 2012; report available at https://oig.nasa.gov/audits/reports/FY12/IG-12-012.pdf.

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12 Knowledge Continuity Management

Tell me and I forget, teach me and I may remember, involve me and I learn.
—Benjamin Franklin (1706–1790)

Knowledge Continuity Management (KCM) is a specific application of knowledge management with the goal of identifying valuable knowledge that is vulnerable and at risk of being lost due to the departure of one of more employees. KCM processes are targeted at identifying vulnerable knowledge, who has this knowledge, and how it can be best transferred to a successor and also preserved in organizational memory for future reuse. There are a number of frameworks to help address the potential risk of losing hard-earned valuable organizational knowledge through employee departures, whether they are due to an anticipated retirement or other, unexpected resignations.

Learning Objectives

1. Define what knowledge continuity management is and why all managers need to add this to their toolbox of required management roles and responsibilities.
2. Describe the key steps needed to complete a KCM project.
3. Explain how KCM processes can become institutionalized.
4. List the different characteristics (individual, group, and organizational) that must be taken into account when designing an optimal KCM approach.
5. Match each potential obstacle to knowledge sharing with an appropriate mitigation strategy.

Introduction

Most successful organizations will state that their two greatest assets are the people who work for them and the knowledge they possess. The most important organizational asset has always been employees and they are now seen as "human capital" to clearly label them as a valuable asset. Yet these valuable assets are not at all like physical inventory—they leave every night and they are free to leave the organization when they wish (Beazley et al., 2002).

Campos and Trees (2008) identified a number of issues related to potential knowledge loss in the APQC best practices report they edited (p. 5). These included:

- The retirement of a record 77 million baby boomers has the potential to result in huge losses of critical tacit knowledge, including organizational and technical knowledge related to key processes and competencies.
- The problems are not limited to retirement. Churn within organizations and new business models for offshoring work necessitate careful identification and transfer of knowledge.
- Organizations often have difficulty pinpointing when and where knowledge loss or knowledge needs may occur.
- Employees—especially new hires—are facing steeper, longer learning curves at the same time that employers are looking for faster revenue and higher productivity.
- Knowledge retention and transfer efforts are complicated by generational gaps that influence how people work and collaborate with one another.
- Knowledge loss and time-to-competency issues for new hires threaten to compromise organizations' growth strategies.

Daghfous et al. (2013) note that organizational knowledge loss can be either the intentional or unintentional disappearance of knowledge from the organization's memory. This knowledge was built up from the individual and collective actions and learning of employees over their time of employment. Intentional loss would be something like deliberate downsizing or selling off a unit (Schmitt et al., 2011). KCM deals with unintentional knowledge loss. Different business units have different perspectives on the major causes of unintentional knowledge loss:

- Human Resources (HR) tends to view knowledge loss as employee turnover, where the major types are resignations, retirements, and layoffs.
- Information Technology (IT) tends to view knowledge loss as system errors such as crashes and failure of backups.
- Organizational Learning (OL) views knowledge loss as ineffectiveness of organizational routines and organizational memory.
- KM views knowledge loss as not being able to share and preserve knowledge.

One of the major concerns facing companies today is not only to prevent knowledge loss due to employee attrition but how to transfer valuable knowledge to others within the organization. This challenge is often referred to as "knowledge continuity" (analogous to business continuity or the ability to maintain operations if the company suffers a disaster). Knowledge Continuity Management (KCM) refers to the specific transfer of critical knowledge from existing employees to those who will replace them. The imminent turnover signals a potential for the loss of valuable accumulated knowledge and know-how in the form of the competence and expertise possessed by the departing individuals. This valuable knowledge and know-how exists in both formal and tangible forms (explicit knowledge), such as documents, but also in less visible forms—often referred to as tacit or difficult-to-articulate knowledge. Particular emphasis must be placed on the tacit form as this often resides within a given individual or group and is therefore more easily and completely lost when people leave an organization (Labarre, 1998).

Paulin and Suneson (2012) note that there has been a fair amount of conceptual confusion when using the terms knowledge sharing and knowledge transfer. Often, knowledge sharing and knowledge transfer are used synonymously but there are important distinctions to be made between them. In general, knowledge sharing tends to refer to voluntary, bidirectional interactions between people who want to share knowledge with one another. An example would the type of exchanges that occur in peer networks. Knowledge transfer tends to refer to a deliberate, unidirectional conveying of knowledge from one individual to another (or to a group of individuals). An example would be the KCM activity of a retiring employee providing their knowledge, together with an explanation on how to apply it, to someone who will be doing their job in the future.

It should be noted that there are two distinct timelines for KCM: the first is to ensure that present-day employees can continue to benefit from the knowledge of those leaving the organization. The second is to ensure that existing employees can reuse this knowledge in the future and, in addition, newly hired employees will also be able to benefit from this cumulative knowledge base (Beazley et al., 2002). Hana (2012) notes that KCM “also incorporates the continuity of an organization’s development, the quality of managerial positions, and the continuity of decision making” (p. 46). Loss of expertise and experience could cause significant problems such as more mistakes, more costly mistakes, diminished quality of products and/or services, and the inability to continuously operate.

Joe et al. (2013) warn that the risk of knowledge loss is particularly elevated in small-to-medium sized businesses, which typically have fewer than 500 employees. There is less likely to be overlap in experience and skill sets of employees and the departure of older, more senior employees can lead to unrecoverable knowledge loss. Smaller organizations tend to rely more on technology and documentation KCM strategies and less on network diffusion of knowledge, which makes for a less effective KCM outcome.

All organizations are also at risk of knowledge loss as the demographic pressure continues to press on organizations: more and more workers are reaching retirement age and there is a risk that a critical mass of knowledge may be lost if they all retire around the same time. Scorsone (2015) notes that this is partially a time-limited phenomenon as the largest cohort in North America, the baby boomers (born between 1945 and 1965) represent such a large number of potential retirees. There could be a loss of valuable knowledge and it could begin to impinge on the organization’s ability to continue to carry on its normal operations. There is some evidence that some baby boomers are choosing not to retire but the number who do decide to retire will definitely have a serious impact on the workforce. This is at the core of the knowledge continuity management issue, which aims to ensure a smooth and effective transfer of knowledge from those leaving to those remaining behind. There is a further complication in that people from different generations or age cohorts appear to differ in how they prefer to learn, to share knowledge, their attitude to work, their values, and their attitudes toward technology (Scorsone, 2015). A good KCM plan should therefore address generational differences.

Alderton (2015) found that only half of global organizations have a formal knowledge transfer process or plan in place. This means that there are many lost opportunities for less-experienced personnel to learn from more senior colleagues. KCM is an integral part of organizational learning and also contributes to learning from the past, avoiding repeating the same mistakes, and replicating successful practices. KCM can be short term and temporary, as when teams are disbanded, or long term and permanent, as when employees leave the organization, due either to a planned retirement or to another unanticipated reasons. The intuitive reaction to a departure would be to simply hire someone else in their place. Unfortunately, this is not as easy as it sounds. Alderton (2015) notes that “in 2014, 36 percent of employers indicated they had trouble filling jobs—the highest percentage since 2007” (p. 33). That is because we are talking about knowledge, experience, and knowledge workers. If, in fact, it is possible to hire someone else, then there is no need for KCM. Where continuity becomes an issue is when the person leaving has acquired years of valuable experience, developed evaluation and judgment skills, and has valuable knowledge that can be applied to that specific organizational context. A good KCM plan should therefore be formalized and institutionalized.

Knowledge Continuity Management Process

KCM is necessarily a top-down process, one that begins with senior management deciding to implement a formal program (Alderton, 2015). In addition to a clear communication plan to ensure that all employees are on the same page and understand what will be done, why, and how everyone will benefit, management needs to ensure that adequate resources are assigned to KCM activities. This may or may not include a dedicated team but a team is required. In addition, management needs to make sure that time spent on KCM activities is authorized and valued as "real work." In unionized environments, union representatives need to be involved in the dialogue to ensure workload and scheduling are done in an equitable manner. Finally, management needs to ensure there is time and space to carry out KCM.

Levy (2011) outlines a three-step process for KCM, consisting of scoping, documenting and transferring, and integrating knowledge into business processes for future reuse. She views KCM as a subdiscipline of KM. The first stage, scoping, is deciding what knowledge should be retained based on an analysis of the risk of knowledge loss. The second stage includes determining how to transfer knowledge and prioritizing this. The final phase, integration, refers to specific details such as: will a document database be used? What taxonomy will be used to organize the knowledge? The next priority is to identify some potential candidates who will be receiving this knowledge.

The first stage, scoping, consists of preparing a list of what knowledge is to be retained and what is not. Most managers will have a pretty good idea of this and will be able to readily identify who has what type of expertise. This type of identification may be more efficient than carrying out a full-blown knowledge audit, replete with questionnaires and interviews, to determine where critical knowledge is located (referred to as "peer identification" by Levy). Next, the items on the transfer list need to be prioritized. In the case studies Levy studied, "all experts chosen by managers, indeed held more knowledge that could be transferred in any reasonable amount of time" (p. 594). Levy recommends representing each expert's knowledge as a tree, identifying branches where knowledge is to be transferred. A description can then be added to each of these branches to justify why this knowledge is critical (e.g., doesn't exist anywhere else, can help save money, improve reputation, increase ability of the organization to renovate, etc.) Ultimately a priority can be assigned to each branch (e.g., priority categories 1, 2, and 3). When the manager signs off on this knowledge tree, the scoping phase is done.

Transfer refers to transferring knowledge from the retiring employee to other employees and to the organization. Documented knowledge needs to be stored in an easy to find, retrieve, and reuse manner. Undocumented (tacit) knowledge will need to be codified. Levy (2011) recommends using standard templates to codify tacit knowledge. This helps the knowledge capture process as the retiring expert quickly understands what type of knowledge he needs to provide, and it also helps the ultimate recipient as knowledge is presented to them in a much more structured fashion. This phase can easily require a minimum of three to six months to complete as KCM knowledge capture interviews should be spaced out over time (employees still need time to do their work, they will be better able to recall missed details later on, and it gives the KM team time to analyze and digest the knowledge they have elicited).

The last stage is integration, and if knowledge is not successfully embedded into organizational processes, they will not be reused. If the knowledge is not reused, KCM has not succeeded. Employees need to be made aware that this content is there, and that it is accessible and easy to use. Workshops, lectures, training sessions—all can be used to help embed the knowledge.

The major steps in a KCM cycle, again aggregated from a number of authors, can be summarized as follows:

1. Identify knowledge at risk (e.g., possessed by very few employees, difficult to hire someone to do this, difficult or time-consuming to train someone to do this).
2. Identify location or containers of this knowledge—what percentage is explicit and what percentage is tacit? (Tacit refers to people with this knowledge, whereas explicit knowledge refers to containers such as documents, databases, etc.)
3. Identify who the recipients of this knowledge will be. (Are they known? If not, can we derive a general profile? What characteristics can we identify?)
4. Select the best knowledge transfer mechanism or channel (e.g., high bandwidth channels such as video stories for tacit knowledge, procedural manual for some explicit knowledge).

5. Design a knowledge transfer schedule.
6. Develop metrics to assess how well knowledge was transferred.
7. Brief participants (train team if needed).
8. Conduct knowledge transfer.
9. Validate knowledge elicited.
10. Ensure recipients can apply knowledge (where possible, as it will not always be feasible to have the successor meet with the person leaving the organization).
11. Measure/assess effectiveness of knowledge transfer (e.g., increased project completion success, problems solved faster, fewer questions asked of experts, etc.).
12. Preserve the elicited knowledge in organizational memory in such a way that it is easy to reuse in the future.

Identifying Critical Knowledge

As discussed earlier, the point is not to capture, transfer, and preserve all knowledge. The first step in identification is to define what is meant by "critical knowledge" for each specific organization. Typically, a number of criteria need to be met in order for knowledge to "qualify" for KCM—in other words, there is a cost–benefit analysis that should be done. KCM will involve a great deal of time, effort, and expense. It should not be carried out for knowledge that is easy to document, easy to transfer, or easy to acquire (e.g., how to fix the photocopy machine when there is a paper jam). Critical knowledge is defined as knowledge that is of strategic importance to the organization and it is at an elevated risk at being lost (usually because only one or a few individuals possess this knowledge). Joe et al. (2013) found five types of critical knowledge: subject matter expertise; knowledge about business relationships and social networks; organizational knowledge and institutional memory; knowledge of business systems, processes, and value chains; and knowledge of governance.

Most organizations have some variation of a formula to determine the value of knowledge and the risk of that knowledge being lost. This is usually a combination of knowledge characteristics, individual characteristics, and job position characteristics. Human resource departments are already responsible for establishing retirement projections and identifying position gaps, even core competency gaps. They can provide a map of areas where there is potential for loss of a critical mass of workers as they will all become eligible for retirement around the same time. Knowledge characteristics include how many people are able to apply this knowledge, how mission critical it is, how long it would take to train someone to do this, and so forth. A number of KCM guides exist that include some combination of these characteristics.[1] The author (Dalkir) has made use of nine criteria to assess whether or not knowledge is critical enough to warrant a KCM approach based on experiences with a large number of private and governmental organizations. These criteria are:

1. How specific is it to the organization?
2. How localized is it? Sole source?
3. How much has it already been documented?
4. How complex is it?
5. How often does the knowledge change?
6. How hard is it to learn?
7. How hard is it to hire such people?
8. Is it possible to subcontract?
9. What are the consequences of not being able to access and apply this knowledge?

Organizational specificity refers to how specialized or contextual this expertise is. Can it be found throughout the industry or is it specific to this company? For example, legal expertise tends to be highly country-specific: US law differs from Canadian or other countries' laws. We have differences even within Canada as the Quebec legal system differs from the rest of Canada and actually has more in common with France (they are both based on Napoleonic Law). Legal expertise would therefore be an example of a highly organization-specific form of expertise. The more specific the knowledge is, the harder it will be to replace, making the organization more vulnerable to permanent knowledge loss.

The degree to which expertise is localized refers to the number of people who can apply this type of expertise who work within the organization. The most extreme case of vulnerable knowledge is when there is a sole source of expertise (i.e., one person has the ability to apply this knowledge). The more people share the expertise, the less elevated the risk of the organization losing this knowledge. Another way of looking at this parameter is to assess the uniqueness of the knowledge in question. What is the level of diffusion or extent to which this expertise is shared within the organization? How many people have the same type of expertise and can perform at the same level (e.g., mastery or very advanced skillset)? If only one, then it is unique and it is at the greatest risk. If shared by other similar professionals (e.g., within a network of professionals), then the risk is much less.

How well documented is this expertise? It is always useful to estimate the ratio of tacit to explicit knowledge for each type of expertise. If there are already a number of manuals, job aids, FAQs, demos, how-to guides, or event training, then the ratio is low and the organization is less vulnerable with respect to losing this knowledge. Another useful ratio is to try to estimate the percentage of procedural knowledge that makes up the expertise, compared to more abstract knowledge such as reasoning, judgment, analogical analysis, problem solving, and so on. The more procedural the know-how, the easier it is to document and the more likely that it has already been documented to some extent. The less procedural the expertise, the more vulnerable the organization is. If expertise is not extensively documented, the next question to ask is: how easy would it be to document? How long would it take? In other words, a cost–benefit estimate will be needed. Some useful heuristics are to ask: can it be explained to someone in approximately twenty minutes over the phone? Or, is it better to have a full two days spent observing what the experienced employee does? This will give some idea of the scope and effort of the documentation effort that will be needed.

The next criterion concerns the level of complexity of the expertise in question. For example, does it involve multiple interrelated steps? Does it require prerequisite knowledge? Does it depend on others to complete different steps in the process? An "easy"-to-transfer type of know-how is typically something that you could teach or show someone else to do in less than two days and consists of independent, self-contained tasks. The more complex the knowledge, the more it is at risk of being lost.

Another useful parameter is to estimate what the predicted useful lifespan of this knowledge is. How stable or enduring is the type of expertise? Alternatively, how dynamic or changeable is the demand for this know-how? Has it changed much in the past five years? Past decade? Past decades? For example: a group of Y2K specialists in a company possess expertise of a limited lifespan (or one that has an expiry date). Someone who is specialized in mediating conflicts in teams and helping them to work well together probably will have a longer useful lifespan for their know-how. The shorter the useful lifespan of knowledge, the more likely it is to be lost.

It is also important to consider how the experienced person came to acquire this knowledge. Was it something they learned in school or did they have to pick it up on the job? Most expertise will be a blend of the two. A question to ask is how difficult is it to learn or acquire this knowledge? How easy or hard is it to train someone to do these tasks? What type of training is available, such as vocational training, university level programs, internal or external formal professional development (e.g., continuing education)? Can peer mentoring be an option to help others acquire this expertise? The easier it is to train someone "up" to assume these responsibilities, the less the risk of this expertise being lost.

Related to the previous point, another way of addressing potential future knowledge gaps is to hire someone else for that job position. This requires an assessment of the job market. What is the level of difficulty in recruiting someone with this knowledge and know-how? How easy or hard is it to find and hire people with this type of expertise? How many graduates are there on average every year? How competitive is the market? In other words, will you have to compete with other companies to try to recruit these graduates? You should also take into account the ability of the organization to retain talented individuals once they have been recruited. What are the industry turnover rates? What is your organization's turnover rate? For example, some sectors have difficulty attracting younger workers such as Generation X and millennials, due to their less-than-rich IT environment or less-than-evolved organizational culture. The easier it is to hire well-qualified candidates and keep them as employees, then the less likely this knowledge will be lost.

Also in a related vein, the possibility of subcontracting this type of knowledge work should be evaluated. How easy is it to find a person or a company to subcontract some or all of these tasks? In other words, how much is this type of expertise available outside the organization? Diffused throughout an industry? Service provided by consultants? Remember: expertise will consist of not just technical skills but soft skills, strategic expertise. The easier it is to subcontract, then the less vulnerable the organization is with respect to potential knowledge loss.

Finally, the potential consequences of not doing this work need to be considered and ideally, measured. What are the consequences of not doing these tasks well? Is the knowledge mission-critical? Life-threatening? What if the tasks are done but not done well—suboptimal performance? What is the potential impact on reputation (e.g., through media coverage, etc.)? The greater the potential consequences, then higher the priority that should be given to this expertise in the KCM strategy.

Selecting the KCM Strategy

Once the critical knowledge has been identified, the next decision is which knowledge transfer and retention strategy should be used. The major consideration should be whether the knowledge is tacit or explicit and the amount of time you have to conduct the KCM activities. The following outlines the major approaches that can be used for KCM.[2]

If knowledge is not documented (tacit)[3]:

- After action review, project post mortem, lessons learned workshops (G)
- Codesign, codevelopment groups (G)
- Communities of practice, knowledge networks (G)
- Exit interviews (I)
- Formal classroom training with experienced employee as trainer (critical incidents, case studies) (I, G)
- Group problem solving (complex problems/cases) (G)
- Job rotation (I)
- Legacy circles (G)
- Knowledge books(G)
- Knowledge mapping or knowledge codification (I and G)
- Mentoring, peer mentoring, coaching, job shadowing (I)
- Peer assists (I)
- Portal or organizational memory (I and G)
- Social network analysis (G)
- Special mandates (e.g., sent to work in other units, other teams) (I, G)
- Storytelling, learning histories (I and G)
- Simulation (e.g., pandemic) (G)
- Structured expert–novice interviews (I)
- Targeted secondment (I)
- Yellow pages or expertise location system (G)

Most of these approaches were described in chapter 4. Some that are more specific to KCM are described here. One approach at the individual level is the exit interview. Traditionally, the exit interview was a formal interview with the staff member leaving an organization and asking about their reasons for leaving. KCM exit interviews attempt to capture and store valuable knowledge of the departing employee. It is of course not realistic to think that all of their knowledge could be capture in one, or even several, interviews. The interview instead focuses on the following points (German Ministry for International Development, BMZ, available on the KM4Dev website[4]):

- Can they identify who in the organization would benefit from their knowledge?
- Who currently comes to them for help and what types of questions do they ask or what problems do they need help solving?
- How much of their knowledge is already documented and where can it be found?
- In the time available, review key tasks and describe how they are undertaken, what inputs and outputs are needed, what are the obstacles, bottlenecks, and sensitive parameters involved.
- Map out their informal network (their formal one should already be documented).

- Ask them to clean up and organize their files, documents, and shared folders, and to leave notes to help guide their successor (post-its and electronic markups are very effective).

One approach at the group level would be to conduct a post project review. First, meet with project managers to get their perspective on:

- What went as expected (routine)?
- What was unexpected?
- What went well? Better than expected? (innovations)
- What did not go as well as expected and how can we ensure we do better next time (lessons learned)?

Next have a facilitated session with the project team and ask the same questions. The facilitator should be neutral and should ensure everyone has a voice and feels "safe" during discussion. The final steps would consist of documenting the best practices and lessons learned. This would include categorizing them and assessing them for their scope or degree of generalization possible. Their metadata should include information on who could benefit from implementing these best practices and learning from the lessons learned. This content can then be diffused using some collaboration and/or repository tools.

Daghfous et al. (2013) notes that social networks are another good group approach. The network of relationships through which work gets done is "an efficient mechanism for sharing both tacit and explicit knowledge between actors and groups of actors to generate organizational and collective learning" (p. 643).

If the knowledge is already mostly documented, some good techniques for explicit knowledge transfer include[5]:

- Blogs(I)
- Classroom training (I, G)
- Competency profile (I)
- Documentation including AV documentation (e.g., podcasts) (I, G)
- E-learning (I)
- Employee orientation program, onboarding (I, G)
- Intranets and shared folders (I)
- Portals, knowledge repositories (I)
- Procedural manuals, checklists, job aids (I)
- Simulation (I, G)
- Tasks analysis and EPSS (I)
- Taxonomy building to decide how best to organize know-how for easy future access, retrieval, and application; to document the context, when to use, when not to use; should be developed in a bottom-up or consensus-based manner to make use of everyday terms and include nonofficial content (e.g., works in progress)
- Wikis (G)
- Yellow pages or Expertise Locator System (I)

If the knowledge is very rare, the focus should be on increasing the diffusion of this knowledge so that more people have it. The best techniques to use in the KCM strategy would be:

- Apprenticeship (e.g., interns) and mentoring by experts
- Have experts develop training seminars, give lectures and presentations
- Have experts produce a knowledge dictionary
- Set up a peer network around the experts
- Job shadowing

The rarer the knowledge, the more time will be needed for KCM activities. Ideally, a time period of one to three years should be dedicated to knowledge transfer and retention activities within the KCM strategy.

If you don't have a lot of time before the experienced employee leaves, if for example, they give notice for less than six months, then you need to use an "emergency or rescue archaeology" method. This is derived from the common practice in many European countries to halt any work being done on a residential or commercial construction site should any archeological remains be found. The archeology team then has a limited time (e.g., 24–48 hours) to get out and rescue what they can before work resumes. They have no choice but to focus on what is the most valuable and what is at the same time easiest to recover. Emergency or rescue KCM operates in much the same manner. If someone is leaving in two weeks, the best thing to focus on is to map out their professional networks (e.g., using social network analysis). Ideally, the incumbent should introduce his or her successor (in person or virtually) to the key people in their network to ensure that there is continuity in how work is done. The successor will thus have access to valuable sources of information, help, and support to carry out their professional duties. The key questions to ask the expert who will be leaving are: who do you ask for help? Who asks you for what type of help? A map is often the best way to document the network, with contact information for each person identified. Where possible, it would be valuable to include the leaving employee should they accept to stay in contact. Some organization provide a laptop and preserve their company email address while others pay per question answered or a monthly retainer so that the experienced employee remains connected and part of the network.

Other good techniques specifically recommended for tacit knowledge and others for explicit knowledge can be found in an online recommender system developed by Erickson and Dalkir in 2009.[6]

In parallel, you will need to develop or revise your KCM plan, which is your strategy for the longer term. Develop a KCM strategy for five years, including a one-year road map for key priorities. As you gain more insight into the approaches that work best for your organization, you will be able to include specific recommendations and guidelines on how to deal with valuable and vulnerable knowledge that is both tacit and explicit. In the KCM strategy you need to think about roles and responsibilities. These need not be dedicated KCM roles necessarily. You will also need IT and HR on board, on committees. Next, think about policies and guidelines. More often than not, will need to involve the legal department as there may be intellectual property, patent, and other copyright issues involved. To start with, if all participants agree, the Creative Commons[7] or "copyleft" agreement may be used to facilitate knowledge sharing. Handover procedures in particular will need to be institutionalized as explicit policies: what are the obligations of the leaving employee with respect to turning things over (passes, books, etc.) and turning knowledge over to their successors?

Handover procedures are particularly useful when employees frequently change jobs. For example, there is formal rotation of jobs in the military and employees can expect to be posted to a different location, unit, and role. Handover refers to the handing over of relevant knowledge so that the new person can take up their new duties in an efficient and effective manner. The tool that is often used is some form of checklist or structured notes. Ideally, a number of face-to-face meetings should take place to ensure effective knowledge transfer, but this may not always be possible (Catignani, 2014). A good outline would include the following:

- What strategically important processes are being dealt with at present?
- What time-sensitive processes will your successor need to address soon?
- What tips and advice can you offer about the most important aspects of your job?
- What are the major constraints you have to deal with and what can be done about them?
- What sources of information/reference are useful (people and content management systems)? Include useful contact information and point to specific resources you would recommend. Share your web browser bookmarks with them.
- How can you give your successor access to your informal knowledge network? (Note: during the knowledge elicitation phase, this often takes the form of a social network map). Can you introduce them or give them access? They should, whenever possible, be personally introduced to your most important contacts.

Joe et al. (2013) discusses how older workers have a lot more contacts, especially in smaller organizations. This knowledge can be easily lost when the older employee leaves. It would be beneficial to capture this knowledge, typically in the form of a social network or map. This map would also include who younger, less experienced workers can go to for what type of help. You can refer back to chapter 4 for more details on knowledge elicitation and organization techniques. Recall that questions used with experienced workers include asking them what their major responsibilities are, who they call upon for help, and who asks them for what type of help. Interviews should ideally take place during their career and not just when they are about to leave. These can be short texts or video clips on specific topics and they can be classified and organized on the organizational portal or repository for future reuse.

A Three-Tiered Approach to Knowledge Continuity

The traditional response to potential knowledge loss has been to pair the person leaving with the person who will take up their responsibilities and use mentoring, coaching, or job shadowing techniques to transfer knowledge. This is fine but it addresses only the short-term problem: the end result is that the organization had one person with a very high percentage of tacit knowledge who will leave and now they have a different person who has a great deal of tacit knowledge in their head—and they will eventually leave or retire at some point too. The problem of continuity has been treated with a Band-Aid. In the long run, KCM has to look beyond the individual to individual level of knowledge transfer and also address the group or team level and the organization level. Knowledge has to be more diffused throughout the organization, shared with more than one other employee, and this knowledge has to be preserved in organizational memory for future reuse. A good KCM plan is therefore one that addresses knowledge transfer at these three levels: individual, group, and organizational to ensure that tangible legacy materials are produced, shared, and fed into the corporate storehouse of intellectual capital in an ongoing and seamless manner. KCM can help capture, transfer, and retain *valuable* knowledge using a three-tiered approach that addresses the individual, the networks, and the organization itself.

The approaches used for individual-to-individual knowledge transfer level include structured subject-matter expert interviews and knowledge mapping of their key knowledge areas together with task support system prototyping and mentoring. Individual structured interviews typically focus on past success stories, disasters, problems that were not handled well, the history of how processes came to be put in place, the evolution of competencies, and so forth. The key roles and responsibilities of the expert serve as a starting point and a number of key case studies are reviewed in order to extract historical best practices and lessons learned. Anecdotes and stories capture the contextual and social dimensions of knowledge, experience, and expertise. This is often the type of knowledge that is not documented in any formal way. Stephen Denning (Denning, 2001) of the World Bank is a leading advocate of using storytelling to capture the tacit culture surrounding intellectual assets and using it as a means of catalyzing the cultural changes that need to occur before an organization becomes effective at knowledge sharing.

Bahman (2015) notes that mentoring is a required complement to any formal knowledge base. Even when employees know the knowledge is documented in the system, they will almost always prefer to talk to a peer who will direct them to the best resources, vouch for the best practices, and help them understand and apply the knowledge. Mentoring requires time and this is largely due to the fact that knowledge is transferred and acquired by the successor in a contextual manner. It is not just simple units of knowledge but knowledge *in situ*—with all of its accompanying history, background, and so son. Most mentoring is more effective when it is face-to-face but technology-mediated sessions could also be used. Scorsone (2015) advocates co-mentoring as a good practice. Sometimes called reverse mentoring, this is when the more junior employees mentor more senior ones, in addition to the more traditional direction, such as in the area of new technologies. The end result is greater motivation and trust.

At the group level, knowledge is often circulated within project teams, organizational units, and more informal peer networks. Such groups have been around for quite a long time, ever since people realized they could benefit from sharing their knowledge, insights, and experience with others of similar interests and goals. These groups are described in greater detail in chapter 5. A number of surveys such as the one by Bartlett and Ghoshal (1998) have shown that even in a company with an effective KM infrastructure, people by far rely on other people as sources of knowledge and help. In fact, the company knowledge base was ranked fourth among five choices. For the most part, peer networks are voluntary informal gatherings,and sharing of expertise where synergies occur, best practices are identified and shared, lessons learned are analyzed and discussed, where problems are identified, and often where the seeds of innovation are sown. The knowledge capture and transfer challenge lies in conveying what needs to be understood or what employees need to know for business results. This can encompass a company's values, work climate, commitment, and culture—in short, a communal mental model of the company, how it works. and the environment in which it works.

There are a number of other techniques that can be used to share knowledge with the larger peer group. These include peer presentations, which can be in person or conducted remotely (Alderton, 2015). These can be formal (scheduled seminar or talk) or informal (lunch and learn sessions). Warmington (2015) outlines how groups can be encouraged to reflect upon their lessons learned (described more fully in chapter 11). The organization should value the time spent in these reflective activities. Open conversations can be used to have the team learn collectively. These are discussions with open questions and everyone is free to express their opinion.

To foster its learning capabilities and transfer knowledge at the organizational level, an organization must first be aware of its core competencies and its associated knowledge. These knowledge assets must first be made explicit to become a real or practical asset. Organizational learning and corporate memory are two terms that are often used to describe the transfer of knowledge from individuals and CoPs to the organization as a whole. These are usually encapsulated in the form of lessons learned, best practices, the organization's way of doing things, anecdotes, myths, and case studies.

Table 12.1 summarizes the three-tiered approach to knowledge capture and transfer, together with the types of knowledge best addressed by each tier and the types of tangible legacy products that can be produced for individual, group, and organizational knowledge transfer processes.

Table 12.1 The three-tiered approach to knowledge capture and transfer for knowledge continuity

Knowledge Transfer (KT) approaches	Types of knowledge	Tangible by-products
Individual structured interviews with experts KT at individual level	Operational Anecdotal Lessons learned Best practices Where to find knowledge and experts	Map of key knowledge Map of key contacts, memberships Glossary of discipline Interview templates Interview transcripts Key tasks and task support systems
Facilitated workshops with community of practice members KT at group level	Tactical Knowledge flow facilitators Knowledge flow blocks Identification of CoP	Workshop notes Knowledge repository design and implementation Map of social interactions within CoP and with external stakeholders
Storytelling workshops and individual interviews with key executives KT at executive level	Strategicconsensus re. key intellectual assets Criteria for evaluation of intellectual assets' business value	Map of key intellectual assets of the organization Organizational lexicon of key concepts Springboard storiesHistorical knowledge (organizational "saga")

Source: Adapted from Dalkir 2003.

There is not one specific approach that should be used with each of the three tiers. Rather, a wide range of knowledge retention and transfer approaches should be used with at all three levels in order to identify what is fairly easy to transfer, hard to transfer, and impossible to transfer from one individual to another, in a retirement or succession planning situation.

The three-tiered approach to knowledge capture and transfer described here helps ensure that critical intellectual assets are identified at the individual, community, and organizational levels. By capturing all the individual, community, and organizational intellectual assets explicitly in the form of a map, the organization is able to make use of this to create and sustain competitive advantage, barriers to entry, and continued innovation and learning (Senge, 1990. The map of the organization's intellectual assets will also make it much easier to identify knowledge areas at risk (imminent retirement of an expert, disbanding of a community of practice, lack of tangible by-products left behind as organizational legacy).

The overriding initial emphasis should be on knowledge capture—the creation of concrete, tangible knowledge containers to transform tacit knowledge into explicit knowledge. Ideally, this should be done before the departure of retirees and this should be done on for knowledge and know-how that is of high business value to the organization. Always keep in mind that the point of the exercise is not to document everything.

Next, given the highly collaborative nature of the knowledge work and knowledge workers today, some form of shared virtual workspace should be put into place to enable members to quickly access key information and easily contact key members of their community. This would reduce some of the risks associated with the high employee turnover expected over the next few years but only if supported by organizational processes, procedures, rules, rewards, and censure that promote the existence and use of the tools. The overriding emphasis should now be placed on an organizational culture and tools that facilitate knowledge sharing.

Finally, the task support systems should be embedded in the shared work environment in order to promote knowledge application, use, and reuse, as well as learning or internalization of this knowledge, know-how, and know-why.

Organizations using this three-tiered approach to knowledge capture, retention, and transfer will be in a better position to proactively stem the potential loss of intellectual capital due to attrition of their most experienced and expert employees. This approach was first tried by Transport Canada and has subsequently become a best practice for the Canadian Government, as described further in the vignette below.

Box 12.1
Transport Canada knowledge continuity best practices

Transport Canada was a pioneer in the identification of critical knowledge that was at risk of being lost due to imminent retirements. They undertook a comprehensive pilot study in order to develop a toolkit for knowledge transfer for succession planning. Their initial questions were how to:

1. Identify critical human resources.
    - Whom do others turn to in a crisis?
    - Who are the subject matter experts (SMEs)?
    - Who has long-term corporate memory?
    - Who is doing a one-of-a-kind job?
    - Who has a unique set of skills/knowledge?
    - Who carries the ball on major projects?
2. Maximize retention.
3. Retain their critical knowledge.
4. Facilitate the transfer of this critical knowledge.
5. Expose the right people to that critical knowledge.

Some key lessons learned (Avoiding Knowledge Collapse—Proactive Solutions for Regulatory/Inspection Organizations. Government of Canada, Regulatory Inspection Secretariat, Transport Canada, March 2003) included:

- Buy in from senior management.
- Raise awareness, generate enthusiasm.
- Managers should take ownership of the process of KT.
- Human Resources (HR) personnel provide significant and sustained support to managers and SMEs through entire KT and succession planning process.
- Integrate KT and succession planning into the ongoing business planning process of the department.

Good practices that emerged included:

- Analyze your organization's demographics to identify your vulnerabilities (where will the loss of personnel most seriously threaten the execution of your mandate?).
- Secure senior management support and funding (if possible, name a champion).
- Identify critical knowledge holders.
- Approach them to discuss what would motivate them to stay on.
- Prepare succession and knowledge transfer plans.
- To facilitate mentoring and one-on-one knowledge transfer; bring in a replacement before the SME retires whenever possible.
- Extract critical knowledge held by these experts, customizing your methods to fit your subjects.
- Work with IM/IT personnel and librarians in your department to choose your codification methods, information management software and retrieval tools.
- Encourage/facilitate strong CoPs to help disseminate tacit knowledge into the organization.
- Reward knowledge sharing.
- Involve retiring SMEs in the writing of their job descriptions and the selection of successors

wherever possible.

- Provide extensive hands-on support to individual managers and management team.

The Transport Canada knowledge transfer toolkit consists of the following key components:

1. Stakeholder maps identified internal and external interactions with stakeholders and partners—personal and professional networks of SMEs.
2. Knowledge maps—conceptual representation of job tasks, key resources, how to obtain and reuse knowledge, summary of SME expertise
3. Task support systems—online tools to support specific processes and information needed to complete specific tasks—glossaries, demos, templates, references, resource lists, case studies, simulations, Computer Based Training (CBT) modules
4. Dashboard—single-stop shop, customized work tools to hold knowledge maps, stakeholder maps, task support, and other information such as answers to Frequently Asked Questions (FAQs), relevant legislation and regulations, calendar of events, scholarly articles, recent news, and useful tools

Transport Canada found that it was necessary to address both explicit and tacit knowledge and found that Information Technology (IT) worked best for explicit knowledge while Communities of Practice (CoPs) worked best for tacit knowledge.

Other best practices included:

- Hire successors before incumbent leaves, if possible, to establish mentoring relationship.
- Include Knowledge Transfer (KT) in Results-based Management and Accountability Framework (RMAF).
- Document lessons learned, best practices, decisions made—include as much context as possible (include the whys, the justification, why alternatives were discarded).
- Focus on intellectual capital.
- Be proactive—don’t wait until key people retire.
- Promote intergenerational knowledge sharing (under 35, 35–45, and over 45) through communities of practice.

Intergenerational Knowledge Transfer[8]

It is necessarily an oversimplification to say that different generations will all homogeneously share the same knowledge sharing preferences. However, it is useful to look at the different generations as archetypes and avoid viewing them as stereotypes. The term "generation" is itself problematic as there is not objectively verifiable definition. A generation represents a cohort of people born during a specific period in time and sharing many traits so as to form a common identity (Mannheim,1952). Kupperschmidt (2000) defines a generation as "an identifiable group that shares birth years, age, location, and significant life events at critical developmental stages" (p. 66).

Joe et al. (2013) note that |older, more senior employees will tend to have valuable knowledge of key industry players and resources, and tacit knowledge about company culture, politics, and norms. ... this includes why the organization functions the way it does, the past successes and failures, and why certain tactics or approaches are more effective than others" (p. 916).

There is a general consensus that there are currently four generations in the active workforce: the matures, the baby boomers, Generation X, and the millennials (DeLong, 2004). These are summarized in table 12.2 below.

Table 12.2 Summary of the four generations in the active workforce

Name	Time period of birth	General preferences
Matures (silent, traditionalist)	1925–1945	Comfortable with hierarchy, direct authority, and rules; more individualistic
Baby boomers	1945–1965	Value working hard, being rewarded for seniority; less comfortable with new technologies (e.g., social media) and more resistant to change
Generation X	1966–1980	Prefer more feedback on rewards on work done, need greater flexibility and autonomy in workplace
Millennials (Generation Y)	1981–	Collective action and team oriented, take technologies such as social media for granted

Matures (also called the veterans, the silent generation, and traditionalists) were born before 1945 (Reeves, and Oh, 2008). Most have already retired but some are still in the workforce. Matures tend to have extensive organizational memories and they therefore tend to make good mentors. They are usually good team members, are loyal, respect authority, and follow rules. They view their job as a duty and work well under directive supervision.

Baby boomers are defined as those born between 1945 and 1966 and they represent the largest group in today's workforce (Sirias et al., 2007). These workers tend to see their work as a validation of their self-worth. They are also team oriented but at the same time they are sensitive to feedback and uncomfortable with conflict. They are optimistic and value personal growth opportunities. They may have difficulty with younger workers who are less strict about their work as their work ethics will differ (e.g., baby boomers value putting in more hours whereas younger generations value a good work/life balance). They also appear to acquire knowledge well through stories.

Generation X is defined as those born between 1966 and 1980 (Howe and Strauss, 1991; Rushkoff, 1994). This group reached adulthood around the turn of the twenty-first century (Alsop, 2008). As employees, this group tends to be comfortable with technology and working in an autonomous fashion. Some attribute the latter to having parents (often both) who worked outside the home. They appear to change jobs much more frequently than the baby boomers did and value a good work-life balance.

Generation Y is defined as those born since 1980 and are often referred to as millennials. Taylor (2014) describes this group as fairly cautious and risk averse because "Millennials came of age in the nineties and oughts, an era of global terrorism, of domestic school shootings, Columbine, 9/11, a lot of pretty horrible things that are particularly disturbing to parents. They worry about strangers online, online predators, and all the rest ... There is a kind of an 'everybody gets a trophy' quality to the way millennials have been raised. You're precious. It's a mean and difficult world. I need to protect you. Which may then be picked up by the children raised this way as you better be careful, you better be wary." They differ from preceding generations in that they grew up with technology and take it for granted. They tend to question authority and prefer to make their own choices. They expect to be able to influence how they will do their job. They tend to prefer constant feedback and want maximum flexibility in their working conditions.

While there does not seem to be clear-cut delineation between the concept of a generation and that of employee age, and there are more nuanced differences among individuals belonging to a given generation, the notion of looking at the different preferences of the different generations does seem to hold practical applications with respect to KCM (Parry and Urwin, 2011). Knowledge sharing between generations will continue to be a demographic factor in the success of knowledge continuity initiatives (Jurkiewicz and Brown, 1998). It is important to discern differences with respect to knowledge sharing preferences and levels of comfort with different techniques and technologies for doing so.

The notion of a generational category or cohort can help with high-level decision making with respect to the best KCM approach to take (Wiedmer, 2015). For example, McNichols (2010) recommends the use of transparent leadership and technology infrastructures for optimal knowledge transfer from baby boomers to Generation X workers. However, from there, more nuanced decisions need to be made (and revised as required) in order to further adapt to individual differences, and differences due to organizational culture, location, national culture, status, age, and gender (Parry and Urwin, 2011). An example would be the decision as to what type of management involvement and specific technological platforms to select to transfer knowledge from a specific individual or group of baby boomers to Generation X workers (e.g., a successful pairing of a manager to act as an active mentor and the use of YouTube videos) in order to go beyond the high-level recommendations (such as McNichols, 2010).

Levy (2011) found that millennials tended not to open any documents or attachments if they did not know in advance whether or not they would be useful. She recommends always sending a short summary of the contents to each important document that is part of the KCM knowledge transfer.

Success Factors for Knowledge Continuity Management

Leavitt and Trees (2013, pp. 5–6) edited the third in a series of APQC best practice reports on knowledge transfer and retention. They identified nineteen best practices associated with identifying, capturing, transferring, and applying critical knowledge, categorized into six general themes that correspond to the major stages of KCM:

- Creating a strategy and process to protect critical knowledge
  - Create a comprehensive knowledge capture and transfer strategy focused on business continuity.
  - Let business leaders drive the strategy and process, with KM functioning as an enabler.
  - Design the strategy and process with an understanding of the organizational culture and "appetite" in mind.
- Identifying critical knowledge
  - Let business leaders and experts determine what knowledge is critical, but provide criteria to support their decision making.
  - Leverage a combination of top-down and grassroots approaches to identify critical knowledge.
- Capturing and transferring critical knowledge
  - When deciding how to capture and transfer knowledge, consider the ratio of tacit to explicit knowledge, the intended audience, and the rate of change.
  - Structure systematic knowledge elicitation as a time-bound event with clear goals, milestones, responsibilities, and outcomes.
  - Provide multiple channels for informal knowledge capture, and make it easy.
  - Develop a process to capture and transfer knowledge related to specific roles.
- Managing access to critical knowledge
  - Make knowledge broadly accessible unless there is a specific reason to restrict it.
  - Make access easy and part of employees' workflows.
  - Offer self-service tools to navigate, filter, and customize the flow of knowledge—and provide a human support team as a last resort.
  - Leverage communities to help socialize knowledge and connect people to the right content, information, and expertise.
- Managing change related to knowledge capture, transfer, and reuse
  - Embed knowledge champions and change agents in the business.
  - Make knowledge capture, transfer, and reuse measurable aspects of employee performance.
  - Help employees understand the level at which they are participating and allow for friendly competition.
- Ensuring critical knowledge is applied and used
  - Build elicited knowledge into documentation, training, and learning resources.
  - Make stakeholders explicitly accountable for contributing and applying knowledge.
  - Use measures and success stories to demonstrate the value of reuse.

McNichols (2010) advocates a number of strategies to improve the chances of completing successful knowledge continuity management activities. These include:

1. Building a knowledge sharing culture
2. Establishing mentoring programs
3. Initiating teamwork

Employees will be more likely to share knowledge willingly if they buy into the organization's mission and vision. If they see management is actively supporting KCM, they will feel they are contributing to something valuable and that their contributions are valued. The greater the level of trust, empathy, altruism, tolerance for errors, and collectivism, then the easier it will be to conduct KCM. It is important that everyone sees a personal, team, and organizational benefit to KCM. The more they clearly identify how they will benefit from the collective experience of their colleagues in the future, then the easier it will be to "sell" KCM.

Mentoring has been shown to be one of the most effective ways of transferring knowledge. Mentoring involves having the mentor and the protégé work together to develop the knowledge, skills, and abilities of the protégé. The mentor is a teacher, coach, and advisor who shares his or her experience, insights, and perspectives along with the more standard core knowledge (Shea, 2002). The major benefit of mentoring is that both explicit and the more elusive tacit knowledge can be transferred. Although effective, mentoring requires a great deal of time so it should not be left to the last minute (e.g., it should not start when an experienced employee has handed in their two weeks' notice). It is helpful to pair up newer employees as early as possible in their careers so that knowledge transfer can take the time it needs and occur over the course of their careers.

Storytelling is a good complement to mentoring as it both captures and transfers tacit complex and subjective knowledge particularly well (Dalkir, 2015). Storytelling uses examples to illustrate how decisions were made or problems solved while the experienced employee carried out his or her job responsibilities. Stories capture context and they tend to be more compelling and easier to remember, as they tend to be enjoyable to read or listen to. They can help you put yourself in someone else's shoes and adopt a different perspective. Stories are easily elicited from experts and easily "digested" by those less experienced, making them an effective knowledge transfer tool for KCM (Denning, 2001).

Last but not least, teamwork, also initiated sooner rather than later, will go a long way toward ensuring that valuable knowledge remains distributed throughout a knowledge network rather than concentrated in the heads of only a few or even just one employee. Wherever possible, these teams should be intergenerational in composition to seed KCM as early as possible and as broadly as possible throughout the organization. The more employees work together, the more likely they are to develop trust, share knowledge, make mistakes, learn from one another, improve their work practices, and even innovate (McNichols, 2010). "The result is a collective knowledge greater than any single individual could produce" (McNichols, 2010, p. 34). Alderton (2015) concurs and notes that "in addition to fueling a collaborative culture, organizations must also create intergenerational teams to maximize the value of knowledge transfer programs" (p. 33). He goes on to say these teams should be formed in a deliberate fashion to address anticipated knowledge gaps in the near future (three to five years).

Another great practice (again, where feasible) is to institute a phased-in retirement. For example, the government of Canada implemented a 3/3/3 program for senior scientists and researchers. The program allows them to begin knowledge transfer activities three years before their anticipated retirement date. In the first year, they spend one-third of their time doing knowledge transfer activities. In the second year, this increases to two-thirds of their time, and in the final year before retirement, they are engaged 100 percent in knowledge transfer for KCM[9].

KCM has a definite business value and this should be measured and made very tangible. For example, metrics could include:

- Accelerate the development of competency in new hires.
- The number of employees with this valuable knowledge has increased.
- Decision making is based on historical empirical evidence, which should result in fewer errors and faster decision making.
- KCM results in reusable documentation of the knowledge required in certain jobs or roles.
- Succession planning is more effective.

DeLong (2004) strongly recommends that KCM processes be embedded into daily work practices so that it would be more difficult to make budget cuts that seriously affect the successful outcome of the KCM program.

As with all KM initiatives, the more management models good KCM behaviors and are seen to be actively engaged in knowledge transfer activities themselves, the more likely it is that the KCM program will succeed.

Challenges for Knowledge Continuity Management

A number of typical barriers to successful knowledge transfer have been identified (Szulanski, 1996; O'Dell et al., 1998; Davenport and Prusak, 2000). These include:

1. Level of difficulty, complexity, and time needed (could take up to two years to complete)
2. Lack of sufficient absorptive capacity
3. Lack of trust, no preexisting relationship, lack of rapport, lack of motivation
4. Incompatible cultures, languages, work values, frames of reference
5. Not viewed as doing productive, valuable work
6. Little incentive, reward, or status boost
7. Knowledge to be transferred not valued or knowledge owner not perceived as credible or important
8. Difficulty tolerating mistakes, asking for help, admitting not knowing something (loss of face)
9. Inability to articulate knowledge to be transferred
10. Lack of methods, tools, and support to transfer the knowledge

Many of these obstacles have already been discussed in previous chapters as they form the core framework for successful knowledge management. They are amplified in knowledge continuity management as the sheer volume and complexity of the knowledge to be transferred is overwhelming. Someone may have worked at an organization for over thirty years and gained a great deal of experiential knowledge. Where to begin? The first step is to realize that the goal is not to document all of this experienced person's accumulated knowledge. The use of a systematic process will go a long way to help identify who should be involved, what knowledge should be transferred (and preserved), and how.

Alderton (2015) notes that "some senior employees avoid participating in knowledge transfer programs for fear of being diminished or replaced by new colleagues and technologies" (p. 33). He also notes that a shortage of time, resources, and executive sponsorship will hinder KCM efforts. Warmington (2015) has found that "in organizations with siloed departments and challenging communications, knowledge transfer can be difficult" (p. 44).

Schmitt et al. (2011) note that while interviews and documentation are common approaches to knowledge capture and retention, these approaches usually fail. This is because: "(a) documentation does not guarantee the retrieval, correct interpretation, and application of the knowledge; (b) not all tacit knowledge can be captured and stored in a database; and (c) these approaches ignore the context that embeds the individual's knowledge in a social network of coworkers and external parties" (pp. 67–68). Social network analysis can help to identify the experienced employees informal peer networks and these can be analyzed to identify the key internal and external relationships they make use of in order to perform their job well.

Concluding Thought

Knowledge Continuity Management should be part of every organization's managerial toolkit. There is always flux in an organization's human resources and there have been traditional ways of ensuring that positions are filled as they are vacated. We now need to look beyond the container labeled "job" and look instead inside the container marked "valuable experiential knowledge." There does not have to be a one-to-one mapping of valuable knowledge to one job position or even to one employee. KCM requires a different perspective or logic, one based on identifying the critical expertise needed in order for the company to continue to operate but beyond that—to continue to operate at the same level of excellence.

Key Points

- Knowledge continuity is the process of ensuring that valuable knowledge is not lost to the organization due to employee attrition. Ideally, knowledge transfer should take place at the individual (knowledge worker), group (community of practice), and organizational (organizational memory) levels.
- KCM involves many business units and different roles and responsibilities including HR, IT, and strategy.
- KCM is not just about managing knowledge through technologies and integration into standard procedures: a vision and culture that supports knowledge sharing must be an integral part of the organizational culture.
- A comprehensive KCM strategy is needed to help establish criteria to identify critical knowledge and guidelines to select the best methods of transferring and retaining different types of knowledge transfer. This strategy should also take into consideration individual characteristics of the workers involved in the knowledge transfer.
- The KCM process consists of identifying critical knowledge at risk, where it is located (tacit knowledge in which employees, explicit knowledge in which books and databases), identify who this knowledge will need to be transferred to, select the best transfer and retention mechanisms for each type of knowledge, develop a schedule and metrics to assess the effectiveness of the transfer and retention, validate elicited knowledge, transfer and retain critical knowledge, ensure it is applied and reused, encapsulate this in a KCM strategy (long-term) and action plan (short-term).
- It is best to use a combination of methods as critical knowledge will be complex and will at least include both tacit and explicit forms of knowledge. The combined methods should include at least some form of technology to help retain knowledge and some form of networks to help diffuse knowledge.
- Management support should include providing the time, space, and recognition of KCM efforts.

Discussion Points

1. List the major steps you would have to undertake in order to develop a knowledge continuity strategy. Include information on how you would identify potential areas for concern, and how you would identify critical know-how that needs to be preserved at all costs, and discuss some of the mechanisms you could use in order to effectively carry out knowledge capture and transfer.
2. Compare and contrast different approaches to transferring knowledge. What are the strengths and weaknesses of each? Are some techniques better suited to explicit knowledge? Tacit knowledge?
3. What is the role of technology in KCM? What characteristics would you use to guide your decision in selecting the specific technology to use with a given pair or group?
4. What are the major challenges to overcome in order to implement a successful KCM program in an organization? How would you tackle these?
5. Explain how knowledge transfer occurs at the individual, group/team, and organizational levels. How can you ensure that there are solid bridges between these three levels?

Notes

1. See: Michigan State, "Knowledge capture and transition for state agencies," https://www.michigan.gov/documents/mdcs/FINAL__KnowledgeCaptureAndTransitionReport_

2. Some of these were from a KM master class conducted by the author and Professor Réal Jacob.

3. Note: (I) refers to individual and (G) refers to group level.

4. See www.km4dev.org/indexphp?module=uploads&func=download&fileid=244.

5. Some of these were from the KM Master Class conducted by the author and Professor Réal Jacob.

6. See http://www.cefrio.qc.ca/index.php?id=173&no_cache=1.

7. See https://creativecommons.org.

8. The author would like to thank Anne-Marie Smith for her contributions to this section.

9. See Treasury Board of Canada, https://www.tbs-sct.gc.ca/gui/spgr/spg-gpgr-eng.asp?for=execs.

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13 The Knowledge Management Team

> He is wise who knows the sources of knowledge—where it is written and where it is to be found.
>
> —A. A. Hodge (1823–1886)

This chapter provides an overview of the professionals who form part of the KM team. The key skill set required to carry out KM responsibilities is described using a variety of frameworks. The CKO (chief knowledge officer) and CLO (chief learning officer) roles are introduced and their evolution from the more traditional CIO (chief information officer) is discussed. The different types of KM jobs that exist and potential KM employers are outlined, and the chapter concludes with a discussion of the emerging KM profession and some of the ethical issues involved in its practice.

Learning Objectives

1. List the key KM skills required to carry out KM professional work and justify the need for each one.
2. Describe the different roles that are required for a KM team and list the key responsibilities of each.
3. Understand how a CIO role can evolve into a CKO role or even a CLO position.
4. Identify the different types of potential KM employers.
5. Relate the critical cognitive and attitudinal attributes that an ideal KM professional should possess.
6. Critically evaluate ethical issues in KM situations in order to make recommendations on how to successfully prevent and correct any morally challenging hurdles to KM implementations. Outline the key tenets that should be included in a KM code of ethics and justify your recommendations.

Introduction

This chapter introduces the final component to complete the integrated KM cycle: the KM team (see figure 13.1).

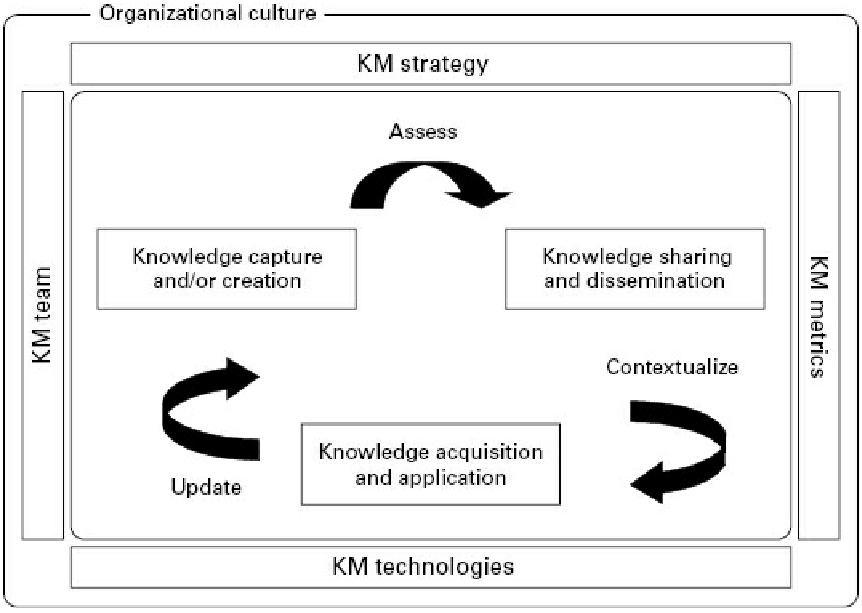

Figure 13.1 The KM team in the integrated KM cycle

The brief historical overview of KM in chapter 1 discussed how the KM field has transformed from one led primarily by consultants and other KM practitioners to a bona fide discipline with a distinct body of knowledge. This has been paralleled by the growing number of academic programs that offer KM as compared to the predominately private sector training that had been the only way to learn about KM until recently (e.g., Al-Hawamdeh, 2003).

One approach to forming an effective KM team is to define the different types of KM professionals and the types of skills, attributes, and background they should ideally possess. The ultimate goal is to develop a list of cognitive, affective, and psychomotor skills together with the required competency levels for each skill.

TFPL (http://www.tfpl.com) is a specialist recruitment, advisory, training, and research services company with offices in London focusing on knowledge management, library and information management, records management and web and content management. Since 1987, TFPL has worked with organizations in both public and private sectors to help them develop and implement knowledge and information strategies and to recruit and train information and knowledge leaders and their teams. TFPL has drafted a guide of KM skills and competencies to provide a clear and practical overview of KM skills and competencies that draws on the practical experience of organizations in a wide range of sectors and with varying approaches to KM. In general, these KM skills include:

- Time management to use their time and energy effectively for acquiring knowledge (spending all day surfing the net is probably counterproductive)
- Use of different learning techniques to absorb key knowledge and learning quickly
- Effective skills of advocacy and inquiry to present knowledge to, and gather knowledge from, others
- Informal networking skills to build influence to gain access to people with knowledge
- Resource investigation skills
- Effective IT skills for recording and disseminating information
- Skills of cooperative problem solving
- Open dialogue skills

- Flexibility and willingness to try new things and take educated risks
- Active review of learning from mistakes, risks, opportunities, and successes

The TFPL knowledge management skills map[1] is based on extensive international research. The project team contacted over 500 organizations involved in implementing KM and identified the roles that they had created, the skills that were needed in those roles, and the additional skills that were required across the organization. These key skills included an understanding of the KM concep—the philosophy and theory; an awareness of the experiences of other organizations in developing KM solutions and approaches; an understanding of and the ability to identify the business value of KM activities to the organization; and an appreciation of the range of activities, initiatives, and labels what are employed to create an environment in which knowledge is effectively created, shared, and used to increase competitive advantage and customer satisfaction (see table 13.1).

Table 13.1 Excerpt from the TPFL KM skills map

Business awareness/experience	Managementskills	Intellectual and learning skills
Business planning	Change management	Ability to deal with ambiguity
Entrepreneurial	Coordination	Analytical
Forward thinking	Cost control	Bigger picture view
Globalization issues	Financial management	Conceptual thinking
Industry/ sector knowledge	Leadership	Emotional intelligence
Leadership	Measure performance impact, value	Self-awareness, self-motivation, persistence, read emotion in others
Organizational design	People management	Innovation
Organizational skills	Project management	Lateral thinking
Risk management	Quality assurance	Organizational skills
Strategic thinking	Team building	Original thinking
Strategic planning	Time management	Perspective
Understanding value chain	Training and development	Problem solving
Visioning	Needs analysis	Positive thinking

The KM team's skill requirements can be built up from the set of critical skills or core competencies, such as an ability to learn, to be autonomous, to wait to be told, to be a collaborative team player, to see the big picture, to make connections, to learn from mistakes, snd to think and do with a focus on outcome and an appreciation of information management techniques.

A KM dream team would collectively possess the following skills: communication, leadership, expertise in KM methodology/processes/tools, negotiation, and strategic planning. The team would also know the organization, remain connected to the top, adopt a systems view, and be an intuitive risk taker.

Goade (2002) groups key KM skills along the following seven categories:

1. Retrieving information
2. Evaluating/assessing information
3. Organizing information
4. Analyzing information
5. Presenting information
6. Securing information
7. Collaborating around information

The skill of retrieving information is everything from the low-tech skills of asking questions and listening and following up to the more complex skills of searching for information using Internet search engines, electronic library databases, and relational databases. Concepts of widening and narrowing one's search, Boolean logic, and iterative search practices are an important part of the effective exercise of this skill.

Evaluating information entails not only being able to the judge the quality of information, but to determine its relevance to some question or problem at hand. Though this has no necessary computer mechanism for implementation (though Internet search engines have crude relevant raters), the greater availability of information in the current information-rich environments makes this skill of far greater importance.

Organizing information entails using various tools to draw connections between items of information. In the manual environment, we use file folders, drawers, and other mechanism for organizing information; in more high-tech environments, we use electronic folders, relational databases, and web pages. Effective organizational principles must underlie the effective implementation of information organization regardless of the environment.

Analyzing information entails the challenge of tweaking meaning out of data. Integral to analyzing information is the development and application of models, often quantitative, to deduce relationships out of the data. Tools such as electronic spreadsheets and statistical software provide the means to analyze information, but the human element is central in framing the models that are embodied in that software.

The key aspect of presenting information is the centrality of audience. Presenting information—whether through PowerPoint presentation, website, or text—builds on principles of chunking information to enable audiences to understand, remember, and connect. Web styles and monographs on designing website usability provide concrete content for this KM skill.

While securing information is a different kind of KM skill than the other six KM skills, it is no less important. Securing information entails developing and implementing practices that assure the confidentiality, quality, and actual existence of information. Practices of password management, backup, archiving, and use of encryption are important elements of this effectively practiced KM skill.

Increasingly, information technology tools called groupware are being provided to support collaborative work. To use that technology effectively requires not just understanding how to use those tools, but understanding underlying principles of effective collaborative work. Principles of email etiquette are an illustration of important knowledge underlying the effective exercise of this KM skill.

Most organizations are still defining their KM roles and some are repurposing or extending existing roles in order to better accommodate knowledge work. While KM in every organization is unique and necessarily tailor-made, there are a number of generic KM roles that can be identified. These are discussed in further detail below.

Major Categories of KM Roles

KM roles are quite diverse. They may include such categories as:

- Strategic roles—chief human capital officer, human capital retention manager
-
- Senior and middle management roles—chief knowledge officer, knowledge manager
- Knowledge leaders—responsible for promoting KM within the organization, also referred to as KM champions
- Knowledge managers—responsible for the acquisition and management of internal and external knowledge
- Knowledge navigators—responsible for knowing where knowledge can be located, also called knowledge brokers
- Knowledge synthesizers—responsible for facilitating the recording of significant knowledge to organizational memory, also called knowledge stewards
- Content editors—responsible for codifying and structuring content, also called content managers; roles involving capturing and documenting knowledge—researchers, writers, editors
- Web developers, electronic publishers, intranet managers, content managers
- Learning-oriented roles such as trainers, facilitators, mentors, coaches—including those with responsibility for developing information and knowledge skills
- Human resources roles with specific responsibility for developing programs and processes that encourage knowledge-oriented cultures and behaviors
- Knowledge publishers—responsible for internal publishing functions, usually on an intranet, also called Webmasters, knowledge architects, or knowledge editors
- Coaches and mentors—responsible for assisting individuals throughout the business unit or practice to develop and learn KM activities and disciplines
- Help desk activities, including the delivery of KM and information related to training, also called KSO (knowledge support office)

In seeking to recruit relevant professionals for KM roles, a key challenge lies in defining the objectives and deliverables of those roles, and in specifying the skills and experience of the people needed to fill them. Some of these roles may be newly created, while others may involve redefining or extending existing roles.

Different organizations will necessarily have different approaches to describing knowledge management roles. A sample KM job description may look something like the example in box 13.1.

Box 13.1
Sample job description: Knowledge and Information Manager (posted on http://www.brint.com)

Responsibilities will include:

- The systematic recording and storing of health-related information and expertise
- The “packaging” of organizational expertise, health information, knowledge, and learning for use by a variety of clients
- Maximizing the usability and usefulness of health resources/information products for different user groups
- Promoting the meaning and purpose of information and knowledge resources/products to clients within and outside of the organization
- Ensuring information/knowledge resources can be readily accessed and easily retrieved

The Knowledge and Information Manager:

- Will provide leadership in the area of knowledge management as a technique for the management of the intellectual assets of the organization
- Will assist with the development of knowledge and information as a core business function for all business units
- Will provide the “hands-on” expertise required to manage organizational expertise in the form of both knowledge and information resources/products

Selection criteria:

- Tertiary qualifications preferably in relevant field, for example, Information Science, KM
- In-depth appreciation of the capabilities and limitations of information technology
- The ability to manage knowledge and information via online databases, collaborative technologies, and web-based services
- Understanding of knowledge processes such as organizational learning and development
- Understanding of the principles of knowledge management as a management technique to enable organizational development in the knowledge economy
- Excellent computer skills preferably with experience with database and website management
- Experience in systems development and implementation would be an advantage
- Experience managing small teams and budgets
- Leadership and planning skills
- Superior communication and relationship-building skills
- Strong project management skills

Role responsibilities:

- Develop, implement, and achieve a knowledge management plan for the organization
- Establish a Health Information Center for the knowledge and information resources/products of the organization
- Develop and maintain a health Internet and intranet site
- Train and develop staff in information literacy and knowledge awareness that is, in systematically identifying, collecting, reviewing, sharing, and retaining high-value knowledge
- Ensure compliance with relevant legislation, for example, copyright and intellectual property

- Oversee development and achievement of business and project plans for the unit
- Monitor and report on relevant activity levels in operational and business plans
- Establish and maintain links with relevant internal and external stakeholders

KM professionals require a multidisciplinary skill set that consists of such competencies as finding, appraising, and using knowledge, reformulating questions, navigating through content, evaluating the relevance of content, filtering out what is not needed, and synthesizing from diverse sources in order to apply the knowledge (e.g., to make a decision). Last but not least, they must contribute to the recording of such valuable experiences to organizational memory systems. Two good references are Careers in Knowledge Management (http://www.knowledge-management-tools.net/careers.html) and Gurteen KM jobs (http://www.gurteen.com/gurteen/gurteen.nsf/id/jobs).

Senior Management Roles

One may be familiar with the role of a chief executive officer (CEO), chief operating officer (COO), and chief financial officer (CFO). There are also chief technology officers (CTO) and chief information officers, positions typically reserved for heads of information technology. An analogous role exists for a knowledge management executive, sometimes referred to as the chief knowledge officer (CKO) or chief learning officer (CLO). The CKO or CLO position heads the KM team and is primarily responsible for:

- Knowledge management strategy
- Knowledge management operations
- Influencing change in the organization
- Managing knowledge management staff (Rusonow, 2003)

The KM executive must decide how information is evaluated, created, processed, inventoried, retrieved, and archived, so that KM activities are aligned with the business goals of the organization. There are huge ramifications when an organization creates records, installs a new online catalog or a firewall, designs a website, creates virtual workplaces, copyrights information, and creates policies and procedures on how one department communicates information to another (or too many times, it doesn't), and the head of KM must be present in all these events. This executive KM role often also incorporates change management.

Thurow (2003; 2004) maintains that in our increasingly knowledge-based economy, every company will eventually have a senior manager responsible for KM, and those that get there first will have a competitive edge. Just what this person will do is still being invented and will differ from industry to industry. The KM executive's duties may be as varied as recommending whether a company should buy, sell, or make its technologies, or determining where technology is going and where new competitors may arise. KM executives identify critical knowledge needs within a company as well as any knowledge gaps that need to be addressed. KM executives need to be good relationship builders as the fundamental issues revolve around people, culture, roles, behaviors, and the business processes in the organization.

Skyrme (1997) defines a CKO as a senior executive who is responsible for ensuring that an organization maximizes the value it achieves through one of its most important assets—knowledge. Although only a few companies have people with this explicit title, those with similar responsibilities include director of intellectual capital and director of innovation. CKOs will typically contribute to the following KM goals:

1. Maximize the returns on KM investment in knowledge—people, processes, and intellectual capital
2. Exploit intangible assets, for example, know-how, patents, customer relationships
3. Repeat successes and share best practices
4. Improve innovation and the commercialization of ideas
5. Avoid knowledge loss and leakage after organizational restructuring

The responsibilities associated with the job function of KM executive revolve around converting the KM strategy into specific KM initiatives that help achieve organizational business goals. KM initiatives fall into general categories such as:

1. Promoting the importance of knowledge sharing
2. Creating a technical infrastructure to ease that sharing
3. Promoting a cultural climate that rewards knowledge sharing behaviors
4. Measuring the value of knowledge and KM practices to the organization

Potentially the most important part of the job function is promoting a corporate culture that encourages knowledge sharing. A long-term proposition, the CKO works as a change agent to build a cultural climate that rewards sharing behavior (Earl & Scott, 1999). Because of the power associated with expertise, employees may be reluctant to share their knowledge and skills. "A person who has unique or special knowledge, skills, and experience may use this expertise as a source of influence and a way of building personal power" (Gordon, 2002).

The CKO argues against perceived reasons for hording knowledge (Stewart, 1998), persuades workers that knowledge-sharing initiatives are to their benefit (Earl & Scott, 1999), and uses motivational techniques to reward a sharing climate. The CKO also creates an environment that makes it easier to build communication networks among employees who do not normally work together but would generate value from exchanging information (Earl & Scott, 1999). The CKO works with formal and informal communication networks and supports communities of practice or groups of experts who could learn from knowledge exchange (Stewart, 1998).

Davenport and Prusak (1997) argue that these organizational changes will necessarily require changes to the information technology structure, since IT is the key enabler in leveraging intellectual capital. Having fostered a sharing culture, the CKO uses IT to create a structured means of knowledge exchange, and as a way of generating opportunities to connect workers together across organizational units and geographies. The CKO designs ways for workers to present and receive knowledge and is responsible for developing and maintaining an information infrastructure to harness the collective knowledge of the organization.

While working to foster a cooperative culture and creating mechanisms to exchange knowledge, the CKO keeps a sharp eye on the rewards of these endeavors. The results of KM activities must translate into real business value. In business ventures, the bottom line is the measure of success to an organization. The CKO evaluates the return on investment before making cultural and design decisions and proceeding with KM initiatives. A final function for many CKOs is that of manager to a team of knowledge professionals. Although not all CKOs have a team, Earl and Scott (1999) found that most have a small staff of three to twelve specialists working under their supervision. In addition to leading the management of intellectual capital in an organization, the CKO must therefore also supervise the work and careers of their employees.

Some KM executives have the title of chief learning officer (CLO). There is even a journal dedicated to this role, called *Chief Learning Officer*[2]. Like CKOs, most CLOs are first-generation incumbents.. Chief knowledge officer positions are typically created to leverage knowledge into tangible business benefits. Likewise, CLO positions are designed to leverage learning through the culture of an organization, the type of knowledge and learning it wants to emphasize, and how technologically focused it is.

Unlike CKOs, the roots for most chief learning officer positions, on the other hand, are in human resources, organization development, or sales and marketing (Bonner, 2000). Most incumbent CLOs have strong backgrounds in learning strategies and a strong orientation toward setting and reaching business goals. They have been selected from such positions as director of training or vice president of sales and marketing. CLOs are committed to the strategic integration of organizational and individual learning at all levels and across all functional silos. They often have as a primary objective to change their organizations' mindsets from training (usually defined as a classroom-based delivery system) to continuous learning and human performance improvement, and to use a wider variety of delivery methods such as virtual learning options, corporate universities, and self-directed learning.

Chief learning officers are not glorified training directors. Baard (2002) points out that the CLO role began as being primarily concerned with organizational learning and initiatives such as e-learning but the role has expanded to help transform the organization into a learning organization. The primary factor for being a successful CLO is being a businessperson first and understanding how to drive through a strategic initiative. CLOs must be able to communicate in business-tangible results, think strategically, and talk the language of other executives. CLOs are strategic leaders who help senior management translate learning into strategic business capabilities.

Willis and May (2000) describe the CLO role as:

- A strategic, lead player in today's business organization

- Responsible for making sure that learning across an entire system is leveraged, not sacrificed
- Accountable to the whole system and having broad discretionary power
- Operating by using knowledge about how adults learn, how learning affects work, how value systems operate, and how social and technical systems in an enterprise or in their environment may either support or counteract each other

CLOs work with the know-how of knowledge—the tacit knowledge that is hard to codify. They integrate thinking and acting and their work involves lots of errors and mistakes. CLOs need to create an environment that fosters knowledge sharing informally so that they can interact with a team in a work context. The CLOs work begins and ends with the customer. Their work is applicable at each point in the continuous cycle that becomes spirals of need and need satisfaction. Customers validate and confirm the mission of the organization, which in turn drives the business strategy. Strategy involves inventing and choosing options, determines the culture needed to accomplish the strategy, and leads to modification of the systems in use to create competitive advantage. If there is advantage to the customers, they are satisfied and the mission of the company is once again ratified. Some typical CLO initiatives would include:

1. *Cultural transformation*. Assisting with the development and communication of a new vision and strategy for the organization and tending to the cultural transformation to support the new corporate direction. Watkins and Marsick (1993) noted that training programs can help deliver skills needed for organizations to change, but do not address the deep-seated, mental models and attitudes or the organizational structures and norms which perpetuate them.
2. *Culture maintenance*. Designed to support the marketplace strategy and address deficiencies in skills essential to maintain the new culture developed.
3. *Contemporary initiatives*. Related to business development, like developing a new marketing plan, account manager development, or promotional process redesign. These require the CLO's in-depth experience in the industry, comfort/ease in working across all functions of the organization, and a whole systems viewpoint/thinking.

Due to the nature of work, CLOs have a limited number of quantitative performance indicators and most are budget related. The CLO's job focuses mainly on management of projects, preparing plan documents for projects including problem or opportunity synopsis, proposed solutions, action steps and timetable, deliverables and projected costs. A CLO's performance is evaluated in terms of meeting objectives on target, on time, and on budget. The CLO is an unprecedented kind of catalyst in organizations, serving to combine technical and social work factors through communication and paving the way for employees to contribute their very best to the collective enterprise.

KM executives, whether they have a CKO or CLO title, are primarily responsible for ensuring that KM goals are in line with organizational strategies and objectives.

KM Roles and Responsibilities within Organizations

The main types of KM roles observed in a wide range of private and public sector organizations can be summarized as follows:

1. Designing information systems (designing, evaluating, or choosing information content, database structures, indexing and knowledge representation, interfaces, networking, and technology)
2. Managing information systems (maintaining the integrity, quality, currency of the data, updating, modifying, improving the system, and operating the system)
3. Information resources management (managing organizational information resources to support organizational missions and for competitive advantage)
4. Training (coaching, mentoring, CoP start-up and lifecycle training support, and feeding back lessons learned and best practices into training content)
5. Information agencies (acting as information consultants or guides for clients: advising, training, guiding on information, information sources, information use; acting as an agent on behalf of the client: gathering, evaluating, analyzing, synthesizing, summarizing information for clients)
6. Competitive intelligence (gathering and analyzing intelligence to inform decision making)
7. Customer relations for information systems/technology (acting as intermediaries between clients and information system designers, translating client needs into functional specifications and sales)
8. Designing and producing information services and products publications (databases, information systems, multimedia products, and stories from storytelling workshops)
9. Knowledge journalist (gathering organizational stories and coding tacit knowledge)
10. Organizational information & KM policy analysts (designing access to corporate organizational information and KM policies, quality control, maintaining proprietary information and KM, and mapping corporate intellectual assets)
11. Government KM policy analysts (formulating government policies at all levels regarding such issues as the KM infrastructure, access to and use of government information, intellectual property, privacy and public/ private roles in knowledge creation, dissemination and use, government acquisition of information, and information technology)

The types of organizations where KM roles can be found are typically those organizations concerned primarily with information content, such as publishers, database creators and providers, the press/mass media, new media companies (e.g., multimedia developers), information collectors (e.g., Reuters), data service companies (e.g., Mead), value-added providers (e.g., Standard and Poors), and disciplinary societies (e.g., American Chemical Society). Also, organizations concerned primarily with information delivery offer a number of major KM roles. These would include companies such as telecommunications and cable companies, database vendors (e.g., DIALOG and networks), service providers (e.g., BARNET, ANS).

Organizations concerned primarily with information technology have long had a number of key KM positions. These include the software industry, computer hardware companies, and systems integrators, especially to develop criteria for hardware and software and optimize systems for customers and instructional technology development companies. Similarly, KM can be found in organizations concerned primarily with information organization, access, and preservation such as libraries (e.g., college and university libraries, public libraries, corporate libraries, school libraries, research libraries, and other special purpose libraries such as hospital libraries), museums, archives, data centers, and hospitals and other medical organizations.

KM can be found in almost every type of organization today: law firms, medical practices, pharmaceutical companies, utilities, engineering firms, healthcare, government departments, banks, insurance companies, and the military sector. KM roles include the application of information technology—evaluation, selection, applications design, research and information-gathering, synthesis, and evaluation—libraries, competitive intelligence units, and records management. The government has been a KM leader in many areas. KM jobs are often found at governmental agencies engaged in information production and distribution (e.g., Bureau of Labor Statistics, Department of

Commerce, National Center for Education Statistics, NTIS, ERIC, US Geological Survey, NIH, Bureau of the Census, Patent and Trademark Office, United Nations, World Bank, foreign governments); governmental agencies involved in information regulation (e.g., PUCs regarding telecommunications regulation); governmental agencies involved in information technology assessment, development, and policy; information resources management to help agencies accomplish their missions (e.g., a GAO report that criticized the Department of Energy for inadequate information resources management which impeded its operations), the intelligence community (e.g., CIA), and agencies involved in policy formulation/decision making as consumers of information (e.g., the FDA).

There are a number of important KM functions to be found in other academic and research institutions such as large scientific enterprises (e.g., Human Genome project, Mission to Planet Earth) and in the design and management of discipline-specific information systems. PhDs in KM also follow an academic career path at universities or find employment in information industry firms for R&D and government agencies.

KM Job Titles

With the exception of the now prevalent CIO and CKO job designations, there are a bewildering number of possible job titles for KM professionals—and some of these are quite exotic. David Skyrme[3] lists the following:

- Knowledge harvester—a person who has the skills to elicit tacit knowledge from experts and to codify it into a form that is more readily shared
- Knowledge analyst—typically a person who links the needs of users with that of knowledge provision; they translate user needs into knowledge requirements and interpret new knowledge into the business context
- Knowledge editor—a person who refines explicit knowledge, converting it into language and formats that are user-oriented; they also synthesize the essence and nuggets from the vast amounts of unstructured information in emails, discussion forums, and other unstructured sources
- Knowledge navigator—someone who knows their way around the various knowledge repositories within your organization, whether they are in databases or pockets of expertise
- Knowledge broker—someone who connects people who need knowledge with those who have it; they usually have a good network of knowledgeable contacts
- Knowledge gatekeeper—a person who keeps tab on external sources of knowledge and directs it to where it might be useful; more proactive than the [knowledge] broker, who handles specific user requests
- Knowledge steward—a custodian of knowledge resources; they ensure that knowledge is properly managed and kept up to date
- Knowledge facilitator—a person who is active in encouraging sharing of knowledge, whether it be through structured conversation, workshop sessions, or creating other mechanisms for people to interact

The KM Profession

Al-Hawamdeh (2003) refers to KM as an emerging profession. The field of KM has slowly evolved from a consulting service to an internal business function, to become an academic discipline that is being taught in universities worldwide. At the same time, many organizations are still in the process of defining their KM roles. There are a wide range of differing job titles and an even wider diversity in the backgrounds of KM practitioners. These factors all contribute to the emergence of the KM profession. The KM field is fairly young when compared to more established profession such as law, medicine, or engineering. As the KM skill set continues to grow and show valuable contributions to the overall organizational goals, the profession will too continue to mature and coalesce as a distinct field of professional activity. There are a number of certification initiatives underway that will help solidify KM's position as a bona fide field of professional practice (e.g., the KMCI Certificate in Knowledge and Information Management, http://www.kmci.org). At the same time, university programs in KM are proliferating and new classes of KM graduates are entering the KM job market. In parallel with the emergence and coalescence of KM as both an academic discipline and a professional field of practice is a growing awareness of the need to incorporate ethics into the job description of each KM team member.

In general, KM is found in the management, education, and library and information studies departments of universities. Standalone special interest courses have evolved into degree programs at the undergraduate and graduate levels. Some sample KM courses and their syllabi can be found online. Quite a few doctoral students have also completed dissertations on KM topics

Knowledge management has become more solidly established as a discipline as well as a field of professional practice. In parallel, KM qualifications now require more than having had a course or two in the subject, as many employers now require a degree or at least a specialization in KM. The field of knowledge management still maintains its wide diversity as the titles of these degrees range from computer science, management or business, cognitive psychology, and library and information science degrees. In parallel, a number of professional associations have created KM chapters such as the Special Libraries Association (http://km.sla.org), which in addition to its excellent content is also a "practice what you preach" site with wikis, communities of practice. and many Web 2.0 features. Other associations include:

- KMPro, the Knowledge Management Professional Society (http://www.ikmpro.org), with wide-ranging chapters and a certification process
- The Knowledge Management Benchmarking association (http://kmba.org)
- The Information and Knowledge Management Society (http://www.ikms.org)
- The International Association of Knowledge Management (http://www.iakm.net)
- A sample job posting from a consulting firm might be like this[5]:

C&C International Computers and Consultants, Inc. (C&C) is seeking a Knowledge Management Specialist to help support NASA's Knowledge Management processes, requirements, and business needs. The KM Specialist will develop processes and technical solutions for the identification, categorization, review/approval, maintenance and management, and retirement of knowledge, information, and data; provide support on knowledge retention and transition planning to ensure improved communications; develop a component of the customer's KM training plan/program; and provides data, information, and knowledge (includes processes, roles, responsibilities, tools, systems, etc.) produced, consumed, utilized, distributed (internally and externally), and processed in daily operations of the IT support services program.

Some additional sample KM job postings are shown in boxes 13.2 and 13.3.

Box 13.2
Sample KM job descriptions

Chief Knowledge Officer

- To take the lead in developing the infrastructure, resources, processes, and culture for knowledge management to support creativity and competitiveness
- To supervise senior managers (IT, HR, business development)
- Prioritize KM initiatives
- Implement KM processes and procedures around a corporate memory
- Qualifications: Degree plus professional experience
- Skills: Demonstrated capacity for managing change, ability to negotiate and persuade; presentation skills, team-building and motivational skills
- Personality traits: Effective, pragmatic, and action orientated, adaptable and flexible in approach, people orientated

Knowledge Manager

- To manage and promote the effective supply and use of knowledge
- Identifying local knowledge needs and prioritizing in terms of value to the business
- Promoting the effective use of knowledge-sharing tools for all partners and staff
- Qualifications: Postgraduate qualification in librarianship, information sciences, or a related discipline. Business-related qualification desirable (or appropriate professional experience)
- Experience: Over 5 years senior experience in a business/financial environment
- Skills: Management skills, good IT skills including maintaining quality databases; in-depth understanding of the principles of knowledge management
- Personality traits: Good at building, motivating, and leading teams, good communicator; pragmatist

Box 13.3
Sample job posting for information/knowledge management specialist/coordinator

Purpose/Objectives: To manage the effective supply and use of internal information and its integration into the corporate knowledge base

Responsibilities:

- Industry research using a variety of sources
- Maintaining a collection of internal research
- Assisting in the population of the company's existing information databases
- End-user training in the use of desktop information resources such as SharePoint
- Knowledge management administration, including maintaining internal distribution lists and upkeep of hard-copy library

Education: Degree or postgraduate qualification in librarianship, information sciences, or a related discipline.
Experience: Over two years of experience providing research services in a corporate or industry specific environment

Skills:

- Added-value research skills
- Project management skills
- High competency in searching CD-ROMs, Dialog, Datastar, and the Internet
- Instruction/training skills

Personality:

- Ability to function in a high-pressure environment
- Fast thinker with a flexible attitude

Where Does KM Belong in the Organization?

KM teams can be found in disparate business units including information technology, information management, human resources management, training, and strategy units. So where does it belong? David Skyrme[6] notes that:

> In practice, the focus of KM in an organization is found within many different management functions—human resources, IT, information management (library), marketing, and R&D, to name but a few. However, in an organization-wide KM program. its tentacles should reach out into all parts of the organization. This is best achieved through some kind of networked organization structure. Various terms such as "spider's web," lattice organization, hypertext organization, clustered webs, federation of business units, [and] TeamNets have been used. Whatever their name, these are the recurring characteristics:
>
> - There is more emphasis on informal human networking than formal reporting structures
> - Leadership is distributed—thus a KM specialist in one business unit may lead on one aspect of KM, while responsibility for another aspect of KM resides elsewhere
> - A clear vision and set of plans/priorities provides a unifying factor across the network
> - Individual contributors are independent, yet interdependent
> - "Boundary busting" (i.e., overcoming organizational "silos") is achieved through conscious attention to bridging mechanisms

- Communities of practice provide an effective way of knowledge networking across an organization
- Virtual teams are often the organizational unit where the core work takes place

In practice, structure goes hand-in-hand with the organizational culture, since it is a knowledge-enriching culture that will largely determine how well the structure works.

Maier (2013) notes that in some organizations, there is a separate KM business unit. In many cases, KM units were "spinoffs" of existing units such as the library, document management, or information technology units. Other KM units had employees from all key business units serving as members.

A similar situation exists with the academic home of the KM discipline. KM is taught in various university departments such as management, computer science, information and library sciences, communications, media, education, and public policy.

The Ethics of KM

Ethics establishes a framework for making decisions based on values, a determination of what is right and wrong. Laws create public policy built on government's presumption of what is best for its citizens. Legal aspects frequently attempt to codify ethical responsibilities, but can often differ from an individual or organizational moral standard. An ethical code for a profession is a system of standards to which those in the field agree to conform (Rogus, 1997). Professionals in formal leadership roles have a responsibility to model the highest possible standards for those whom they manage. Perhaps our most important aspiration is that we understand how the larger culture supports a set of values centering on personal success, power, and popularity, and tends not to care about the means by which they are achieved.

The field of ethics, also called moral philosophy, involves systematizing, defending, and recommending concepts of right and wrong behavior (The Internet Encyclopedia of Philosophy.[7] Philosophers today usually divide ethical theories into three general subject areas:

1. Metaethics investigates where our ethical principles come from, and what they mean. Are they merely social inventions? Do they involve more than expressions of our individual emotions? Metaethical answers to these questions focus on the issues of universal truths, the will of God, the role of reason in ethical judgments, and the meaning of ethical terms themselves.
2. Normative ethics takes on a more practical task, which is to arrive at moral standards that regulate right and wrong conduct. This may involve articulating the good habits that we should acquire, the duties that we should follow, or the consequences of our behavior on others.
3. Applied ethics involves examining specific controversial issues, such as environmental concerns, how whistleblowers will be treated, and so on. By using the conceptual tools of metaethics and normative ethics, discussions in applied ethics try to resolve these controversial issues.

McElroy (2002) discusses recent accounting scandals that highlight the dangers of allowing dysfunctional knowledge processing in a corporate context. He points out that knowledge management can help generate a greater sense of openness in managerial decision making. KM can promote ethics by enhancing transparency in management where transparency is defined as openness with respect to knowledge and knowledge processes. In this way, it becomes possible to identify dysfunctional knowledge processes and bad practices or ideas. KM deals explicitly with the manner in which organizational knowledge is produced and integrated into practice. Openness should contribute not only to more ethical business practices but also to innovation.

KM is the one management discipline that concerns itself with managing the quality and complexion of knowledge processing. It, and no other body of management practice, deals explicitly with the manner in which organizational knowledge is produced and integrated into practice. The transparency problem in business is fundamentally a knowledge management problem, because bad practice is nothing more than bad knowledge in use, and bad knowledge in use is the product of dysfunctional knowledge processing. Separately, we can see that a move toward more openness or transparency in organizations not only has an impact on illicit behaviors, but also serves to enhance innovation through greater inclusiveness in knowledge processing. By involving higher proportions of stakeholders in knowledge production and integration, organizations can avail themselves of both more quality control over knowledge in use and more stakeholder participation in the process, thereby adding to the depth and breadth of organizational creativity. Openness is, at once, a prescription for enhancing both corporate responsibility and business innovation.

It is also clear that knowledge management is uniquely well equipped to assist organizations in making the transition from relative states of closure to greater openness in knowledge processing, primarily because KM is a management discipline that seeks to enhance knowledge processing. The targets of its interventions are always knowledge processing behaviors, not just their outcomes. This is often referred to as the "transparency" of an organization (Tapscott & Ticoll, 2003).

In terms of knowledge processing behaviors, ethics in KM consists of valuing human beings. Ethics is often considered to be a simple matter, whereas it most definitely is not. Much of ethics can be distilled down to boundaries—boundaries that can help employees of an organization stay on the correct side of organizational policy and can help clarify ethical issues (Groff & Jones, 2003). Some examples of boundaries are landmarks, fences, and DMZs (demilitarized zones). A landmark is a high-level ethical guideline often built upon the company's culture (e.g., values the demonstration of social responsibility among their employees, promotes recycling, donates to local charities, pays employees to work on community events) and these can often be conveyed through good stories. Fences are explicit boundaries that show exactly where an important ethical line lies (e.g., official company policies on ethics). These should be ubiquitous as policies define the fence and the procedures define operating within the limits of the ethical fence. DMZs are concerned with active compliance monitoring (e.g., monitoring of software licenses). They define exactly where the ethical line is and prevent employees from crossing the ethical line in order to monitor and report any violations.

Managing ethical liabilities involves four major processes:

1. *Prevention*, using codes of conduct, standard operating practices, and providing landmarks, fences, and DMZs
2. *Detection*, using automated systems to enforce and monitor ethical compliance and to verify appropriate use of company assets
3. *Reporting*, where employees able to report unethical behaviors (whistleblowers) without suffering any retaliation,
4. *Investigations*, which often require outside assistance in order to be thorough, fair, and neutral

The challenge is, once again, a question of establishing and maintaining a dynamic balance: too much monitoring and regulation can lead to a lack of innovation. Organizations must be able to continue rewarding and motivating innovative and creative behaviors but this cannot be at the expense of cutting corners so drastically that ethical values become compromised.

What is needed is a KM code of ethics to help govern the professional practice of knowledge management work. A number of good examples exist that can serve as a basis or starting point, and a great deal of work is being done on this issue by the KMCI (Knowledge Management Certification Institute).[8] A good illustration is the code of ethics developed for health science librarians, as shown in table 13.2.[9]

Table 13.2 Sample code of ethics from the Medical Libraries Association (MLA)

Goals and principles for ethical conduct	The health sciences librarian believes that knowledge is the sine qua non of informed decisions in health care, education, and research, and the health sciences librarian serves society, clients, and the institution by working to ensure that informed decisions can be made.
Society	The health sciences librarian promotes access to health information for all and creates and maintains conditions of freedom of inquiry, thought, and expression that facilitate informed health care decisions.
Clients	The health sciences librarian works without prejudice to meet the client's information needs, respects the privacy of clients, and protects the confidentiality of the client relationship and ensures that the best available information is provided to the client.
Institution	The health sciences librarian provides leadership and expertise in the design, development, and ethical management of knowledge-based information systems that meet the information needs and obligations of the institution.
Profession	The health sciences librarian advances and upholds the philosophy and ideals of the profession, advocates and advances the knowledge and standards of the profession, conducts all professional relationships with courtesy and respect, and maintains high standards of professional integrity.

Another good example exists in the U.S. Federal Government, particularly in the forestry sector. A list of key questions is used to assess and monitor the ethical health of the organization, such as: do senior leaders generate high levels of motivation and commitment in the workforce and promote ethical behavior through modeling, communication, training, accountability systems, and disclosure mechanisms? Some performance indicators that are used include the promotion of teamwork, continual feedback, and whistleblower rights and employee protection if they report wrongdoing.

Morris (1997) emphasizes that the business world does not exist in isolation. The way people think and act in clearly business contexts filters into all other social contexts as well. How can we overcome short-term, bottom-line thinking in order to do the right thing? Ethical decision making emerges when we emerge from self-centeredness to inclusion. Why are ethical rules of conduct not enough? Because we can never have enough rules, rules have exceptions, rules can conflict, and rules require interpretation. The Golden or Universal Rule: Treat others the way you would want to be treated in their place.

Key Points

- A number of studies have been undertaken to better describe the knowledge, skills, capabilities, and attitudes that good KM professionals require.
- KM skills span the range from business awareness and experience, management skills, learning abilities, communication, and interpersonal skills, as well as information management and information technology expertise.
- In general, KM professionals should be proficient in retrieving information, evaluating/assessing information, organizing and analyzing content, presenting content, ensuring the security of content, and collaborating around valuable content.
- Major types of KM roles include knowledge manager, knowledge journalist, KM champion, KM navigator, knowledge synthesizer, content editor, knowledge publisher, coach or mentor, and help desk activities. More senior roles are chief learning officer and chief knowledge officer.
- CKOs ensure that KM goals are in line with organizational strategies and objectives.
- CLOs ensure that the organization acts like a learning organization, improving over time with the help of accumulated best practices and lessons learned.
- Wide ranges of organizations employ KM professionals, including private, academic, and public sector companies.
- The KM profession is an emerging one and is in the process of examining the ethics that KM professionals should be espousing in their work. As with all professions, KM must be practiced in an ethical fashion. A KM code of ethics should be formulated and shared with key stakeholders for all KM projects.

Discussion Points

1. What are some of the major types of KM roles or jobs that exist in organizations today? Describe the types of tasks that each would be expected to carry out.
2. How would you devise a training program or a course curriculum to train KM professionals in the critical job skills they will need in the workplace?
3. What types of competencies should be present in a good KM team? What is the contribution of each skill set?
4. List some of the major types of organizations that offer KM positions and discuss why they need these KM skills.
5. Compare and contrast professional KM training courses with academic degree programs that integrate KM within their curricula.
6. What core skills will KM professionals need in the next five years? Why do you feel these will be important in the future?
7. In your opinion, what are the three critical ethical issues facing KM? Why have you selected these as being critical?
8. Draft a sample code of ethics for KM professionals. Explain/justify each element in your proposed code. What would be the best way of publicizing this? How would you make sure that KM professionals practice KM in an ethical fashion?

Notes

1. See http://library.tmu.edu.tw/chiu/KMmap2000.pdf.

2. See http://www.clomedia.com.

3. See http://www.skyrme.com/kmroadmap/roles.htm.

4 From the indeed.com job board.

5. See http://www.skyrme.com/kmroadmap/roles.htm.

6. See http://www.iep.utm.edu/e/ethics.htm.

7. See http://www.kmci.org.

8. See http://www.mlanet.org/p/cm/ld/fid=160.

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14 Future Challenges for Knowledge Management

The gem cannot be polished without friction.

—Chinese proverb

Knowledge management objectives are ambitious and almost always involve change—change at the level of the individual, the group, and the organization as a whole. As a result, they are almost never easy or straightforward. This chapter explores some issues facing knowledge management such as intellectual property issues, how KM can contribute to innovation, and how to provide incentives for knowledge sharing to successfully incorporate KM into organizations.

Learning Objectives

1. Define the paradox of value and explain how this impacts on the design of KM solutions. Describe ways in which this impact can be minimized.
2. Compare and contrast the different ways incentives can be provided for knowledge sharing.
3. Understand and critically debate where KM stands today, particularly with respect to how well initial expectations of KM have been met.
4. Outline the major reasons why KM may be perceived as a success or a failure and discuss how you would improve upon ROI measures for KM.
5. Describe the key areas of research in the field of KM today and make educated guesses about how these new developments will impact KM.
6. List the key challenges KM faces today and in the near future and provide some recommended approaches to best address them.
7. Summarize the history of KM to date and predict some directions that the field may take with respect to the profession, the education of KM professionals, and the types of KM implementations that will be undertaken in organizations.
8. Discuss some ways in which KM processes can be harnessed toward increasing creativity at individual and group levels, and innovation in terms of products and services at the organizational level.

Introduction

The major challenges facing KM include people or cultural issues, an overemphasis on technology, conducting KM in isolation from business goals, ignoring the dynamic aspects of content, and opting for quantity of content over quality. While this is not an exhaustive list, there does appear to be a fairly good consensus on the most important challenges that are facing KM. These can be found as recurring themes in KM discussion groups, conferences, and publications (e.g., Firestone & McElroy, 2003; Tannenbaum & Alliger, 2000).

The major problems that occur in KM usually result because companies ignore the people and cultural issues. In an environment where an individual's knowledge is valued and rewarded, establishing a culture that recognizes tacit knowledge and encourages employees to share it is critical. The need to sell the KM concept to employees should not be underestimated; after all, in many cases employees are being asked to surrender their knowledge and experience—the very traits that make them valuable as individuals. One way companies motivate employees to participate in KM is by creating an incentive program. However, there is the danger that employees will participate solely to earn incentives, without regard to the quality or relevance of the information they contribute. The best KM efforts are as transparent to employees' workflow as possible. Ideally, participation in KM should be its own reward. If KM does not make life easier for employees, it will fail. This is why the role of organizational culture is so important together with any cultural change that needs to take place in order to better accommodate any KM initiatives.

KM is not a technology-based concept. All-inclusive KM solutions, despite any vendor claims to the contrary, simply do not exist. Companies that implement a centralized database system, electronic message board, web portal, or any other collaborative tool in the hope that they've established a KM program are wasting both their time and money. While technology can support KM, it's not the starting point of a KM program. KM decisions should be based on who/whom (people), what (knowledge), and why (business objectives), and you should save the how (technology) for last. In other words, successful KM begins with a sound KM strategy combined with a fostering organizational culture that enables and rewards the sharing of valuable knowledge.

A KM program should never be divorced from a business goal. For example, while sharing best practices is a commendable idea, there must be an underlying business reason to do so. Without a solid business case, KM is a futile exercise. Knowledge is also not static. Since knowledge can get stale fast, the content in a KM program should be constantly updated, amended, and deleted. What is more, the relevance of knowledge at any given time changes, as do the skills of employees. Therefore, there is no endpoint to a KM program. Like product development, marketing, and R&D, KM is a constantly evolving business practice. Finally, companies diligently need to be on the lookout for information overload. Quantity rarely equals quality, and KM is no exception. Indeed, the point of a KM program is to identify and disseminate knowledge gems from a sea of information. While KM has always been defined as contributing to two major types of organizational goals—efficiency through reuse of knowledge and innovation through the creation of new knowledge—the latter does not appear to have evolved at the same rate as the former (du Plessis, 2007).

The key critical issues are discussed in this chapter:

- The paradox of value—the harder-to-manage-knowledge is often the higher-value knowledge.
- How do copyright (and copyleft) and other intellectual property issues impact KM? How can knowledge be shared without losing attribution and without false attribution?
- How can KM address the objective of innovation and creativity in addition to efficiency through reuse?
- What is next on the horizon? For example: collaborative knowledge creation, machine learning, the Internet of things, innovation capital, global KM—how will these shape the future evolution of KM?

The "paradox of value" (Boisot, 1998) lies in the fact that the easier it is to extract the knowledge, the less value it actually embodies. That is to say, the more the knowledge is tacit, the greater its value (see figure 14.1).

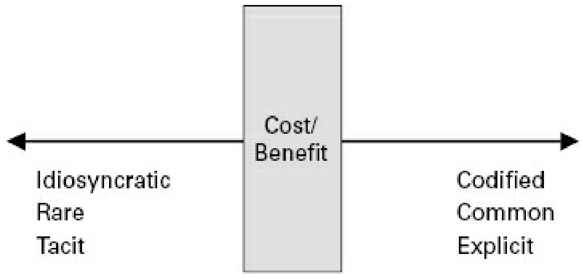

Figure 14.1 The value of a knowledge asset

Knowledge assets are a source of competitive advantage for firms that possess them. Yet the way the possession of knowledge translates into a competitive advantage is not well understood. Of course, this does not happen automatically—a firm has to know how to extract value from knowledge assets. This leads to another paradox of a knowledge asset: knowledge transfer does not require physical contiguity. It does require codification and abstraction. There is cost involved with this, therefore only select information with potential value and utility that will justify the time and effort required. Yet the more transferable we make knowledge, the less scarce it becomes. We therefore need reliable ways of measuring intangibles in valuing intellectual capital. Some of the other KM challenges are discussed below.

Intellectual Property Issues

At first glance, intellectual property issues may appear to make knowledge implementation quite problematic. However, two dimensions need to be considered for KM applications: the first is that when discussion occurs around intellectual property and authorship—even ownership—of content to be posted and shared company-wide, the concerns need to be further elucidated. Most practitioners have found that the concerns expressed by knowledge workers revolve around attribution and unwanted attribution. Attribution refers to the discomfort over the possibility of a knowledge resource—a best practice, a template—may sever the link between the creator and the actual knowledge. If KM takes appropriate steps to ensure that attribution—or author credits—are always connected and therefore move with the knowledge, then most of the concerns have been allayed. The second issue is related but is almost the exact opposite of attribution: authors are also very concerned that once the knowledge is out of their hands it will become modified, watered down, invalidated or otherwise modified, and still attributed to them. Authors and creators feel that they cannot control the changes and adaptations and therefore they can no longer attest to the validity and quality of the knowledge. One of the best means of mitigating such circumstances is to follow tried-and-true document management and version control best practices. Knowledge resources should be tracked just as seriously with contact names associated for those knowledgeable about the resource (experienced users, subject matter experts), the author, and any subsequent authors of modified versions. Most of this type of knowledge history (analogous to document or report history) can be captured in the metadata as well as being clearly indicated in the corporate memory system.

A second development may also aid the KM cause: the evolution of a "copyleft" revolution or reaction against some of the restraints imposed by copyright laws. Copyleft is more formally known as the "Creative Commons"[1] and refers to a more customized approach to author rights than the one-size-fits-all approach of more traditional copyright rules. The polar opposite of copyright would be the removal of all restrictions—for example, open source software or any publicly available content. Copyleft does not venture this far but does remove some of the copyright restrictions, making it easier for others to use, modify, and otherwise adapt their original works. A typical Creative Commons license would read as follows (adapted from http://en.wikipedia.org/wiki/Creative_Commons): There are four major permissions that are contained in Creative Commons licenses:

1. Attribution (BY) requires users to attribute a work's original author. All Creative Commons licenses contain this option, but some now-deprecated licenses did not contain this component.
2. Authors can either not restrict modification or use Share-alike (SA), which is a copyleft requirement that requires that any derived works be licensed under the same license, or
3. No derivatives (ND), which requires that the work not be modified.
4. Noncommercial (NC) requires that the work not be used for commercial purposes.

As of the current versions, all Creative Commons licenses allow the core right to redistribute a work for noncommercial purposes without modification. The Creative Commons license has become quite popular in the academic world and has a good potential to be applied to knowledge content in organizational KM systems.

How to Provide Incentives for Knowledge Sharing

KM practitioners often neglect the crucial management issues of organizational learning, motivation, and culture when formulating a knowledge management strategy. Knowledge workers need to have a climate in which knowledge sharing is encouraged and they need a reason for sharing the knowledge. Incentives remain one of the more important challenges facing KM today. An incentive is a reward or some form of positive feedback given when a desired behavior is exhibited. Since human beings are purposeful creatures who would tend to continue behaviors associated with positive rewards and avoid those behaviors that lead to negative consequences, it seems reasonable to expect that incentives for knowledge sharing should lead to more sharing of knowledge. This being said, the situation is, as always, not so clear-cut.

Incentives can be quite tricky to get right because others may see as an insult what some perceive as a reward. An example is the system of recognition. In one company, the public posting of a "knowledge sharer of the month" serves to motivate employees to share more knowledge. In another context, employees feel that as highly educated professionals, they should not be reduced to something that reminds them of a plaque used by fast food companies to motivate their staff. *De gustibus non disputatum*—of some tastes there is no disagreeing. In other words, the reward should fit the person being rewarded—personalization is very important or, at a minimum, allow employees to choose their reward from a list of possibilities. At Buckman Labs, this problem was resolved by polling the employees and the top choice turned out to be a fully equipped laptop computer to be conferred to the top KM citizens flown in to headquarters for a public remittance of the prize by the company president himself.

It may be helpful to look at how incentives can be classified according to the different ways in which they motivate agents to take a particular course of action. The common and useful taxonomy developed by Callahan (2004) divides incentives into three broad classes:

1. Remunerative incentives **(**or financial incentives) are said to exist where an agent can expect some form of material reward—especially money—in exchange for acting in a particular way.
2. Moral incentives are said to exist where a particular choice is widely regarded as the right thing to do, or as particularly admirable, or where the failure to act in a certain way is condemned as indecent. A person acting on a moral incentive can expect a sense of self-esteem, and approval or even admiration from the community; a person acting against a moral incentive can expect a sense of guilt, and condemnation or even ostracism from the community.
3. Coercive incentives are said to exist where a person can expect that the failure to act in a particular way will result in physical force being used against him or her (or loved ones) by others in the community—for example, by punishment, imprisonment, firing, or by confiscating or destroying their possessions.

These categories are not an exhaustive list of all types of incentives. For example, personal incentives are related to preferences and personal objectives that may motivate actions of individual people. The reason for setting these sorts of incentives to one side is not that they are less important to understanding human action. Personal incentives are essential to understanding why a specific person acts the way he or she does, but social analysis has to take into account the situation faced by any individual in a given position within a given society, which means mainly examining the practices, rules, and norms established at a social, rather than a personal, level.

Quite intuitively, if there is no economic, social, or personal incentive for any individual to do work, it will not get done. Therefore, a society must provide incentive for the work necessary for its own maintenance. Likewise, a company or organization will have better results if it provides incentives for its members to improve said institution. A company that provides no or little incentive will suffer from weak morale.

There are obviously some issues with KM as it is applied in many organizations, and care needs to be taken so that the application of this effective approach is accepted and supported. It is *not* the information collection, but the processes and systems that must be acceptable to those involved. Business issues as well as people issues are involved and a simple framework might be helpful in understanding and rolling forward. Remember, nobody ever washes a rental car, so address issues of ownership and involvement as you progress.

Denning (2000) points out that since knowledge sharing usually entails a change in the way the business of an organization is conducted—often, it entails a shift from vertical "look-up" and "yelldown” modes of behavior to horizontal knowledge-sharing behaviors—relevant behaviors should be reflected in whatever incentive systems are in place in the organization. It is important that the value of knowledge sharing be reflected in the ongoing personnel evaluation and periodic merit review or pay bonuses of the organization, so that managers and staff can see that knowledge sharing is one of the principal behaviors that the organization encourages and rewards.

Knowledge sharing should be designated as one of a small number of core behaviors that are rewarded in the performance review system. Getting agreement across a large organization to focus on knowledge sharing as one of a small number of core behaviors is not easy, and even when accomplished, does not have any instant effect. In the short run, there is often cynicism and posturing, but the experience of organizations, particularly the large consulting firms, is that over time such a change sends an unmistakable signal throughout the organization, which does accelerate the intended behavioral change.

In practice, informal incentives, in the form of recognition by management and visibility within the organization, can often be more powerful incentives than the formal incentive system. While the establishment of formal incentives is important for the long-run sustainability of a knowledge management program, it is easy to overestimate the value of incentives. The absence of formal incentives in the early days of knowledge sharing can become a pretext for not implementing the program. The establishment of rewards for individual knowledge sharing activities can signal the importance of knowledge sharing, but it also runs the risk of creating expectations of rewards for behavior that should be part of the normal way of conducting the business of the organization.

In the long term, however, the establishment of incentives through the regular personnel and reward system of the organization can establish a clear value framework that confirms that knowledge sharing is not a mere management fad, but rather part of the permanent fabric of the organization. An example is shown below.

Box 14.1
An example: Siemens Medical Solutions

Gale (2003) describes the case of Siemens Medical Solutions and how they decided to change their “knowledge is power” culture into one in which knowledge sharing was the norm. The company wanted employees to have easy access to information and expertise across business units so that they could do their jobs better and faster without reinventing the wheel. The problem was that many employees associated sharing knowledge with losing power. Busy employees also perceived taking the time to share information or to coach someone in a new skill as a burden. Employees saw no value in this activity. In order to change that attitude, employees had to see an immediate and personal advantage to sharing information. To support the new environment, the company built three web-based knowledge-sharing tools, through which employees can collect and disseminate useful information to the rest of the company. The first, People of Med, is an online database of employee profiles that includes each member’s contact information, experience, areas of expertise, and photograph. The second, Communities of Practice, is an online meeting place where employees volunteer to host forums on specific topics, such as ISO 9001 certification challenges. Any employee interested in that topic can register and participate in conversations, and share materials that may be of value to the group. The third knowledge-sharing tool is the Knowledge Square, an online database filled with presentations, web sites, technical papers, specs, and any other materials that might be of value to the company. Employees can search the database to quickly find information related to their area of interest. To encourage employees to take advantage of the knowledge-sharing opportunities, they receive bonus points every time they use one of the three tools. These can be used to purchase items from a gift catalog that includes everything from T-shirts to vacations. Whether they store their profiles in People of Med, participate in a community, or download information from the Knowledge Square, they get rewarded. Community leaders are also encouraged to throw parties for their members where they can share the stories of successful knowledge-tool users in company newsletters, marketing materials, and broadcast emails.

Additional Challenges for KM

What lies ahead for KM? There is one camp that predicts no future for KM, citing a number of failures to deliver. However, this gloomy forecast can be mitigated somewhat: it is true that, as with all innovation, initial expectations were on the unrealistic side. One of the reasons for this was underestimating the people component of KM together with an overemphasis on the role of KM technology in KM solutions. As Pollard (2003) discusses, the reason for this failure was the unrealistic expectation that human organizational behavior could be easily and rapidly changed. Of course, behavioral change at the individual level and cultural change at the organizational level are two very difficult and lengthy processes. The KM "quick fix" was therefore vastly misleading.

Critical KM issues are often the reason why applications of KM fail. A KM strategy enables an organization to act proactively (acting before the problem occurs) rather than reactively (acting after a crisis has arisen). This means trying to anticipate potential problems, potential areas of resistance to organizational change, the lack of incentives for knowledge sharing, and the very thorny ethical issues that are associated with KM applications. Some good practices and lessons learned from organization's experiences with KM to date could help guide us in being proactive. Some recommendations would include:

1. Improving access to information and knowledge—covering the availability, accessibility, and affordability of information (especially of scientific information in developing countries)
2. Promoting knowledge sharing through learning circles and vertical/horizontal coalitions, peer-to-peer learning, knowledge networks, infomediaries, help desks, e-learning, and better interaction and mutual learning with target groups
3. Networking and international and regional cooperation—covering networking models, digital solidarity, collaboration tools like portals and common terminology (e.g., thesaurus), and network effectiveness, and strengthening existing structures and knowledge resource centers
4. Including the development of local content in local languages and dissemination channels besides Internet, capacity building, and quality control and standards
5. Avoiding weak incentives (A weak incentive is an incentive that does not encourage maximization of an objective, because it is ambiguous. For example, payment of weekly wages is a weak incentive since by construction it does not encourage maximum production, but rather the minimal performance of showing up every workday. This can be the best kind of incentive in a contract if the buyer doesn't know exactly what he wants or if output is not straightforwardly measurable.)

KM and Innovation

A major reason for managing knowledge is to learn from what has been done already. By leveraging the experience and capabilities of others, less time and effort is required and fewer mistakes are made (Wiig, 1997). However, the holy grail of knowledge management is innovation. Capturing and sharing information provides raw material to help inspire people throughout an organization to figure out something different and better. KM should facilitate and motivate those leaps of thinking to enhance individual creativity and organizational innovation capabilities (McElroy, 2003). Whereas the first goal has been extensively addressed, the second KM goal of improving innovation remains elusive.

Du Plessis (2007) notes that the speed of innovation is continually increasing due to technology evolution, shorter product lifecycles and higher rates of new product and service development. There has been, in parallel, a strong increase in the amount and complexity of knowledge being used by organizations. Organizations will rely more and more on their capability to innovate in order to maintain or gain a sustainable competitive advantage. Du Plessis (2007) also points out that there is little clarity in both the academic and practitioner literature on the role KM can or does play in innovation. This lack of clarity persists today. The Conference Board of Canada (Kabilan, 2014) notes that while there is an increase in publications that link KM and innovation concepts, most simply state that there is a need for effective KM to achieve innovation. McAdam (2000), for example, proposed a model that could incorporate innovation drivers into knowledge management. He notes that there is a "clear link between the emerging body of knowledge referred to as knowledge management and that of innovation" (p. 240).

Du Plessis (2007) defines innovation as "the creation of new knowledge and ideas to facilitate new business outcomes, aimed at improving internal business processes and structures and to create market driven products and services" (p. 21). She describes knowledge management as not being solely or directly focuses on innovation as an end result but rather that KM helps create an environment that may be conducive for innovation to take place. This can be achieved by promoting collaboration, by managing the complexity created by the volume and richness of knowledge, and by integrating knowledge from within and outside of the organization in such a way that it is easily accessible to knowledge workers.

KM can help employees share tacit knowledge, which in turn can trigger innovation. Tacit knowledge, being harder to articulate, means it is also harder to duplicate—and is therefore more "protected" from competitors. Similarly, there is a great deal of knowledge that remains tacit in the development of new products and services. Whereas the ultimate result can be described, documented, and even patented, the process taken to produce this result is rarely codified. KM actively fosters a more collaborative work environment and provides platforms, tools, and processes to ensure that an organization-wide knowledge repository is available to all employees. The more people interact, the greater the likelihood of discovering new knowledge and new people with new expertise, and the more likely it will be that some synergy and creative sparks may be catalyzed. The conclusion is that there a lot of potential for KM to boost innovation but to date there is little empirical evidence to provide examples, case studies, and best practices. Barbaroux et al. (2016) also point out that organizations can no longer rely on generating innovation solely from their internal knowledge base. They cannot rely just on their internal research and development capabilities. What is needed is an integration of internally and externally generated knowledge with extensive collaboration and interaction between partners, customers, suppliers, research labs, universities, and many others.

One example is provided by Samsung (Kabilan, 2014), where they identified key areas where they felt they needed to manage knowledge. Samsung was selective and did not opt for a company-wide KM program. The areas they selected where those they felt had the greatest potential to yield innovation. As knowledge improved and was more widely shared, employees saw a greater number of intersections and connections. This in turn led to their increased capability to design new products.

Pugh and Stewart (2013) make the case that KM can contribute to the innovation capacity of an organization. KM needs to be better integrated with innovation management, just as closely as it has been with change management to date. KM practitioners are well positioned to be "great innovation conveners" as they often move across silos, are experienced facilitators of groups, and have the knack of being able to reflect on the past with an analytical eye (and help others to do so). They are often the first to spot potential synergies (generalization of practices to other areas), they know how to visualize and how to mine content, and they are often the bridge between individuals and groups and the larger organizational structures. Last but not least, KM people are adept at recognizing and "managing" tacit knowledge which obviously plays a significant role in creative processes. KM processes can be easily harnessed to address creativity and innovation goals. For example, the KM maturity processes that delineate different maturity phases can be readily applied to the generation of an idea, the vetting of that idea with peers, and ultimately the patenting of a new invention. KM with innovation management can lead to smarter innovation and ultimately create societal value.

What's Next?

The future of KM will mirror the key trends in organizations, namely increased collaboration in all work processes, synergy between information and knowledge management, and increased focus on innovation as well as on risk management and ethics[2]. The future will also likely hold an ever-increasing information overload. Organizations cannot be efficient or effective when they have so much content in so many different systems—and no way of preventing this content from proliferating. Berry (2013) predicts that the inability to connect the dots and make sense of content that is widely scattered over different locations will cripple organizations to such an extent that they will see the effects in the quality of their products and services (and revenues). According to the 2013 Gartner Group[3], content was expected to increase by 800 percent from 2013 to by 2018. Knowledge workers are quickly becoming unable to locate specific items needed for their work, let alone analyze this content for patterns and insights. Knowledge has never been so far removed from actions and decisions—which is what KM is all about.

Berry (2013) also notes that cultural and technological challenges become more and more difficult over time. Cultural problems stem from the way we teach and train employees. Our "one size fits all" approach cannot possible deal with diversity or differences in experience and expertise and preferences. On the technological front, while there has been some movement on the standards front, there remains a dizzying proliferation of tools, technologies, and systems that continue to create data silos. Valuable knowledge is located in just too many places and it is simply not possible to search and find it all. KM—and IM—will need that ideal environment where access is personalized, customized, and packaged so that users can make use of to get their jobs done. It is possible to continue to make tools smarter, so that they "know" who we are, what we are working on, and what we are trying to do—all, ideally, in real-time. KM needs something like a GPS to help get us to the knowledge sites we need (and suggest others we might want to visit). Again, in the blue sky version of the KM future, smart tools will aggregate and even mine the content we need and help us apply and share it with our peers. This would include aggregating tacit knowledge as well (e.g., by pointing to people you should contact).

In addition to smarter indexing or labeling of content and smarter tools, the future of KM will require a cohesive and comprehensive perspective, one that is inclusive (e.g., IM plus KM) rather than divisive (e.g., IM vs. KM). The KM program at Columbia University[4] provides an excellent example of a comprehensive approach that shows the contributions of information management and collaboration. Information management and information technologies will continue to integrate big data and predictive analytics tools in order to create and manage knowledge. KM practitioners are interacting more with data aggregators and data analysts, as well as other knowledge workers, to collaborate on the creation of data and metadata. There is also more focus on standardization of KM processes, KM content, governance, and team development. The Columbia KM approach combines not only IM and KM but also collaboration. The key focus is to drive growth, productivity, and societal impact through IM, KM, and collaboration. This encompasses the two major dimensions of KM: intellectual asset management and collaboration management (through feedback looks and collaborative behaviors). This is very compatible with two major goals of KM—operational efficiency through reuse and building of innovation capacity. There is further resonance with the two major KM processes: sharing knowledge among peers today and preserving knowledge for future reuse by future, unknown employees of the organization. Finally, another duality: KM needs to not only leverage internally leveraged knowledge (such as internal best practices and lessons learned) but also look outward to the extended networks of knowledge workers and organizations in order to learn, to innovate, and to ultimately contribute to the broader societal KM goals[5].

Last but not least, KM needs to continue to address issues of intellectual property (including the Creative Commons) and information privacy and security, as well as labor laws. The management and mitigation of risk factors needs to be explicitly addressed in all KM projects, including risks to copyright as well as to employee rights. Ideally, a KM code of ethics will emerge, similar to those found in other professions such as engineering, medicine, and law.

Concluding Thought

The Gartner Group (1998) has stated that knowledge management "will be the standard way of running a business." In a short term perspective, knowledge management does contribute to improved exploitation of the information and knowledge resources available to a company. In a longer term perspective, knowledge management builds the new foundation for improved business advantages and strengthens the capabilities for a sustainable future.

Key Points

- Knowledge management is a complex undertaking, one that involves people and cultural issues, not just technology-related decisions.
- Organizational knowledge repositories should ensure information seeking is both objective and optimized, if not to each individual user at least to the different thematic groups or CoPs that exist within the company.
- The type of organizational culture will often prove to be a KM barrier—this profile needs to be assessed and characterized in order to allow for proactive actions to be taken.
- One of the most important challenges in ensuring the success of KM applications is to put into place the appropriate rewards and punishments to motivate knowledge workers to share knowledge. This means there has to be “something in it for me” as well as for the CoP and the organization.
- KM has enjoyed a steady and pervasive growth into many business functions and the future of KM lies in KM becoming part of the how knowledge workers carry out their professional tasks.
- There continues to be a need for KM to be able to demonstrate its value.
- KM requires a holistic perspective, one that encompasses business goals, people, processes, technologies, and organizational context.
- KM requires a comprehensive approach, one that addresses each step in the KM cycle.
- KM requires an inclusive and collaborative approach, in particular, through stronger integration with innovation management.
- KM must rest on solid theoretical foundations. Current research studies will add to, complete, and complement KM theoretical models, especially in the area of innovation management.
- Knowledge capture and codification will evolve as knowledge taxonomy development methods and tools are increasingly available.
- Knowledge sharing will be leveraged throughout the organization via communities of practice that act as a two-way bridge between individual and organizational learning.
- Knowledge application in the future will be increasingly based on organizational memory management systems that will contain valuable lessons learned and best practices.
- Organizational cultures will continue to transform and will be guided to offer environments that are more conducive to effective knowledge management.
- KM continues to evolve as a profession and this is attested to by the fact that there is more empirical research being undertaken, professionals can attend academic KM programs, KM skill sets are being more clearly identified, and a new wave of KM-related doctoral theses are well on their way.

Discussion Points

1. What are some of the critical issues facing the successful implementation of KM applications? How do they play out in your organization?
2. The "paradox of value" is one of the greatest challenges facing KM today. Do you agree with this statement? Why or why not? Provide illustrative examples to support your arguments.
3. KM often fails to live up to its ideal goals of knowledge sharing due to a lack of incentives. How would you set up a system of rewards and censures to motivate knowledge workers to share knowledge? What are some typical obstacles that you would expect to encounter? How would you address these obstacles? Outline an incentive strategy and describe how you would evaluate its success.
4. Much of the expected benefits of KM stem from being able to deliver the "right information to the right person at the right time in the right format ... etc." What are the implications of this on issues of privacy of information?
5. If after six months' of effort you find your KM project is still not making headway, what actions would you take? What information would you seek out in order to decide the best course of action to take? How and when would you assess progress again?
6. Provide a brief history of the field of KM and describe where you feel it is today and where it is heading.
7. What are the key priorities to be addressed in order for KM to continue to evolve and become better embedded in critical business processes?
8. Describe some research themes in the field of KM. What do you see as the "next big thing in KM"? What breakthroughs would be needed before KM could make a quantum leap in its evolution?

Notes

1. See http://search.creativecommons.org.

2. K. Pugh, personal communication, December 2016.

3. Gartner's Top 10 list of IT infrastructure and operations trends, presented at the research firm's annual Gartner Symposium/ITxpo, Oct. 2011.

4. K. Pugh, personal communication, December 2016.

5. K. Pugh, personal communication.

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15 Knowledge Management Resources

> Libraries are not made; they grow.
>
> —Augustine Birrell (1850–1933)

In this final chapter, a wide variety of additional knowledge management resources are provided to help you grow your own KM library. Note that these are in addition to the references found in each preceding chapter.

The Classics

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General KM Books

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KM for Specific Disciplines

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Engineering

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Public Sector

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Key Conferences

- APQC KM Conferences, https://www.apqc.org/apqcs-2017-knowledge-management-conference.
- Conference on Knowledge, Culture and Change in Organizations, http://igce.cdu.edu.au/events/internationa-conference-on-knowledge-culture-and-change-in-organizations.
- ECKM—European Conference on Knowledge Management, http://www.academic-conferences.org/conferences/eckm.
- ICICKM—International Conference on Intellectual Capital, Knowledge Management and Organizational Learning, http://www.academic-conferences.org/conferences/icickm.
- ICKM—International Council on Knowledge Management, http://www.ickm.net.
- KM World, http://www.kmworld.com.
- OKLC—Organizational Knowledge and Learning Conference, http://www2.warwick.ac.uk/fac/soc/wbs/conf/olkc.

Key Websites

- APQC KM Edge, http://www.kmedge.org.
- Dave Gurteen, http://www.gurteen.com.
- Introduction to Communities of Practice (Etienne and Beverly Wenger-Trayner), http://wenger-trayner.com/introduction-to-communities-of-practice.
- V. Krebs Knowledge Networks, http://www.orgnet.com.
- KM for Development, http://www.km4dev.org.
- KM Resources, http://www.skyrme.com/resource/kmres.htm.
- KnowledgeBoard, http://www.knowledgeboard.com.
- Organizational storytelling resources at http://www.creatingthe21stcentury.org and http://www.stevendenning.com.

KM Glossaries

- Asian Development Bank, https://www.adb.org/sites/default/files/publication/27594/glossary-knowledge-management.pdf.
- Knowledge Research Institute, http://www.krii.com/downloads/KM_glossary.pdf.
- Knowledge Point, http://www.knowledgepoint.com.au/starting_out/glossary.html.
- NASA, http://oce.jpl.nasa.gov/ocko/glossary.pdf.

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KM Journals

- *E-Journal of Organizational Learning and Leadership*
- *Electronic Journal of KM*
- *IBM Systems Journal*
- *Interdisciplinary Journal of Information, Knowledge and Management*
- *International Journal of Knowledge, Culture and Change Management*
- *International Journal of Knowledge Management*
- *International Journal of Knowledge Management Studies*
- *International Journal of Nuclear Knowledge Management (IJNKM)*
- *Interdisciplinary Journal of Information, Knowledge and Management (IJIKM)*
- *Interdisciplinary Journal of Storytelling Studies*
- *Journal of Information and Knowledge Management (JIKM)*
- *Journal of Intellectual Capital*
- *Journal of Knowledge Management*
- *Journal of KM Practice*
- *Journal of Managerial and Organizational Learning*
- *Journal of Organizational Change Management*
- *Knowledge Management*
- *Knowledge Management for Development Journal*
- *Knowledge Management Research and Practice*
- *Knowledge Management Review*
- *Knowledge and Process Management*

KM Wikis

- http://kmwiki.wikispaces.com.
- http://knowledge-management.wikia.com/wiki/Knowledge_Management_Wiki.

KM Blogs

- APQC, https://www.apqc.org/blog/top-10-complimentary-knowledge-management-resources.
- Consulting perspective, http://blogs.forrester.com/information_management.
- Joe Firestone, http://kmci.org/alllifeisproblemsolving/archives/km-20-and-knowledge-management-part-seven.
- Knowledge Jolt, http://www.jackvinson.com.

Visual Resources

YouTube

Most of these are available for use through the Creative Commons License.

- Great visual introduction to knowledge developed by the KM program at Natural Resources Canada, http://ca.youtube.com/watch?v=9vm77Ge2Kxs.
- Another attention-grabbing introduction to the major components of KM, http://ca.youtube.com/watch?v=f_x78XLBBVM.
- Excellent visual explanation of Web 2.0 by Michael Wesch, http://youtube.com/watch?v=NLlGopyXT_g.
- A series of people attending a KM conference were videotaped when asked to answer: how would you define KM? http://www.gurteen.com/gurteen/gurteen.nsf/id/wiskm.

Other Visual Resources

- KM at the World Bank, http://web.worldbank.org/WBSITE/EXTERNAL/WBI/0,,contentMDK:20212624~menuPK:575
- Stephen Denning talking about storytelling, http://www.stevedenning.com/WatchAVideo.htm.

Educational KM Sites

- http://www.knowledge-management-tools.net/KM-resources-techniques.html.

Some Useful Tools

- The mindmapping tool is very useful for building knowledge models, for documenting knowledge acquisition sessions, for depicting mental models, and for taxonomy building. http://www.mindjet.com.

Other visual mapping tools include:

- The Brain, http://www.thebrain.com.
- Inspiration, http://www.inspiration.com.
- Visio, https://products.office.com/en-ca/visio/flowchart-software.

An evaluation of KM tools can be found in: Massingham, P. (2014). An evaluation of knowledge management tools: Part 1—managing knowledge resources. *Journal of Knowledge Management,18*(6), 1075–1100.

Glossary

Absorption costs
Costs incurred when recipients of knowledge content understand and internalize the knowledge in order to be able to apply it.

Absorptive capacity
The individual and/or organizational openness to change and innovation and the capability or preparedness for being able to integrate it.

Abstraction costs
Costs incurred when knowledge context is generalized over a wider scope.

After action review
An assessment that is conducted after a project or major activity to allow employees and leaders to discover what happened and why (popularized by the US Army); a professional discussion of an event that enables participants to understand what worked well, what did not, and what they learned from the experience. An AAR need not be performed at the end of a project or activity as it can also be performed after each identifiable event or milestone, thus becoming a live learning process to help support a learning organization.

Anarchy
An organizational political model where there is an absence of any information/knowledge management policy.

Applied ethics
The examination of specific controversial issues to try to resolve them, and to find a standard or accepted way of proceeding with respect to the specific issue.

Artifacts
Material objects manufactured by people to facilitate culturally expressive activities. The signs and symbols by which the organization is recognized by. The events, behaviors, and people that embody a culture.

Audit trail
A documented history of a piece of knowledge in the knowledge base from knowledge acquisition/capture source to subsequent use and reuse.

Balanced scorecard
The balanced scorecard is a measurement and management system that enables organizations to clarify their vision and strategy and translate them into action. It provides feedback around both the internal business processes and external outcomes in order to continuously improve strategic performance and results.

Belief
An idea with emotional or spiritual appeal that has not been tested and/or is not considered accepted knowledge.

Benchmarking
The search for industry-wide best practices that lead to superior performance. A study of similar companies to see how things are done best in order to adapt these methods for their own use.

Best practice
An improvement in a particular process, approach, technique, or subject matter knowledge that is good enough to replace existing practices and general enough to merit being disseminated widely throughout an organization. A “good work practice” or innovative approach that is captured and shared to promote repeat applications.

Blog
A blog is basically a journal that is available on the web. The activity of updating a blog is “blogging,” and someone who keeps a blog is a “blogger.” Blogs are typically updated daily using software that allows people with little or no technical background to update and maintain the software. Postings on a blog are almost always arranged in chronological order with the most recent additions featured most prominently. An online diary or journal, typically documenting

the day-to-day life of an individual. Often very personal.

Boundary

A boundary separates a system and its environment. Just as there is a subjective element in defining a system, there is a subjective element in choosing a boundary. Defining a boundary is tantamount to defining the thing that is to be considered a "system" and those other things that are to be considered a system's "environment."

Brainstorming

A commonly used group problem-solving technique whose goal is to generate as many solutions to a problem as possible.

Censure

Harsh criticism or disapproval. To rebuke formally, to blame, to criticize adversely, or to express disapproval. If you are censured for something you have done, someone in authority is telling you that they strongly disapprove of it.

Change

An event that occurs when something passes from one state or phase to another. A relational difference between states, especially between states before and after some event.

Change management

Activities involved in (1) defining and instilling new values, attitudes, norms, and behaviors within an organization that support new ways of doing work and overcome resistance to change; (2) building consensus among customers and stakeholders on specific changes designed to better meet their needs; and (3) planning, testing, and implementing all aspects of the transition from one organizational structure or business process to another.

Chief human capital officer (CHCO)

Title of the person who integrates strategic workforce planning, aligns with overall organizational mission, is responsible for policy on recruitment and retention of workforce, and leads workforce planning.

Chief knowledge officer (CKO)

Title of the person who is responsible for managing intellectual capital and is custodian of KM practices in an organization.

Chief learning officer (CLO)

An enterprise-level position that typically reports to the chief executive officer (CEO) of a corporation. The overall goal of a CLO is to improve organizational effectiveness and efficiency by facilitating increased knowledge and skill proficiency in individuals, teams, and the enterprise as a whole. Ultimately, the goal is to transform an enterprise into a learning organization.

Chunking

A chunk can be a letter, syllable, word, phrase, or even a sentence. Chunking is defined as the organization of blocks of content that are conceptually related. The amount of information that is processed as a chunk depends on the learner's ability, maturity, motivation, and prior knowledge related to the content being processed. For example, to a poor or beginning reader. a chunk may be a letter. Good readers generate chunks in the form of words. S.t.u.d-y becomes study. The effect of prior knowledge on processing speed is obvious when we try to read a complex article out of our area of expertise. Short-term memory can usually handle only about seven chunks.

Climate

The prevailing psychological state ("the climate of opinion," "the national climate had changed radically since the last election").

Closed questions

Questions that set limits on the type, level, and amount of information a respondent provides, often used to validate content and can be answered by a finite number of responses such as yes/no (e.g., is it true that this project was initiated by yourself?).

Cluster analysis

Generic term for a set of statistical analysis techniques that elicit or produce classifications from seemingly unordered data.

Codification costs

Costs incurred in rendering tacit knowledge explicit.

Coercive incentive

Failure to act in the desired manner brings about some form of punishment—physical force, firing, disbarment, and so on.

Cognitive maps
Theoretical representations of how humans organize and process some type of knowledge.

Collaboration
A coalition of diverse people with diverse values and expectations working together at the community level to solve problems. A social skill involving working together with two or more persons. Collaboration is the process of shared creation: two or more individuals with complementary skills interacting to create a shared understanding that none had previously possessed or could have come to on their own.

Combination
The reassembling of existing explicit knowledge into new, systematically organized forms such as a database, a summary document, or a trend analysis.

Community of practice (CoP)
An affinity group or information network that provides a forum where members can exchange tips and generate ideas; a group of professionals who try to face commons problems to solve and who strive to improve their profession and thereby themselves. An informal network or forum where tips are exchanged and ideas generated. A group of professionals, informally bound to one another through exposure to a common class of problems and a common pursuit of solutions, and thereby themselves embodying a store of knowledge. A group of practitioners held together by shared practices and common beliefs.

Complex adaptive systems
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 operate according to the rules and contexts of relationships with the other components of the organization and the external world.

Concept analysis
A technique used to clarify the meaning of subjective, value-laden terms such as "democracy." Derived from science education and philosophy, the technique explicitly distinguishes between related terms to pinpoint the boundaries of the concept, and lists examples and nonexamples of the concept in order to extract a set of "necessary and sufficient" attributes that a definition must have in order to adequately reflect the meaning of the concept.

Concept clustering
A methodology for organizing and summarizing domain data by producing an abstraction of the domain based on the analysis of clusters.

Concept dictionary
A conceptual analysis technique that provides a mechanism to visualize an abstraction of the primary concepts in a domain and the terminology used to label them.

Concept hierarchy
A structural taxonomy or arrangement of the associations that make up a concept.

Concept sorting
A psychological paradigm that can be used to tap into the way in which a subject matter expert has organized key concepts.

Content management
The processes and workflows involved in organizing, categorizing, and structuring information resources so that they can be stored, published, and reused in multiple ways; a content management systems (CMS) is used to collect, manage, and publish content, storing the content either as components or whole documents, in such a way as to maintain the links between components. "Content" in this context generally refers to computer-based information such as the content of a website or a database. Content management is about making sure that content is relevant, up-to-date, accurate, easily accessible, well organized, and so on, so that quality information is delivered to the user.

Content steward
Person responsible for improving the management of an organization's knowledge assets, driving new processes and promoting behaviors for creating higher quality information and sharing knowledge.

Continuous process improvement
An ongoing effort to incrementally improve how products and services are provided and internal operations are conducted.

Core competency

Set of skills that confer a competitive advantage on an organization; required to carry out the mission-critical business of the organization.

Core or key process
Business process that is vital to the organization's success and survival.

Corporate memory
All the information, data, and know-how that a company possesses; accumulation of historical events and experiences. The knowledge and understanding embedded in an organization's people, processes, and products or services, along with its traditions and values. Corporate memory can either assist or inhibit the corporation's progress. Also called a *knowledge repository* or *organizational memory*.

Corporate yellow pages
Also called *expertise location systems*. Detection, discovery, and management of human knowledge resources, including subject matter experts. An expertise directory provides a map to subject matter experts in an organization or "virtual" organization (as in communities of practice). Expertise directories usually exist as part of a knowledge-management software environment, sometimes as a fallback resource for computer-based knowledge retrieval systems.

Cultural assumptions
Beliefs about the internal workings and external environment of an organization which, having worked well in the past, have gradually come to be taken for granted, and which provide the basis for group consensus about common events and circumstances. Cultural assumptions function as the unifying themes of organizational culture.

Culture
A people's ways of being, knowing, and doing. All the knowledge and values shared by a cohesive group or organization. The attitudes and behavior that are characteristic of a particular social group or organization. The accumulated habits, attitudes, and beliefs of a group of people that define for them their general behavior and way of life; the total set of learned activities of a people. The beliefs, traditions, habits, and values controlling the behavior of the majority of the people in a social-ethnic group. These include the people's way of dealing with their problems of survival and existence as a continuing group.

Custom
A usage or practice that is common to a group of people or to a particular place. Accepted or habitual practice.

Cybrarian
One of many new terms being used to define a "virtual librarian." Others include electronic services librarian, digital resources librarian, and Internet information specialist.

Data
Directly observable or directly verifiable facts.

Data mining
An information extraction activity whose goal is to discover hidden facts contained in databases. Using a combination of machine learning, statistical analysis, modeling techniques, and database technology, data mining finds patterns and subtle relationships in data and infers rules that allow the prediction of future results. Typical applications include market segmentation, customer profiling, fraud detection, evaluation of retail promotions, and credit risk analysis.

Decision tree
A technique for organizing knowledge that divides sets of elements into subsets such that each node has only one "parent" based on discriminating evidence provided by attributes and their values.

Demilitarized zone (DMZ)
Demilitarized zones serve to prevent employees from breaching ethical boundaries. They monitor compliance and report any violations.

Diffusion costs
Costs incurred in the dissemination and distribution or publishing of knowledge.

Digital library
A collection of a very large number of digital objects, composed of all types of material and media that are stored in distributed information repositories and accessed through national computer networks. Digital libraries can include reference material or resources accessible through the World Wide Web. Digitized portions of a library's collection or original material produced for the

web can also be included in a digital library.

Electronic performance support system (EPSS)
Any computer software program or component that improves employee performance by reducing the complexity or number of steps required to perform a task, providing the performance information an employee needs to perform a task, or providing a decision support system that enables an employee to identify the action that is appropriate for a particular set of conditions.

Environment
Those variables whose changes affect the system and that are in turn affected by the system's behavior. Things outside a system that are important to it. Understanding the system's behavior usually requires some understanding of its context or environment.

Epistemology
The scientific study of knowledge. Knowledge science.

Ethics
The "science of morality." In philosophy, ethical behavior is that which is "good." The philosophical study of the moral value of human conduct and of the rules and principles that ought to govern it; moral philosophy. A social, religious, or civil code of behavior considered correct, especially that of a particular group, profession, or individual. The moral fitness of a decision, course of action, and so on.

Expectation
Belief about (or mental picture of) the future. The anticipation of what is to happen next (e.g., curiosity and suspense), what a character is like, or how he or she will develop, what the theme or meaning of the story will prove to be, and so on.

Expertise location system
See **Corporate yellow pages**

Explicit knowledge
Knowledge that has been rendered visible (usually through transcription into a document or an audio/visual recording); typically, captured and codified knowledge.

Expressive culture
Reflects emotions, feelings, and aspirations of the organization's personnel.

Externalization
The conversion of tacit knowledge into explicit knowledge—rendering previously unarticulated, undocumented, and uncaptured content into a visible, tangible, and concrete form (e.g. recording a meeting, writing up minutes of a meeting).

Facilitation
A collaborative process used to help parties discuss issues, identify and achieve goals, and complete tasks in a mutually satisfactory manner. This process uses an impartial third party, the facilitator, who focuses on the processes and procedures of dispute resolution and decision making. The facilitator is impartial to the issues being discussed, rarely contributes substantive ideas, and has no decision-making authority.

Federalism
An organizational political model where information/knowledge management is approached using negotiation processes to reach a consensus.

Fences
Explicit ethical boundaries that show exactly where the important ethical lines lie, typically encapsulated in formal policy statements or laws.

Feudalism
An organizational political model where individual business units act fairly autonomously in defining their information/knowledge needs.

Googling
The use of the Google search engine (http://www.google.com) to locate content and information about people.

Groupware
Software that enables a group of users to collaborate on a project by means of network communications. Software which supports collaborative work. It may include conferencing, shared files, or facilities to allow several people to work in one document. Software that enables members of a network work group to communicate and collaborate through email, scheduling,

bulletin boards, conferencing, project management, file sharing, and other means.

Heuristic
A set of instructions for searching out an unknown goal by exploration, which continuously or repeatedly evaluates progress according to some known criterion. A method of achieving a goal where the exact means of doing so cannot be precisely specified: we know what it is but not where it is. General rules and guidelines, but not prescribing a specific route to the goal (antonym: algorithm).

Ideal
Model of excellence or perfection of a kind; one having no equal. Conforming to an ultimate standard of perfection or excellence; embodying an ideal. Constituting or existing only in the form of an idea or mental image or conception.

Incentive
A reward for a specific behavior, designed to encourage that behavior; also called an inducement. In economics, an **incentive** in anything that provides a motive for a particular course of action, which counts as a reason for preferring one choice to the alternatives.

Information
Analyzed data. Facts that have been organized in order to impart meaning.

Information literacy
A set of abilities requiring individuals to recognize when information is needed and have the ability to locate, evaluate, and effectively use the needed information.

Information resource management (IRM)
An emerging discipline that helps managers assess and exploit their information assets for business development. It draws on the techniques of information science (libraries) and information systems (IT related). It an important foundation for knowledge management, in that it deals systematically with explicit knowledge. Knowledge centers often play an important part in introducing IRM into an organization.

Innovation
Innovation is a new idea applied to initiating or improving a product, process, or service. All innovations involve change, but not all changes necessarily involve new ideas or lead to significant improvements. The concept of innovation encompasses new production process technologies, new structures or administrative systems, and new plans or programs pertaining to organizational members. The creation of something new or different; the conversion of knowledge and ideas into a new benefit, such as new or improved processes or services. An improvement of an existing technological product, system, or method of doing something. Organizational innovation is the process by which new products or new methods of production are introduced, including all the steps from the inventor's idea to bringing the new item to market.

Intellectual asset/capital
Intellectual assets generally refer to an organization's recorded information (and, increasingly, human talent itself), where such information is typically either inefficiently warehoused or simply lost, especially in large, physically dispersed organizations. An asset is a claim to future benefits (value, cash flows). An intangible asset can be defined as a nonphysical claim to future value or benefits. Intangibles, intangible assets, knowledge assets, and intellectual capital are more or less synonyms. All are widely used—intangibles specifically in the accounting literature, knowledge assets by economists, and intellectual capital predominantly in the management literature.

Intelligent agent
Also called an Internet agent. Most commonly found on websites, this miniprogram is designed to retrieve specific information automatically. Agents rely on cookies to keep track of the user's preferences, store bookmarks, and deliver news through push technology. Intelligent agents cannot perform their duties if the user's browser rejects cookies, and some web pages (especially online ordering sites) will not function properly without the agent's information.

Internalization
The conversion of explicit knowledge into tacit knowledge. Understanding of new knowledge and its integration into existing mental models. Accepting that this new knowledge is valuable and acting accordingly.

Invisible college
An informal communication network, typically consisting of scholars or researchers working

around a common theme.

Jargon
A characteristic language of a particular group (as among thieves); “they don't speak our lingo.” The technical language of an occupation or group. The informal or technical language used by members of the same profession or industry.

Job analysis
An analytical technique that entails structuring the major responsibilities of a job and high-level description of the key tasks encompassed by that job.

Knowledge
Subjective and valuable information that has been validated and that has been organized into a model (mental model); used to make sense of our world; typically originates from accumulated experience; incorporates perceptions, beliefs, and values.

Knowledge acquisition
The process of extracting, transforming, and transferring expertise from a knowledge source.

Knowledge audit
A qualitative evaluation; essentially a sound investigation into an organization’s knowledge “health.” The knowledge audit provides an evidence-based assessment of where the organization needs to focus its knowledge management efforts. It can reveal the organization’s knowledge management needs, strengths, weaknesses, opportunities, threats, and risks.

Knowledge base
The fundamental body of knowledge [REMOVED HYPERLINK FIELD]available to an organization, including the knowledge in people's heads, supported by the organization’s collections of information [REMOVED HYPERLINK FIELD]and data. An organization may also build subject-specific knowledge bases to collate information on key topics or processes. The term *knowledge base* is also sometimes used to describe a database of information.

Knowledge broker
A person who facilitates the creation, sharing, and use of knowledge in an organization. Many organizations have created knowledge broker roles such as “knowledge coordinator.” The term *knowledge broker* is also sometimes used to describe companies or individuals that operate commercially as knowledge traders or provide knowledge-related services.

Knowledge center (or KSO, knowledge support office)
A place where knowledge is gathered and stored and that can be accessed and used by other people. It may be a physical place like a library, a “virtual” place like an interactive website or an online discussion board, or a place where people gather, such as a café or an informal meeting room or discussion area created to encourage knowledge sharing. A focal point for collecting, structuring, and disseminating information. That does not mean that the KSO employees do it all themselves. They set the framework and structures, develop the good practice guides, and provide information management expertise in collaboration with the employees across the company. . A central services group that consists of information specialists who manage content and provide services to the organization’s members.

Knowledge codification
The process of producing a knowledge or intellectual artifact—anything that allows knowledge to be communicated independently of its holder (e.g., a document, a picture, a sound recording, a film, or a video).

Knowledge elicitation
The process of interacting with experts using techniques to stimulate the articulation of the expertise—to convert tacit knowledge into explicit knowledge.

Knowledge management
The deliberate and systematic coordination of an organization’s people, technology, processes, and organizational structure in order to add value through reuse and innovation. Knowledge management is achieved through the promotion of creating, sharing, and applying knowledge as well as through the feeding of valuable lessons learned and best practices into corporate memory in order to foster continued organizational learning.

Knowledge management assessment
A systematic analysis of an organization's current knowledge management capabilities. It assesses current performance against world-class practice and identifies critical areas for applying knowledge management.

Knowledge management system
A centralized databases in which employees enter information about their jobs and from which other employees can seek answers. Often relies on groupware technologies, which facilitate the exchange of organizational information but also emphasize identifying knowledge sources, knowledge analysis, and managing the flow of knowledge within an organization—all the while providing access to knowledge stores. A system or tool that manages the sum of all knowledge within the organization as its "intellectual assets."

Knowledge manager
A role with developmental and operational responsibility for promoting and implementing knowledge management principles and practices.

Knowledge researcher
Individual who is responsible for searching, retrieving, and delivering knowledge that is in explicit or codified form.

Knowledge repository
A place to store and retrieve explicit knowledge. A low-tech knowledge repository could be a set of file folders. A high-tech knowledge repository might be based on a database platform.

Knowledge steward
Individual whose responsibility is to convert tacit knowledge to explicit knowledge that can be more easily codified. Person who interviews a project team and then captures and summarizes the learnings from that session.

Knowledge taxonomy
A scheme that partitions a body of knowledge and defines the relationships among the pieces; used for classifying and better understanding the body of knowledge.

Knowledge worker
Term coined by Peter Drucker to refer to professionals who are relatively well educated and who create, modify, and/or synthesize knowledge as a fundamental part of their jobs. Someone whose primary job focus is the accumulation, processing, or analysis of data and information, as opposed to physical goods.

Landmark
A high-level ethical guideline built upon the tenets of an organization's culture and often conveyed through stories.

Learning organization
An organization that possesses the practices, systems, and culture that actively promotes sharing of experiences and lessons learned to encourage quality performance and continuous improvement.

Legitimate peripheral participation
Informally referred to as "lurking," this refers to a quite different kind of learning theory, situated learning, which is primarily social rather than psychological. It is legitimate because all parties accept the position of "unqualified" people as potential members of the community of practice. It is peripheral because "lurkers" hang around on the edges of the important things, do the peripheral jobs, and gradually get entrusted with more important ones. It is participation because the person is learning.

Lesson learned
Knowledge that results from a post mortem or after-the-fact analysis of a project, a new technique, or the application of new knowledge; lessons learned are the "opposites" of best practices—they are caveats, hard-earned experiences of unsuccessful endeavors that should be disseminated widely throughout an organization in order to prevent the same mistakes from being made again or to ensure that valuable innovations are not lost. A work practice or experience that is captured and shared to avoid a recurrence.

Likert scale
A scale developed by Rensus Likert for the purpose of measuring a person's degree of agreement or disagreement with a set of carefully constructed statements.

Maturity
The state of being fully developed. Attainment of desired goal when growth and progress toward that goal have been successfully completed.

Media richness
The ability of a given medium or channel to carry content with respect to metadata, speed of

feedback, diversity of cues, and ability to convey emotion.

Mental model
Mental models are the result of internal psychological representations of peoples' interactions with the world. One purpose of these representations is that they allow us to solve problems and use artifacts such as computer systems and the like. An individual's existing understanding and interpretation of a given concept, which is formed and reformed on the basis of experiences, beliefs, values, socio-cultural histories, and prior perceptions. Mental models are representations in the mind of real or imaginary situations. Scientists sometimes use the term "mental model" as a synonym for "mental representation."

Metaethics
Investigation of origins of ethical principles and their meaning.

Metaknowledge
Knowledge about knowledge—conscious knowledge about what is known. A process of self-assessment about knowledge levels and abilities while planning, changing strategies, and evaluating/revising throughout task completion.

Model
The representation of the essential features of a system from the perspective of the observer or participant in that system. It can be as simple as a mental picture or as complex as a computer simulation or model of the world (e.g., Club of Rome).

Monarchy
An organizational political model that is an extreme top-down hierarchical model, where information is controlled at the very top.

Moral incentive
Situation where a particular alternative is widely regarded as the right thing to do.

Myth
A dramatic narrative of imagined events usually used to explain the origins of a transformation. An unquestioned belief about the practical benefits of certain behaviors; techniques not supported by demonstrated facts.

Needs assessment
The process of determining or isolating needs to develop a KM initiative that meets specific objectives.

Nominal group technique
A group problem-solving technique that reduces the negative effects that may be triggered by face-to-face interaction among members of a group or team.

Nonreflective skills
Behaviors that initiate, guide, or transition communication (e.g., conversational ice-breakers, attentive silence).

Nonverbal communication
Communication that takes place through media other than talking (e.g. gestures, observation of a demonstration).

Norm
Expectation of how a person or persons will behave in a given situation based on established protocols, rules of conduct, or accepted social practices. A way of behaving or believing that is normal for a group or culture. All societies have their norms; they are simply what most people do. Deviants break norms. Some norms are enshrined in law and society punishes those who deviate from them. Breaches of unwritten norms are unofficially punished.

Normative culture
A set of formal rules, norms, prescriptions, positions, and hierarchies. A culture that emphasizes compliance with the rules.

Normative ethics
The attempt to arrive at moral standards to regulate what is right and wrong, to ensure compliance.

Ontology
An explicit formal specification of how to represent the objects, concepts, and other entities that are assumed to exist in some area of interest and the relationships that hold among them. A formal, explicit specification of a shared conceptualization. *Conceptualization* refers to an abstract model of phenomena in the world by having identified the relevant concepts of those

phenomena. *Explicit* means that the type of concepts used, and the constraints on their use, are explicitly defined. *Formal* refers to the fact that the ontology should be machine readable. *Shared* reflects that ontology should capture consensual knowledge accepted by the communities.

Open questions
Broad questions that impose few restrictions on the respondent and encourage free response (e.g., what do you think about this project?).

Open space technology (OST)
A large-group facilitation process that consists of the setting of an agenda by all members present, self-organization into smaller groups, and conveners who report each group's findings into a proceedings, which are then distributed to all participants. The cultural approach to open space technology serves to create an environment for innovation, teamwork, and rapid change.

Organizational knowledge
A complex network of knowledge and knowledge sets held by an organization consisting of declarative and procedural rules (validated knowledge claims).

Organizational learning
A process involving human interaction, knowledge claim formulation, and validation by which new organizational knowledge is created. The ability of an organization to learn from past behavior and information and improve as a result. The capture and use of organizational knowledge to make organizational decision making more efficient and effective. In organizational learning, working and learning become increasingly collaborative activities based on the limitations of the individual human mind. Individual learning needs to be complemented by organizational learning. Repositories (such as organizational intranets) can support organizational learning by their function as organizational and artifact memories.

Organizational memory
Knowledge is the key asset of the knowledge organization. Organizational memory extends and amplifies this asset by capturing, organizing, disseminating, and reusing the knowledge created by its employees. Also called a *knowledge repository* or *corporate memory*.

Participant observation
A fundamental method of research used in cultural anthropology. It involves a researcher, or researchers, living within a given culture for an extended period of time, to take part in its daily life in all its richness and diversity. The anthropologist in such an approach tries to experience a culture "from within," as a person native to that culture might do.

Personalization/profiling
Using continually adjusted user profiles to match content or services to individuals. Personalization includes determining a user's interest based on those preferences or behavior, constructing business rules to select relevant content based on those preferences or behaviors, and presenting the content to the user in an integrated, cohesive format. For example, the process that occurs upon a page request to a web server and is handled by either (a) a general application server, (b) a specialized one-to-one application server, or (c) a specific personalization engine; or, the capability for electronic library users to choose the information to be "pushed" or delivered directly to them through the e-library.

Portal
A grand and imposing entrance (e.g., "the portals of the cathedral"). A site that the owner positions as an entrance to other sites on the Internet; a gateway whose purpose is to be the major starting point for users when they connect to the web.

Process tracing
Any of a set of techniques that enables the determination of an individual's train of thought while he or she completes a task or reaches a conclusion.

Productivity paradox
Standard measures of labor productivity in the United States suggest that computers, at least until 1995, were not improving productivity. The productivity paradox is the question: why, then, were U.S. employers investing more and more heavily in computers and information technologies?

Protocol analysis
A method used to discern an individual's general problem-solving approach and the specific operations used to move from one knowledge state to another.

Protocols
Verbal reports or transcripts that are typically the result of a process-tracing or interview session to acquire/code knowledge.

Reflective listening
Listening behaviors that provide feedback that the message was communicated (e.g., paraphrasing, clarifying, summarizing).

Remunerative incentive
A financial reward, when money is exchanged for acting in a particular, desired way.

Repertory grid
A psychological technique for eliciting and analyzing a model of the expert's world so that similarities and differences among objects can be represented in a grid.

Requisite variety
The Law of Requisite Variety (formulated by Ross Ashby, a specialist in cybernetics) shows that regulation can be measured. The maximum possible effectiveness of a regulator will be directly measurable by a comparison between the variety (number of possible states) of the regulator and that which is being regulated. In other words, only variety can absorb variety. If a thermostat is to control temperature over a range, it must have more than two settings (on/off). Management must similarly find ways to increase variety through the use of models that present decision makers with the required information.

Retrospective verbalization
A variation on the process tracing technique that asks the expert to verbalize his or her reasoning process after completing the task being investigated.

Reuse
Multiple individuals are able to organize meaningful activities around shared and reusable artifacts to achieve specific goals, typically within the context of distributed work and expertise. These artifacts may be any number of knowledge objects. Knowledge object may be executable procedures, procedures, sections of text, or audiovisual "sound bites." The artifacts may include the use of previously used material in the same or different process. Organizational reuse aims to make additional use of standard parts or components such as reusable code, designs, architectures, test cases, templates, references, and other valuable knowledge-based components.

Reward
An act performed to strengthen approved behavior. To act or give compensation in recognition of someone's behavior or actions to reinforce good behavior. Money or anything else of value usually given in exchange for a good or service.

Rite
Relatively elaborate, dramatic, planned set of activities that consolidates various forms of cultural expressions into one event, which is carried out through social interactions, usually for the benefit of an audience.

Ritual
A standardized, detailed set of techniques and behaviors that manages anxieties but seldom produces intended consequences of practical importance.

Semantic networks
Cognitive models that illustrate associations among elements. A semantic network is a graph structure in which nodes (or vertices) represent concepts, while the arcs between these nodes represent relations among concepts. From this perspective, concepts have no meaning in isolation, and only exhibit meaning when viewed relative to the other concepts to which they are connected by relational arcs. In semantic networks, structure is everything.

Social capital
The value created when a community or society collaborates and cooperates (through such mechanisms as networks) to achieve mutual benefits. The value of social networks that people can draw on to solve common problems. The benefits of social capital flow from the trust, reciprocity, information, and cooperation associated with social networks.

Social constructivism
Emphasizes the importance of culture and context in understanding what occurs in society and constructing knowledge based on this understanding. Social constructivists believe that reality is constructed through human activity and that knowledge is also a human product that has been

socially and culturally constructed. Learning is a social process in which individuals create meaning through their interactions with each other and with the environment they live in.

Social network analysis
The mapping and measuring of relationships and flows between people, groups, organizations, computers, or other information/knowledge processing entities.

Social presence
The degree to which an individual perceives he or she is communicating with another human being using a given medium. The degree to which the other participant is judged to be a "real" person. The extent to which one feels they are communicating with another person and not with a technological medium.

Sociogram
A diagram that shows interaction patterns between people; for instance, a diagram with a node to represent each individual and lines drawn between individuals to indicate that they interact frequently. These diagrams can be used to study workflows, the clustering of groups, communication needs, and inefficiencies in work processes.

Structured interview
An interview that is organized, planned, and appropriate for the sessions that require specific information.

Symbol
An arbitrary sign (written or printed) that has acquired a conventional significance. Something visible that by association or convention represents something else that is invisible; for example, "the eagle is a symbol of the United States."

System
A set of interrelated elements. A system is an entity that is comprised of at least two elements and a relation that holds between each of the elements and at least one other in the set. A system is a holistic or gestalt—it cannot be understood by simple reductionist inquiry because "the whole is greater than the sum of the parts."

Tacit knowledge
From the Latin *tacitare*, which refers to something that is very difficult to articulate, to put into words or an image; typically highly internalized knowledge such as knowing how to do something or recognizing analogous situations.

Task analysis
The process of determining or describing the nature of a task, job, or procedure by breaking it into its primitive components. Analyzes what a user is required to do in terms of actions and/or cognitive processes to achieve a task.

Task model
User-centered representation of the goals and actions a user needs to perform in the context of information processing. A task model helps to characterize tasks that might be fruitfully supported by current or future systems and therefore is a promising aid for a deeper understanding of user activities in certain application domains.

Taxonomy
Basic classification system that enables the conceptual identification of concept hierarchies and dependencies. A hierarchical structure used for categorizing a body of information or knowledge, allowing an understanding of how that body of knowledge can be broken down into parts, and how its various parts relate to each other. Taxonomies are used to organize information in systems.

Technocratic utopianism
An organizational political model where the emphasis is on technology and corporate data.

Thesaurus
An organized language used to describe synonyms that predefines the relationships between terms and concepts used in its vocabulary.

Transparency
The quality of being clear and transparent. Evolving global standard for state institutions and international organizations, requiring open processes according to general rules subject to monitoring; regarded as the basis of accountability and of diminishing corruption. Sharing information and acting in an open manner. Transparent systems have clear procedures for public decision making and open channels of communication between stakeholders and officials,

and make a wide range of information accessible.

Trust
Certainty based on past experience. The trait of trusting, of believing in the honesty and reliability of others. Complete confidence in a person or plan.

Unstructured interview
Interviews that have the goal of exploring an issue, used primarily in early stages of knowledge acquisition/capture.

User model
The user model defines the types of users of an interface and the relevant attributes of those users. Its main purpose is to influence interface generation. It is not designed to be a model of the mental state of the user at a particular time during the interaction.

Value
An ideal accepted by some individual or group. The quality (positive or negative) that renders something desirable or valuable.

Variety
The total number of possible states of a system or an element of a system. A measure of the complexity of the system. The total number of distinguishable states, that is, dependent on the observational powers of a given observer. A useful managerial measure that conveys the amount of requisite variety that will be required to model the system (and to base decisions on).

Virtualness
"As-if-reality," an object that has an effect and shows behavior without physically existing in reality.

Virtual organization
Structure in which organization members in different locations work together using email, phone, fax, and other communication methods; a cluster of organizations united by a series of electronic linkages.

Weak incentive
An incentive that does not encourage maximization of an objective, because it is ambiguous or lends itself to "satisficing" instead of optimizing.

Wiki
Wiki comes from the Hawaiian term meaning "quick" or "super fast"; wiki became a term for a website or other hypertext document collection that gives users the ability to add content, as on an Internet forum, but also allows this content to be edited by other users. The term can also refer to collaborative software used to create such a website.

XML
eXtensible Markup Language. A subset of SGML constituting a particular text markup language for interchange of structured data. The Unicode standard is the reference character set for XML content. XML is a trademark of the World Wide Web Consortium. A flexible way to create standard information formats and share both the format and the data on the World Wide Web.

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