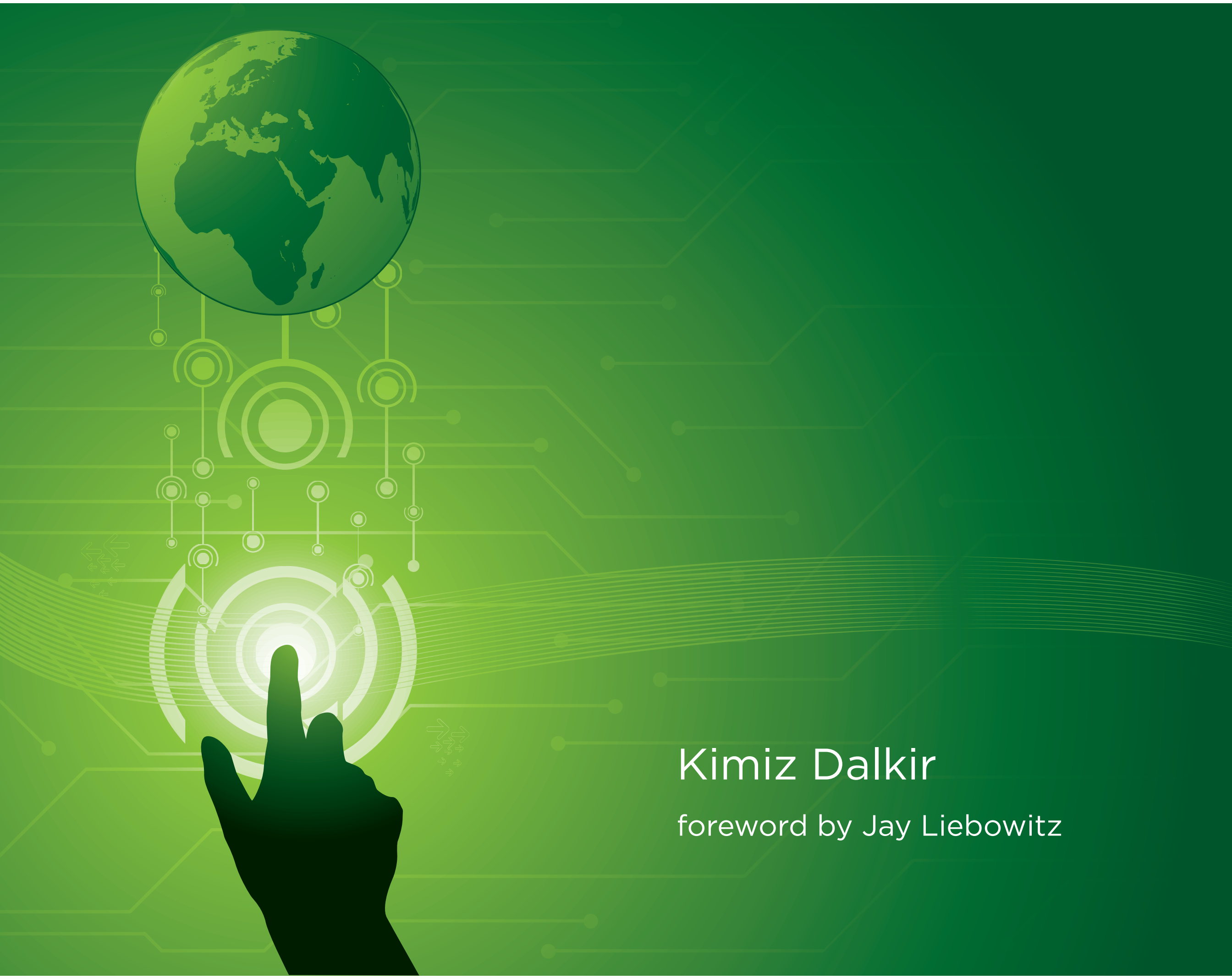
Knowledge Management in Theory and Practice

Second Edition



Knowledge Management in Theory and Practice

Knowledge Management in Theory and Practice

Second Edition

Kimiz Dalkir

foreword by Jay Liebowitz

The MIT Press
Cambridge, Massachusetts
London, England

For information about special quantity discounts, please e-mail special_sales@mitpress.mit.edu

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

Library of Congress Cataloging-in-Publication Data
Dalkir, Kimiz.
Knowledge management in theory and practice / Kimiz Dalkir ; foreword by Jay Liebowitz.
— 2nd ed.
p. cm.
Includes bibliographical references and index.
ISBN 978-0-262-01508-0 (hardcover : alk. paper)
1. Knowledge management. I. Title.
HD30.2.D354 2011
658.4′038—dc22
2010026273

10 9 8 7 6 5 4 3 2 1

Contents

Foreword: Can Knowledge Management Survive?

The title of this foreword, “Can Knowledge Management Survive?” is perhaps rather strange for this second edition of this leading textbook on knowledge management (KM). However, as the KM field has taught us to be “reflective practitioners,” this question is worth pondering.

Knowledge management has been around for twenty years or more, in terms of its growth as a discipline. Even though the roots of knowledge management go back far beyond that, is knowledge management generally accepted within organizations, and is KM a lasting field or discipline?

To answer the first question, we can review some anecdotal evidence that suggests KM is more widely accepted within certain industries than others. Over the years, the pharmaceutical, energy, aerospace, manufacturing, and legal industries have perhaps been some of the leaders in KM organizational adoption. In looking toward the future, the public health and health care fields are certainly well positioned to leverage knowledge throughout the world. And as the graying workforce ensues and the baby boomers retire, knowledge retention will continue to play a key role in many sectors, such as in government, nuclear energy, education, and others. So, KM has permeated many organizations and has the propensity to propagate to others. However, there are still many organizations that equate KM to be IT (information technology), and do not fully grasp the concept of building and nurturing a knowledge sharing culture for promoting innovation. Many organizations do not have KM seamlessly woven within their fabric, and many organizations do not recognize or reward their employees for knowledge sharing activities. It is getting harder to find the title of a “chief knowledge officer” or a “knowledge management director” in organizations, suggesting two possibilities. The first is that KM is indeed embedded within the organization’s culture so there is no need to single it out. The second proposition is that KM has lost its appeal and importance, so there is no need to have a CKO or equivalent position, especially in these difficult economic times.

Probably, both propositions are true, depending perhaps on the type and nature of the organization.

So, returning to the first question about KM being widely accepted within today's organizations, the jury is still out. It may be simply an awareness issue in order to show the value-added benefits of KM initiatives. Or it may be that KM was the "management fad of the day" and we are ready to move on. I believe that KM can have tremendous value to organizations by stimulating creativity and innovation, building the institutional memory of the firm, enabling agility and adaptability, promoting a sense of community and belonging, improving organizational internal and external effectiveness, and contributing toward succession planning and workforce development. KM should be one of the key pillars underpinning a human capital strategy for the organization. As with anything else, some organizations are leaders and some are laggards. Those who recognize the importance of KM to the organization's overarching vision, mission, and strategy should hopefully be in the winning side of the equation in the years ahead.

Let us now address the second question posed, "is KM a lasting field?" In other words, does KM have endurance to stand on its own in the forthcoming years? This relates back to whether KM is more an art than a science. KM is certainly both, and as the KM field has developed over the years, an active KM community of both practitioners and researchers has emerged. There are already well over ten international journals specifically devoted to knowledge management. Worldwide KM conferences abound, and individuals can take university coursework in knowledge management, as well as being certified in knowledge management by KM-related professional societies and other organizations. There are funded research projects in knowledge management worldwide, both from basic and applied perspectives. In addition, there are many KM-related communities of practice established worldwide. So certainly there is an active group of practitioners and researchers who are trying to put more rigor behind KM to accentuate the "science" over the "art" in order to give the KM field lasting legs.

On the other hand, there is the "art" side of KM. Like many fields that draw from a multidisciplinary approach, especially from the social sciences, there is art along with the science. Whether KM contributes to "return on vision" versus "return on investment" indicates some of the difficulty in quantifying KM returns. There certainly is a "touchy-feely" side to KM, but there is a sound methodological perspective to KM, too.

Here again, the jury is still out on whether the KM field will last. So what needs to be done? This is where textbooks such as *Knowledge Management in Theory and Practice* play an important role. This textbook, in its second edition, marries the theory and practice of knowledge management; namely, it provides the underlying methodologies for knowledge management design, development, and implementation, as well as applying these methodologies and techniques in various cases and vignettes sprinkled throughout the book. It addresses my first question of having knowledge management being more widely accepted in organizations by discussing how KM has been utilized in various industry sectors and organizational settings. The book also emphasizes the "science" behind the "art" in order to address my second question regarding providing more rigor behind KM so that the field will endure in the years ahead.

Professor Dalkir, a leading KM researcher, educator, and practitioner, uses her insights and experience to highlight the important areas of knowledge management in her book. People, culture, process, and technology are key components of knowledge management, and the book provides valuable lessons learned in each area. This book is well-suited as a reference text for KM practitioners, as well as a textbook for KM-related courses.

This book, and others, is needed to continue to take the mystique out of KM and provide the tangible value-added benefits that CEOs and organizations demand. Professor Dalkir should be commended on this new edition, which will hopefully propel others to be believers in the power of knowledge management. As this happens, the answers to my two KM questions will be quite obvious! Enjoy!

Jay Liebowitz, D.Sc.
Professor, Carey Business School
Johns Hopkins University

1 Introduction to Knowledge Management

A light bulb in the socket is worth two in the pocket.
—Bill Wolf (1950–2001)

This chapter provides an introduction to the study of knowledge management (KM). A brief 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, for communities of practice, and for organizations are described together with the emerging KM roles and responsibilities 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.

Introduction

The ability to manage knowledge is crucial in today's knowledge economy. The creation and diffusion of knowledge have become increasingly important factors in competitiveness. 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 from 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. Forty-five 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 was knowledge work (Drucker 1994; Barth 2000). Davenport (2005, p. 5) says about knowledge workers 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. A firm only gains sustainable advances from what it collectively knows, how efficiently it uses what it knows, and how quickly it acquires and uses new knowledge (Davenport and 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.

All of these developments have created 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. 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 and Prusak 1998, 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 and Takeuchi, 1995; Pasternack and Viscio 1998; Pfeffer and Sutton, 1999; Ruggles and Holtshouse, 1999). KM is often characterized by a *pack rat* approach to content: "save it, it may prove useful some time 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 ideas re inventoried (the top ten for example). ICM content tends to be more representative of the real thinking of individuals (contextual information, opinions, stories) because of its focus on actionable knowledge and know-how. The outcome is less costly endeavors and a focus on learning (at the individual, community, and organizational levels) 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 will 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 and Prusak 2001, 1). Managers also invariably add that they have no idea how to manage this knowledge! Using the intellectual capital or asset approach, it is essential to identify knowledge that is of value and is also at risk of being lost to the organization through retirement, turnover, and competition.. As Lesser and Prusak (2001, 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 follows: "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, pressure to avoid reinventing the wheel, pressure 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 a hundred published definitions of knowledge management and of these, at least seventy-two could be considered to be very good! Carla O'Dell has gathered over sixty definitions and has developed a preliminary classification scheme for the definitions on her KM blog (see http://blog.simslearningconnections.com/?p=279) and what this indicates is that KM is a multidisciplinary field of study that covers a lot of ground. This 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. 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 of knowledge management from the business perspective:

> Strategies and processes designed to identify, capture, structure, value, leverage, and share an organization's intellectual assets to enhance its performance and competitiveness. It is based on two critical activities: (1) capture and documentation of individual explicit and tacit knowledge, and (2) its dissemination within the organization. (*The Business Dictionary*, http://www.business-dictionary.com/definition/knowledge-management.html)

> 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, 154)

Further definitions come 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. (Rigby 2009)

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, as shown by these two definitions:

KM is predominantly seen as information management by another name (semantic drift). (Davenport and Cronin 2000, 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, 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, 8–9)

The process-technology perspective provides some sample definitions, as well:

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 and Harty, 1998)

Leveraging collective wisdom to increase responsiveness and innovation. (Carl Frappaolo, Delphi Group, Boston, http://www.destinationkm.com/articles/default.asp?ArticleID=949)

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. (Steve Ward, Northrop Grumman, http://www.destinationkm.com/articles/default.asp?ArticleID=949)

A knowledge management system is a virtual repository for relevant information that is critical to tasks performed daily by organizational knowledge workers. (What is KM? http://www.knowledgeshop.com)

The tools, techniques, and strategies to retain, analyze, organize, improve, and share business expertise. (Groff and Jones 2003, 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 [*sic*], enhanced, organized and utilized for the benefit of the organization and its customers. (Abell and Oxbrow 2001)

Wiig (1993, 2002) 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 and 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 much 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
- Linguistics and computational linguistics
- Information technologies such as knowledge-based systems, document and information management, electronic performance support systems, and database technologies
- Information and library science
- Technical writing and journalism
- Anthropology and sociology
- Education and training
- Storytelling and communication studies
- Collaborative technologies such as Computer-Supported Collaborative Work (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 that 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.

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 an understanding and even practice of KM. Someone with a background in

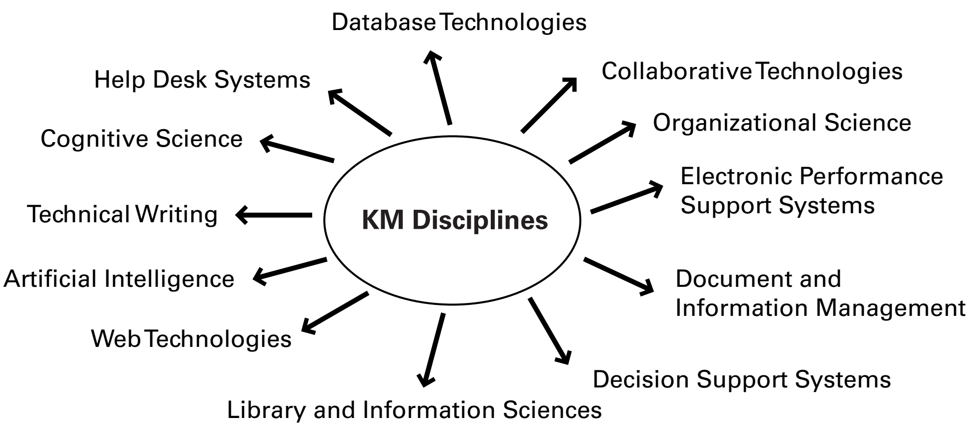


Figure 1.1
Interdisciplinary nature of knowledge management

journalism, for example, can quickly adapt this skill set to capture 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 statements 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 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. Consider the example of planning for an evening movie to distinguish between data, information, and knowledge.

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 pm 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

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

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.

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 lessons 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 these attributes is the concept analysis technique.

The Concept Analysis Technique

Concept analysis is an established technique used in the social sciences (i.e., 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 the obtaining consensus around three major dimensions of a given concept (shown in figure 1.2).

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, because clear criteria can be developed to enable sorting into categories such as knowledge versus information, document management versus knowledge management, and tangible versus intangible assets. In addition, valuable

Concept Name		
Key Attributes	Examples	Nonexamples
1. ______ 2. ______ 3. ______ 4. ______ 5. ______ 6. ______ 7. ______	1. ______ 2. ______ 3. ______ 4. ______ 5. ______ 6. ______ 7. ______	1. ______ 2. ______ 3. ______ 4. ______ 5. ______ 6. ______ 7. ______

Figure 1.2
Illustration of the Concept Analysis Technique

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 and Tamir 1992; Lawson 1994) and 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, and 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 others. 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 but 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, 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 thus 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 a 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. Miller's (1956) magic number can be used to define the optimal number of attributes a given concept should have—namely, seven plus or minus two 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 term *knowledge management* formally 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 journals), philosophers, teachers, and writers have been making use of many of the same techniques for decades. 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"(http://www.stevedenning.com/ knowledge_management.html).

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 vehicle for knowledge transfer was 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 the *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, 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 envisioned 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 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 contributes 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 Kaplan and Norton; APQC 1996; Edvinsson and 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:

- Knowledge management as a business strategy
- Transfer of knowledge and best practices
- Customer-focused knowledge
- Personal responsibility for knowledge
- Intellectual asset management
- Innovation and knowledge creation (APQC 1996)

The Entovation timeline (available at http://www.entovation.com/timeline/timeline.htm) identifies a 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

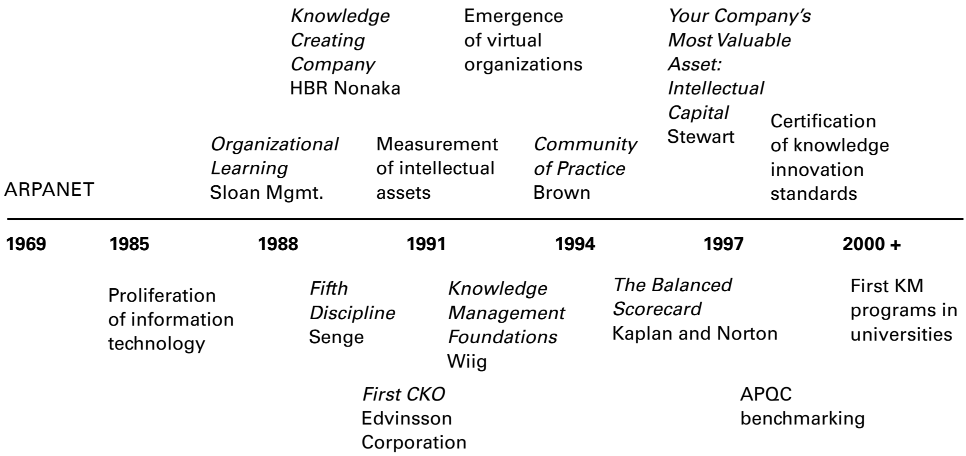


Figure 1.3
A summary timeline of knowledge management

Senge, Ikujiro Nonaka, Hirotaka Takeuchi, and Thomas Stewart. An extract of this timeline is shown in figure 1.3.

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 virtualization in the early 1980s, and early efforts at personalization and profiling technologies beginning in the year 2000 (Deloitte, Touche, Tohmatsu 1999). Figure 1.4 summarizes these developmental phases.

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 the 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

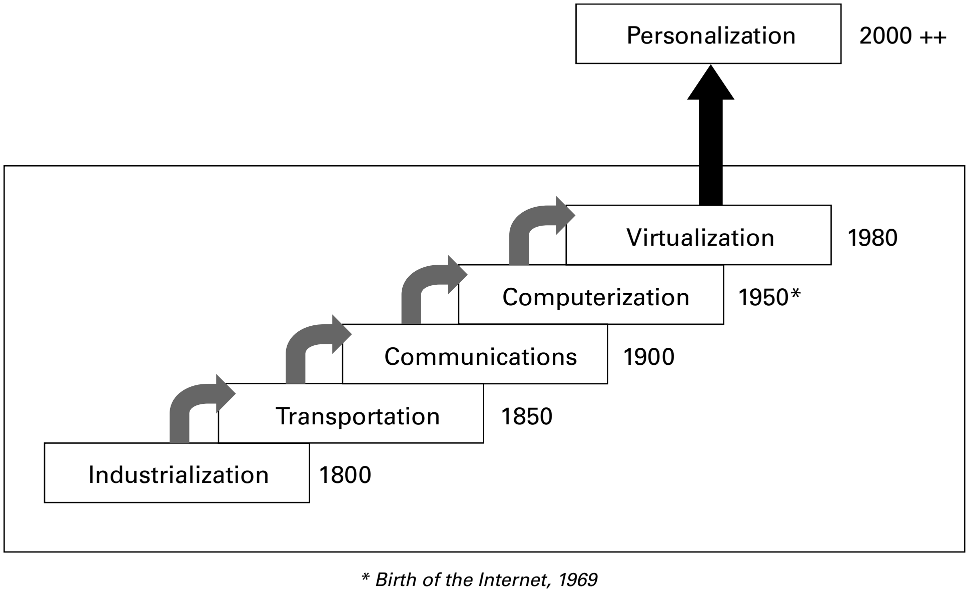


Figure 1.4
Developmental phases in KM history

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 and Harrison-Briggs 1989). They describe knowledge engineering as "involving information gathering, domain familiarization, analysisand design efforts. In addition, accumulated knowledge must be translated into code, tested and refined" (McGraw and Harrison Briggs, 5). A knowledge engineer is "the individual responsible for structuring and/or constructing an expert system" (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.

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	Start internal KM projects
1991	HBR article	Nonaka and Takeuchi
1993	Dr. K. Wiig	First KM book published
1994	KM Network	First KM conference
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

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.

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 who were 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 future practitioners. Today, over a hundred universities around the world offer courses in KM, and quite a few business and library schools offer degree programs in KM (Petrides and Nodine 2003).

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 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 non-physical 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.

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 a 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.

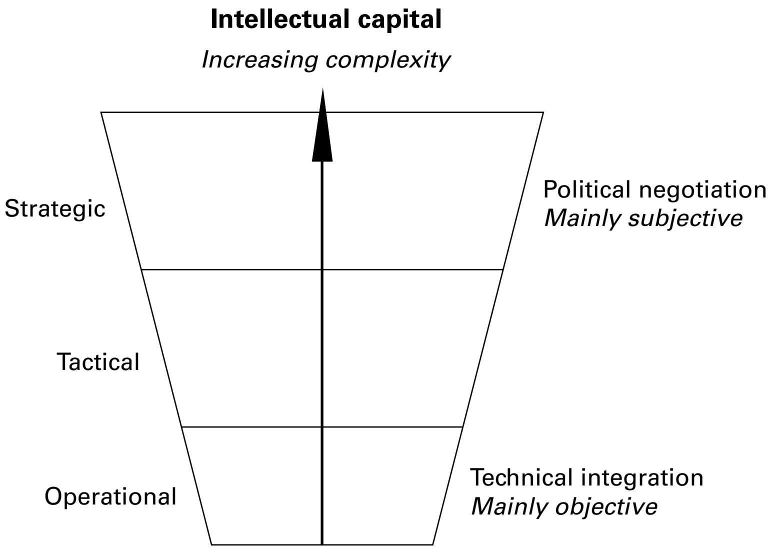


Figure 1.5
Three levels of intellectual capital

Capabilities are potential core competencies 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 and Prahalad 1990). It should be noted that the more valuable a capability is, and 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.

Library and Information Science (LIS) Perspectives on KM

Although not everyone in the 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, 15) 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 (Henczel 2004). 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.

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.

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 every day. Filtering over two hundred e-mails, faxes, and voice mail 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, as well as 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 voice mails asking why you have not responded to an e-mail, and e-mails asking why you have not returned a 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 must also 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, 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 and 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; this 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 were later 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, and 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, 3).

KM for Individuals, Communities, and Organizations

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

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 the organization
- Helps people to keep up to date
- Provides challenges and opportunities to contribute

For the community of practice, 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

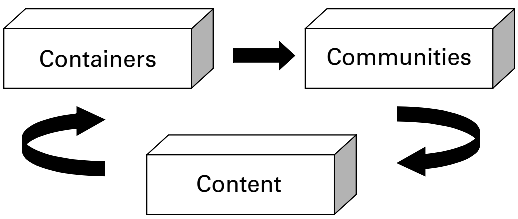


Figure 1.6
Summary of the three major components of KM

Some critical KM challenges are to manage content effectively, facilitate collaboration, help knowledge workers connect, find experts, and help the organization to learn to 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, then 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. Many of these new roles 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 processes of the KM cycle, 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 communities, 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. Community of practice versus community of interest

2. "Knowledge management is not anything new." Would you argue that this statement is largely true? 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?

References

Abell, A., and N. Oxbrow. 2001. *Competing with knowledge: The information professional in the knowledge management age*. London: Library Association Publishing.

Ambur, O. 1996. Sixth generation knowledge management: Realizing the vision in working knowledge, http://ambur.net/ (accessed October 20, 2008).

APQC. 1996. *The American Productivity and Quality Centre*, http://www.apqc.org.

Bareholz, H., and P. Tamir. 1992. A comprehensive use of concept mapping in design instruction and assessment. *Research in Science & Technological Education* 10 (1):37–52.

Barth, S. 2000. Heeding the sage of the knowledge age. *CRM Magazine. May*, http://www.destinationcrm.com/articles/default.asp?ArticleID=832. (accessed October 18, 2008).

Barton-Leonard, D. 1995. *Wellsprings of knowledge—Building and sustaining sources of innovation*. Boston, MA: Harvard Business School Press.

Blair, D. 2002. Knowledge management: Hype, hope or help? *Journal of the American Society for Information Science and Technology* 53 (12):1019–1028.

Boisot, M. 1999. *Knowledge assets*. New York: Oxford University Press.

Broadbent, M. 1997. The emerging phenomenon of knowledge management. *Australian Library Journal* 46 (1):6–24.

Brooking, A. 1999. *Corporate memory: Strategies for knowledge management*. London: International Thomson Business Press.

Davenport, E., and B. Cronin. 2000. Knowledge management: Semantic drift or conceptual shift? *Journal of Education for Library and Information Science* 41 (4):294–306.

Davenport, T., and L. Prusak. 1998. *Working knowledge*. Boston, MA: Harvard Business School Press.

Davenport, T. 2005. *Thinking for a living, how to get better performance and results from knowledge workers*. Boston, MA: Harvard Business School Press.

Deloitte, Touche, Tohmatsu. 1999. Riding the e-business tidal wave, http://www.istart.co.nz/index/HM20/PC0/PVC197/EX245/DOCC65/F11843 (accessed November 4, 1999).

Denning, S. 2002. History of knowledge management, http://www.stevedenning.com/knowledge_management.html (accessed May 17, 2004).

Drucker, P. 1994. The social age of transformation. *Atlantic Monthly. November*, http://www.theatlantic.com/politics/ecbig/soctrans.htm (accessed October 18, 2008).

Drucker, P. 1964. *Managing for results*. Oxford, UK: Butterworth-Heineman.

Edvinsson, L., and M. Malone. 1997. *Intellectual capital: Realizing your company's true value by finding its hidden brain power*. New York: Harper Collins.

Feynman, R. 1966. The Development of the Space-Time View of Quantum Electrodynamics. *Science* 153 (3737):699–708.

Fisher, K. M. 1990. Semantic networking: The new kid on the block. *Journal of Research in Science Teaching* 27 (10):1001–1018.

Gandhi, S. 2004. Knowledge management and reference services. *Journal of Academic Librarianship* 30 (5):368–381.

Gery, G. 1991. *Electronic performance support systems*. Cambridge, MA: Ziff Institute.

Grey, D. 1996. What is knowledge management? The Knowledge Management Forum. March 1996, http://www.km-forum.org/t000008.htm.

Groff, T., and T. Jones. 2003. *Introduction to knowledge management: KM in business*. Burlington, MA: Butterworth-Heineman.

Hamel, G., and C. Prahalad. 1990. The core competence of the corporation. *Harvard Business Review* (May–June):79–91.

Henczel, S. 2004. Supporting the KM environment: The roles, responsibilities, and rights of information professionals. *Information Outlook* 8 (1):14–19.

Hobohm, H.-C., ed. 2004. *Knowledge management. Libraries and librarians taking up the challenge. IFLA Publications Series 108*. Berlin: Walter de Gruyter GmbH & Co. KG.

Jonassen, D. H., K. Beissner, and M. A. Yacci. 1993. *Structural knowledge: Techniques for conveying, assessing and acquiring structural knowledge*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Kaplan, R., and D. Norton.1996. *The Balanced Scorecard: Translating Strategy into Action*. Boston: Harvard Business School Press.

Klein, D. 1998. *The strategic management of intellectual capital*. Oxford, UK: Butterworth-Heineman, Oxford.

Koenig, M. 2002. The third stage of KM emerges. *KM World,* 11 (3), http://www.kmworld.com/Articles/Editorial/Feature/The-third-stage-of-KM-emerges-9327.aspx (accessed October 19, 2008).

Lank, E. 1997. Leveraging invisible assets: The human factor. *Long Range Planning* 30 (3):406–412.

Lawson, M. J. 1994. Concept mapping. In Vol. 2 of *The international encyclopedia of education*., 2nd ed., edited by T. Husen and T. N. Postlewaite. Oxford: Elsevier Science, 1026–1031.

Lesser, E., and L. Prusak. 2001. Preserving knowledge in an uncertain world. *MIT Sloan Management Review* 43 (1):101–102.

Martin, B., A. Hazen, and M. Sarrafzadeh. 2006. Knowledge management and the LIS professions: Investigating the implications for practice and for educational provision. *Australian Library Journal* 27 (8):12–29.

McGraw, K., and K. Harrison-Briggs. 1989. *Knowledge acquisition: Principles and guidelines*. Englewood Cliffs, NJ: Prentice Hall.

Miller, G. 1956. The magical number seven, plus or minus two. *Psychological Review* 63:81–97.

Nickols, F. 2000. KM overview, http://home.att.net/~discon/KM/KM_Overview_Context.htm (accessed October 18, 2008).

Nonaka, I., and H. Takeuchi. 1995. *The knowledge-creating company: How Japanese companies create the dynamics of innovation*. New York: Oxford University Press.

Norman, D. A. 1988. *The design of everyday things*. New York: Doubleday.

Norton, N., and D. Kaplan. 1996. *The balanced scorecard: Translating strategy into action*. Boston, MA: Harvard Business School Press.

Novak, J. 1990. Concept mapping: A useful tool for science education. *Journal of Research in Science Teaching* 60 (3):937–940.

Novak, J. 1991. Clarify with concept maps: A tool for students and teachers alike. *Science Teacher (Normal, Ill.)* 58 (7):45–49.

O'Dell, C., and C. Grayson. 1998. *If only we knew what we know: The transfer of internal knowledge and best practice*. New York: Simon & Schuster. The Free Press.

Pasternack, B., and A. Viscio. 1998. *The centerless corporation*. New York: Simon and Schuster.

Patel, J., and J. Harty. 1998. Knowledge management: Great concept but what is it? *Information Week*, March 16, 1998.

Petrides, L., & Nodine, T. 2003. Knowledge management in education: Defining the landscape. *The Institute for the Study of Knowledge Management in Education,* http://www.iskme.org/what-we-do/publications/km-in-education.

Pfeffer, J., and R. Sutton. 1999. *The knowing-doing gap: How smart companies turn knowledge into action*. Boston, MA: Harvard Business School Press.

Polanyi, M. 1966. *The tacit dimension*. Gloucester, MA: Peter Smith.

Rigby, D. 2009. *Management Tools 2009: An Executive's Guide,* http://www.bain.com/management_tools/home.asp.

Ruggles, R., and D. Holtshouse. 1999. *The knowledge advantage. Dover,* New Hampshire: Capstone Publishers.

Senge, P. 1990. *The fifth discipline: The art and practice of the learning organization*. New York: Doubleday.

Stankosky, M. 2008. Keynote address to ICICKM (International Conference on Intellectual Capital, Knowledge Management and Organisational Learning), 9–10.

Stewart, T. 2000. Software preserves knowledge, people pass it on. *Fortune* 142 (5):4.

Stewart, T. 1997. *Intellectual capital*. New York: Doubleday.

Stewart, T. 1991. Intellectual capital: Your company's most valuable asset. *Fortune Magazine* June:44–60.

Sveiby, K. 1997. The intangible assets monitor. *Journal of Human Resource Costing & Accounting* 12 (1):73–97.

Wells, H. G. 1938. *World brain*. Garden City, NY: Doubleday, Doran & Co.

Wiig, K. 1993. *Knowledge management foundations*. Arlington, TX: Schema Press.

Wiig, K. M. 2000. Knowledge management: An emerging discipline rooted in a long history. In *Knowledge management*, ed. D. Chauvel and C. Despres. Paris: Theseus.

2 The Knowledge Management Cycle

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 phases involved in the knowledge management cycle, encompassing the capture, creation, codification, sharing, accessing, applying, and reuse of knowledge within and between organizations. Four major approaches to KM cycles are presented from Meyer and Zack (1996), Bukowitz and Williams (2000), McElroy (1993, 2003), and Wiig (1993). A synthesis of these approaches is then developed as a framework for following the path that 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 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 life cycle models including the Meyer and Zack, Bukowitz and Williams, McElroy, and Wiig life cycle models.
3. Define the key steps in each process of the KM cycle and provide concrete examples of each.
4. Identify the major challenges and benefits of each phase of the KM cycle.
5. Describe how the integrated KM cycle combines the advantages of other KM life cycle models.

Introduction

Effective knowledge management requires an organization to identify, generate, acquire, diffuse, and capture the benefits of knowledge that provide 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 envisioned as the route that 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 identifies and locates 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.

However, upon closer inspection, the differences in term definitions are not really that great. The terms used differ, but there does appear to be some overlap with regard to the different types of steps involved in a KM cycle. To this end, four models 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 four KM cycle approaches are from Meyer and Zack (1996), Bukowitz and Williams (2000), McElroy (1999, 2003), and Wiig (1993).

Table 2.1
A comparison of key KM cycle processes

Wiig (1993)	McElroy (1999)	Rollet (2003)	Bukowitz and Williams (2000)	Meyer and Zack (1996)
Creation	Individual and group learning	Planning	Get	Acquisition
Sourcing	Knowledge claim validation	Creating	Use	Refinement
Compilation	Information acquisition	Integrating	Learn	Store/retrieve
Transformation	Knowledge validation	Organizing	Contribute	Distribution
Dissemination	Knowledge integration	Transferring	Assess	Presentation
Application		Maintaining	Build/sustain	
Value realization		Assessing	Divest	

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 and Zack 1996). Lessons learned from the physical products cycle 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 these data. The original information has been repackaged to now provides 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 individuals through profiling and personalization 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” (Meyer and Zack 1996, 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. He suggests 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, and pharmaceutical companies have 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 the 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 Lexis/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.

A well-designed repository will include schemes for labeling, indexing, linking, and cross-referencing the information units that together comprise its content. Although Meyer and Zack (1996) specifically address information products, their work is more broadly applicable to knowledge products as well . Whereas knowledge does indeed possess unique attributes not found in information (as discussed in chapter 1), this does not necessitate adopting a tabula rasa approach and reinventing decades of tried, tested, and true methods. This is especially true when managing explicit knowledge (formal, codified), which has the greatest similarity to information management. In the case of tacit knowledge, new management approaches need to be used, but these should, once. again, build on solid content management processes.

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.

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.

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 added value. This refinement may be physical (e.g., migrating form 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 best practice or lessons learned as used within that particular organization). Statistical analyses can be performed on content at this stage to conduct a meta-analysis (e.g., a high-level summary of key themes, or patterns

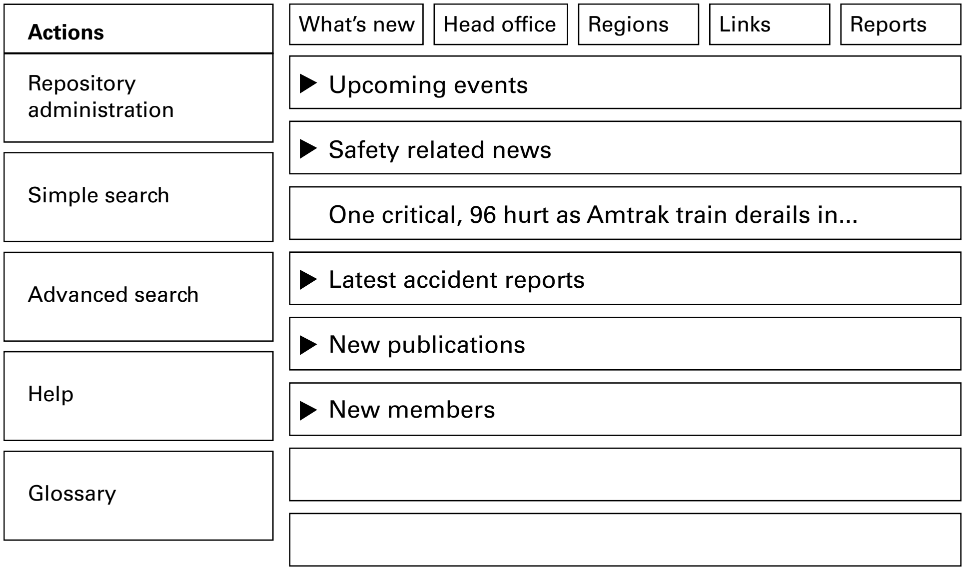


Figure 2.1
Example screen for a repository

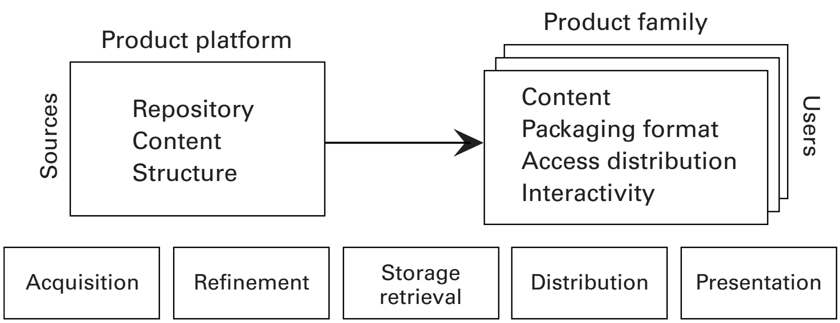


Figure 2.2
High-level view of the Zack Information Cycle

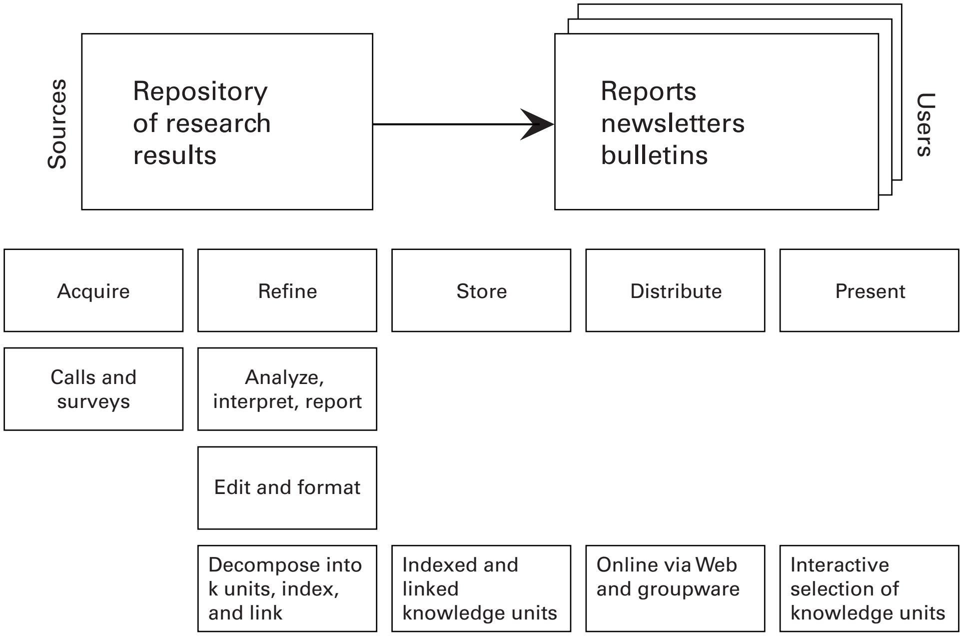


Figure 2.3
Detailed view of the Zack Information Cycle

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, e-mail) 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 firm's information repository. There may also be a similar need at the final stage, for 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 it 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, 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.

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," and "divest" stages are more strategic in nature, triggered by shifts in

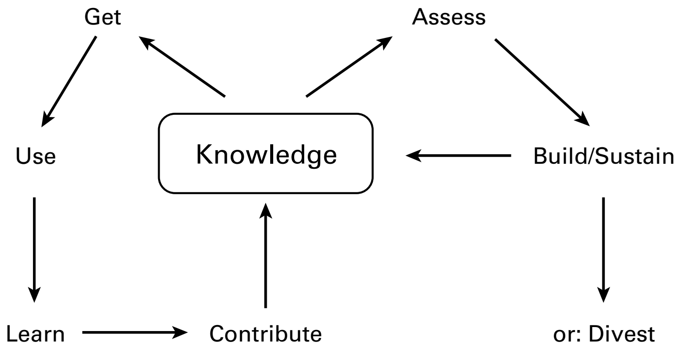


Figure 2.4
The Bukowitz and Williams KM Cycle

the macro environment. These 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. 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 the getting of content encompasses not only traditional explicit content (e.g., a physical or electronic document) but also tacit knowledge. This means that the information that users need must 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 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, outside-of-the-box thinking, and 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 mere 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 because there is a tendency to warehouse 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 shown some methods that do not work: sharing does not happen with a direct pay-per-contribution scheme, and also does not happen if there is a 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 for the user to be notified of how popular his or her contributions were (which is analogous to a citation index for scholarly publications).

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 relationships among human, customer, and organizational capital). The 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. This cost analysis is necessary in order 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 and purposeful form of divesting. This 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, either 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.

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

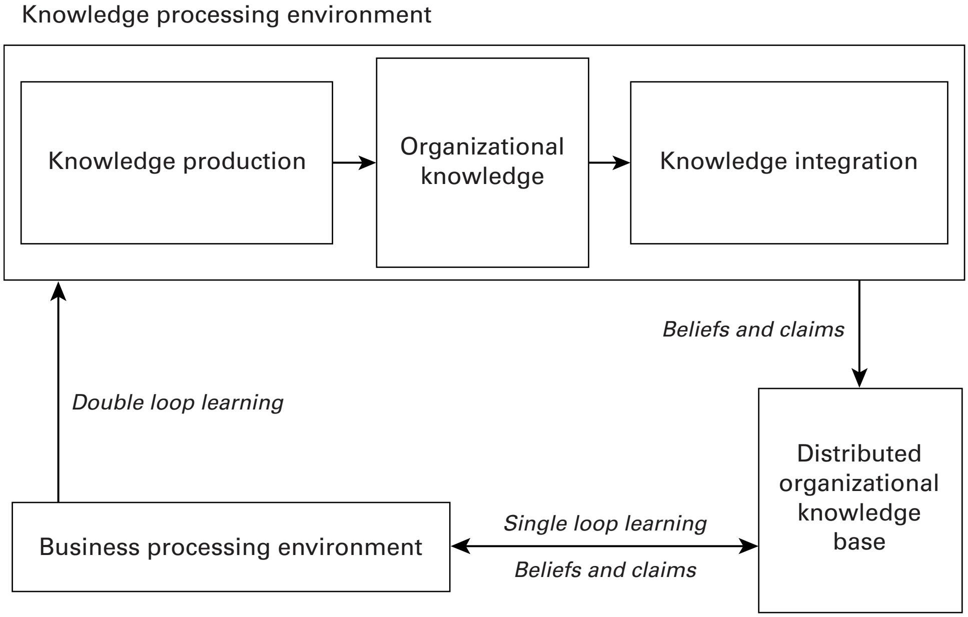


Figure 2.5
High-level processes in the McElroy KM Cycle

expectations or 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 and 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 and Schon 1978).

The term *problem claim formulation* represents an attempt to learn and state the specific nature of the detected knowledge gap. The term *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.

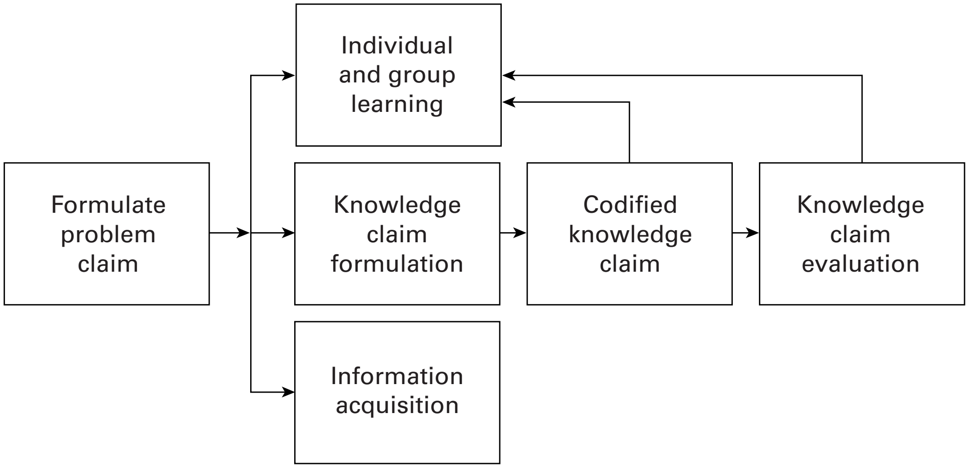


Figure 2.6
Knowledge production processes in the McElroy KM Cycle

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.

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.

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

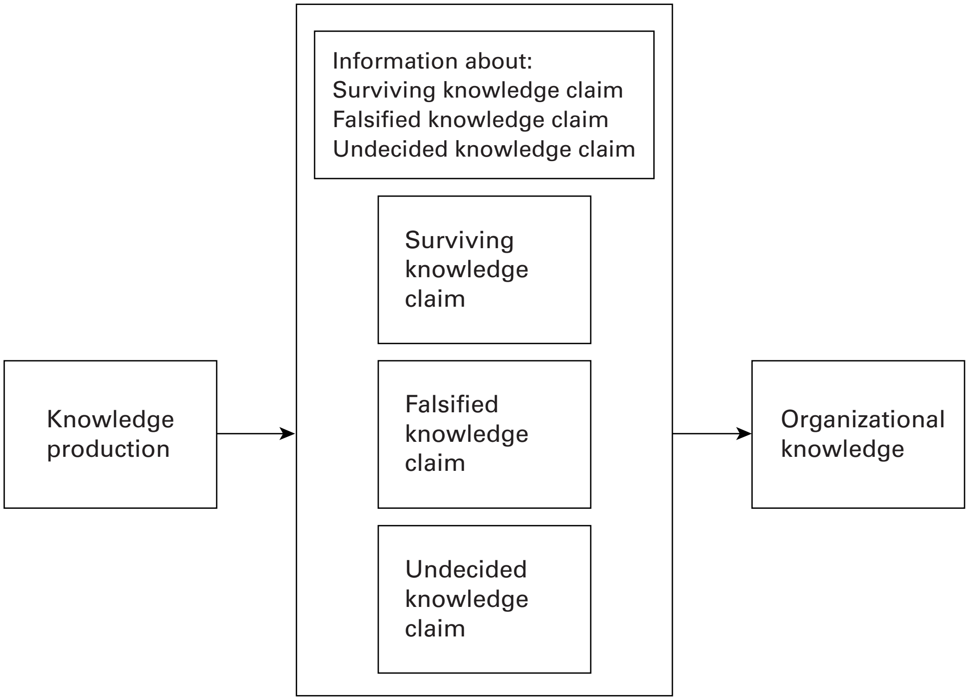


Figure 2.7
Knowledge claim evaluation processes in the McElroy KM Cycle

knowledge to knowledge workers, or integrate newly minted knowledge. Figure 2.8 describes this stage of the 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)

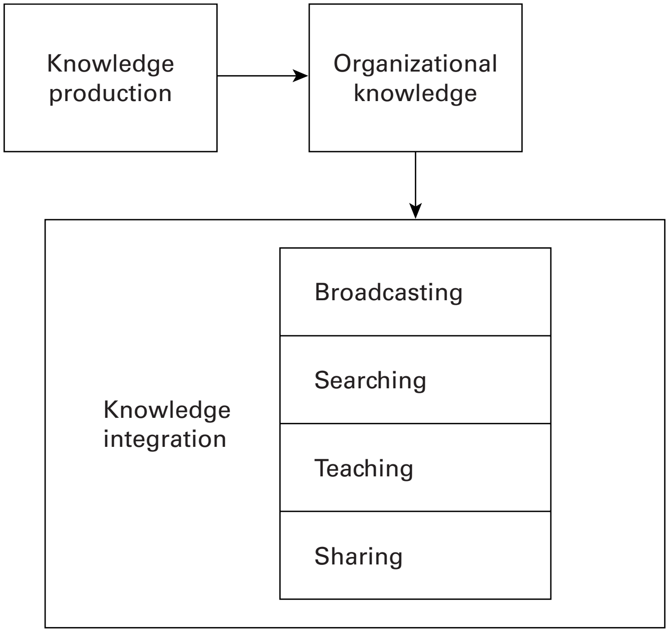


Figure 2.8
Knowledge integration processes in the McElroy KM Cycle

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" (Wiig 1993, 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" (Wiig 1993,51).

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:

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

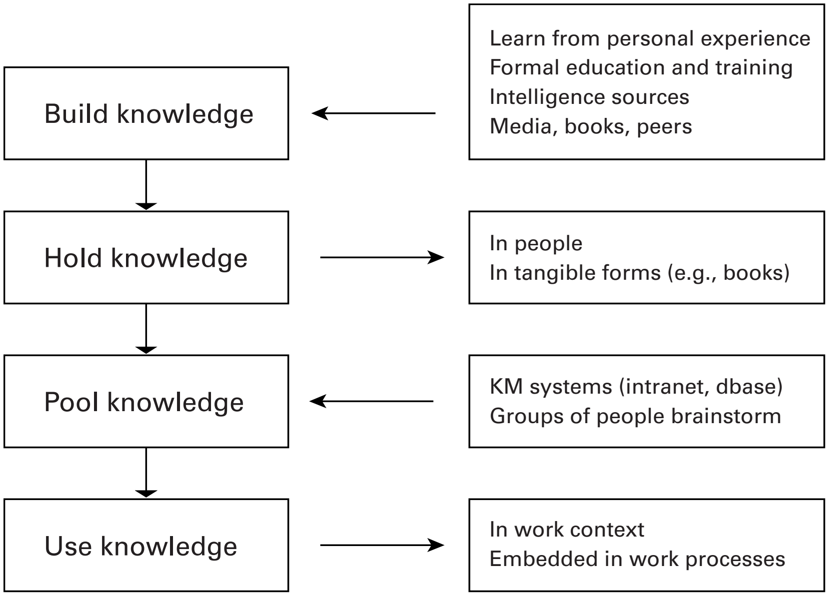


Figure 2.9
Wiig KM Cycle

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, using 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 form 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 refers 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 the way in which they perform their tasks, experimentation, reasoning with existing knowledge, and by hiring new people. Knowledge creation may also be accomplished through knowledge importing (e.g., eliciting 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)
- Abstracting extracted materials (e.g., from a model or a theory)
- Identifying patterns extracted (e.g., trend analysis)
- Explaining relations between knowledge fragments (e.g., compare and contrast, causal relations)
- Verifying 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 keywords or categories, knowledge object attribute specifications, and guidelines for translation.

Holding knowledge consists of remembering, cumulating 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 and 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, and 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 therefore available for future reference and use.

Knowledge pooling consists of coordinating knowledge, assembling knowledge, and accessing and retrieving 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 based 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 who 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, for example, 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, for example, determine what the problem is and estimate potential consequences.

• Use knowledge to describe situation and scope, for example, identify the problem and in general how it should be handled.

• Select relevant special knowledge to handle the situation, for example, identify who you need to consult with or have address the problem.

• Observe and characterize a situation with special knowledge, for example, compare with known patterns and history, followed collecting and organizing the required information to act.

• Analyze situation with knowledge, for example, judge whether it can be handled internally or if outside help will be required.

• Synthesize alternative solutions with knowledge, for example, identify options, outline different approaches that may be taken.

• Evaluate potential alternatives using special knowledge, for example, determine risks and benefits of each possible approach.

• Use knowledge to decide what to do, for example, rank alternatives, select one and do a reality check.

• Implement selected alternatives, for example, 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, since knowledge workers cannot use automated knowledge in unanticipated situations.

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

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 of ways in which knowledge can be applied and used are linked to decision making sequences

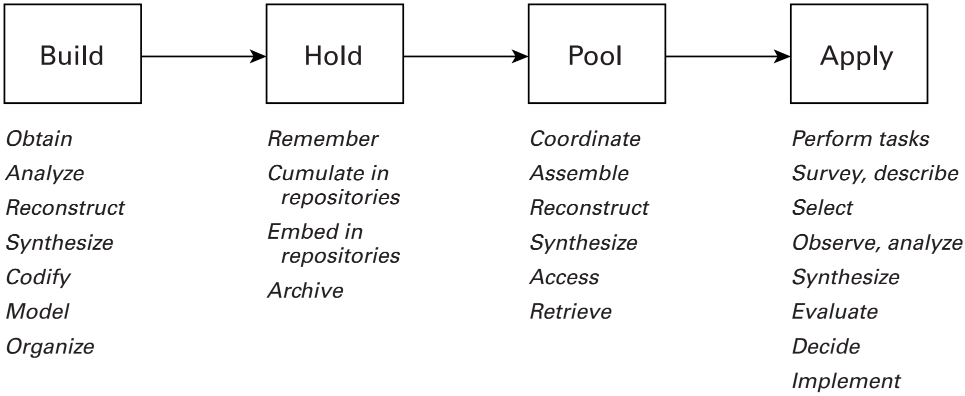


Figure 2.10
Summary of the Key Wiig KM Cycle activities

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 added value to the organization.

An Integrated KM Cycle

A synthesis of the preceding steps from the four approaches to a KM cycle is shown in table 2.2.

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 four 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.

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

Table 2.2
A synthesis of the key KM cycle steps from each of the four approaches

Meyer and Zack (1999)	Bukowitz and Williams (2000)	McElroy (1999)	Wiig (1993)
Acquisition	Get	Individual and group learning	Creation
Refinement	Use	Knowledge claim validation	Sourcing
Store/retrieve	Learn	Information acquisition	Compilation
Distribution	Contribute	Knowledge validation	Transformation
Presentation	Assess	Knowledge integration	Dissemination
	Build/sustain		Application
	Divest		Value realization

Sources: Meyer and Zack, (1999); Bukowitz and Williams (2000); McElroy, (1999); and Wiig (1993).

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

Steps in common	Step added by
1. Knowledge capture	
2. Knowledge creation	
2a. Knowledge contribution	Bukowitz and Williams (2000)
2b. Knowledge filtering and selection	Bukowitz and Williams (2000)
3. Knowledge codification	
3a. Knowledge refinement	Meyer and Zack (1999); Bukowitz and Williams (2000)
4. Knowledge sharing	
5. Knowledge access	
5a. Knowledge learning	Bukowitz and Williams (2000)
6. Knowledge application	
6a. Knowledge evaluation	McElroy (1999); Bukowitz and Williams (2000)
7. Knowledge reuse	
7a. Knowledge reuse or divestment	Bukowitz and Williams (2000)

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. The integrated KM cycle is outlined in figure 2.11.

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 closely follow the organizational goals. Is this content valid? Is it new and better, in other words, is it of sufficient value to the organization 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

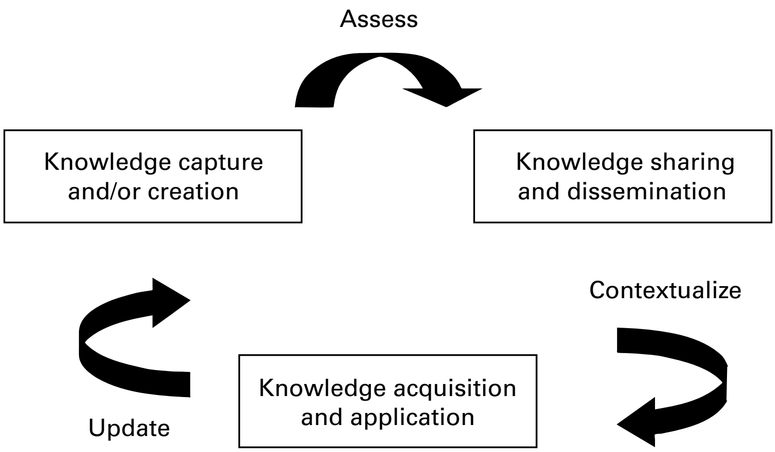


Figure 2.11
An Integrated KM Cycle

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, that is, 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.

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 trans-

Box 2.1
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 postmortem. The AAR was a new procedure and it was initially piloted with a group of experienced consultants. Project managers who became experienced with the postmortem 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 postmortem process and capture the key learning outcomes from the project. Finally, the postmortem was added as an additional step to be completed by all project managers before they could officially check off that a project was 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 agree 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

Box 2.1
(continued)

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 experience in walking in someone else's shoes that 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 one subsidiary where the workforce is represented by a union and another subsidiary that is 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).

formation of knowledge, much like information products are processed, in order to ensure that the knowledge objects reach the 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, and Meyer and Zack.

• 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 the KM cycle? 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?

References

Argyris, C., and D. Schon. 1978. *Organizational learning: A theory of action perspective*. New York: McGraw-Hill.

Bukowitz, W., and R. Williams. 2000. *The knowledge management fieldbook*. London, UK: Prentice-Hall.

McElroy, M. 1999. The knowledge life cycle. *ICM Conference on KM*, Miami, FL.

McElroy, M. W. 2003. *The New Knowledge Management: Complexity, Learning, and Sustainable Innovation*, Burlington, MA: KMCI Press/Butterworth-Heinemann.

Meyer, M., and M. Zack. 1996. The design and implementation of information products. *Sloan Management Review* 37 (3):43–59.

Rollett, H. 2003. *Knowledge management: Processes and technologies*. Boston: Kluwer Academic Publishers.

Wiig, K. 1993. *Knowledge management foundations*. Arlington, TX: Schema Press.

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 must have a conceptual framework to operate within, otherwise the activities will not be coordinated and will not produce the expected KM benefits. Eight 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 frameworks to key KM concepts and the major phases of the KM cycle.
3. Explain the complex adaptive system model of KM and how it addresses the subjective and dynamic nature of content to be managed.

Introduction

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

Although few would argue that knowledge is unimportant, 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 on. 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 complemented by the need to understand what was happening in organizational knowing, reasoning, and learning.

A more holistic approach to KM has become necessary as the complex, subjective, and dynamic nature of knowledge has developed. Cultural and contextual influences further increased the complexity involved in KM, and these factors also had to be taken into account in a model or framework that could situate and explain the key KM concepts and processes. 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 conversions from tacit to explicit and back to tacit knowledge types. The KM models presented in this chapter all attempt to address knowledge management in a holistic and comprehensive manner.

Davenport and Prusak (1998, 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 provide 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 the distinctions 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.

Since there are many overlapping categories of types of knowledge, it is tempting to look for the definitive method of knowledge management. While we study many methods, there is no need to choose one method over another for all of the many different types of content. Respecting the diversity of types of knowledge, content management may be a better, more general term than knowledge management.

Nonaka and Takeuchi (1995) provide a more philosophical distinction: starting from the traditional definition of knowledge as "justified true belief." They define knowledge as "a dynamic human process of justifying personal belief toward the *truth*" (Nonaka and Takeuchi, 58, emphasis added). 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" mode 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 or she does and acts without distance, uses the body, and has great difficulty explaining in words the rules and algorithms the process he or 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 a 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, 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, and expressible in words and algorithms; however, explicit knowledge 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 adequately considering 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

Major theoretical KM models were chosen for this section based on the following criteria:

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

This is not meant to be an exhaustive list or a definitive short list; but the models have been selected with a view to providing the widest possible perspective on KM as a whole combined with a deeper, more robust theoretical foundation to explain, describe, and better predict how best to manage knowledge.

The von Krogh and Roos Model of Organizational Epistemology

The von Krogh and Roos KM model (1995) distinguishes between individual knowledge and social knowledge. Von Krogh and Roos take an epistemological approach to managing organizational knowledge: the organizational epistemology KM model. While pinning down a 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, that is, 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. From this perspective, knowledge resides not only in the minds of individuals, but also in the connections among these individuals. A collective mind is formed as the representation of this network; and it is this mind that lies at the core of organizational knowledge management.

Von Kroch 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 between the individuals. Knowledge is characterized as "embodied" that is, "everything known is known by somebody" (von Krogh and Roos 1995, 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 that tacit knowledge 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, 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 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, then KM will fail. If individual members are not eager to share their experiences with their colleagues on the basis of mutual trust and respect, then there will be no generation of social, collective knowledge within that organization. Finally, if those contributing knowledge are not evaluated highly 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, and Nonaka 2000) to propose a model of knowledge enabling, rather than knowledge management. Knowledge enabling refers to the "overall set of organizational activities that positively affect knowledge creation" (p. 4). This typically involves facilitating relationships and conversations as well as sharing local knowledge across an organization and across geographical and cultural borders.

The connectionist approach appears to be the more appropriate one 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 (harking back to the cognitive approach, which stresses the importance of communicating and storing explicit knowledge). In contrast, the structural characteristics of the Japanese language and influences such as Zen Buddhism led the Japanese to consider that there is a oneness of humanity and nature, body and mind, and self and the other (Nonaka and 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 emphasize the necessity of integrating the two approaches, from the cultural, epistemological, and organizational points of view, in order to acquire new cultural and operational tools 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 Western and Japanese schools of thought.

The Knowledge Creation Process 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 (predominantly 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, there are four modes of knowledge conversion that:

> Constitute the *engine* of the entire knowledge-creation process. These modes are what the individual experiences. They are also the mechanisms by which individual knowledge gets articulated and *amplified* into and throughout the organization. (p. 57, emphasis added)

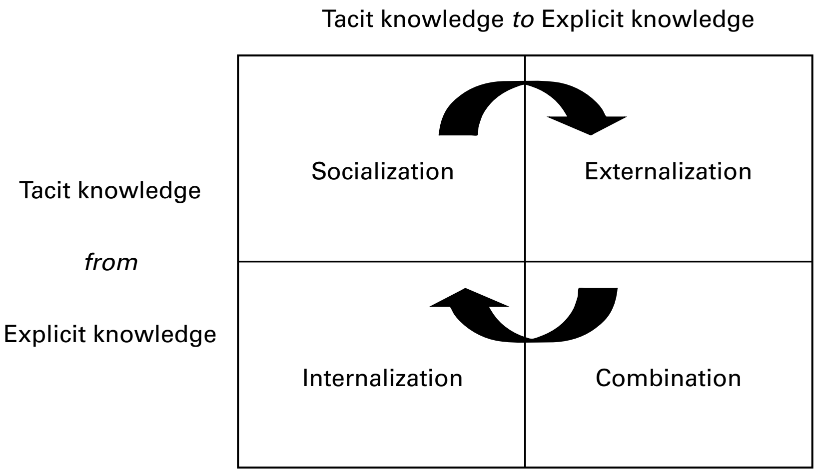


Figure 3.1
The Nonaka and Takeuchi model of knowledge conversion

> Organizational knowledge creation, therefore, should be understood as a process that organizationally amplifies the knowledge created by individuals and crystallizes it as a part of the knowledge network of the organization. (p. 59)

> Knowledge creation consists of a social process between individuals in which knowledge transformation is not simply a unidirectional process but it is interactive and spiral. (pp. 62–63)

Knowledge Conversion There are four modes of knowledge conversion, as shown in figure 3.1:

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. Furthermore, it is difficult and time-consuming to disseminate all knowledge using only the socialization mode.

Davenport and Prusak (1998, 70) 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."

This means that the process of acquiring tacit knowledge is not strictly tied to the use of language but to experience and to the ability to transmit and to share it. This must not be confused with the idea of a simple transfer of information because there is no knowledge creation if we abstract the transfer of information and experiences away from the associated emotions and specific contexts in which they are embedded. Socialization consists of sharing experiences through observation, imitation, and practice.

For example, Honda organizes "brainstorming camps" during which there are detailed discussions to solve difficult problems in development projects. These informal meetings are usually held outside the workplace, off-site, where everyone is encouraged to contribute to the discussion and no one is allowed to refer to the status and qualification of employees involved. The only behavior not allowed during these discussions is simple criticism not followed by constructive suggestions. Brainstorming meetings are used by Honda not only to develop new products, but also to improve its managerial systems and its commercial strategies. Brainstorming can represent occasions for creative dialogue. And brainstorming provides a moment of shared experience, followed by sharing tacit knowledge. During brainstorming, people create harmony among themselves, they feel engaged as part of a whole, and they feel themselves allied by the same goal. Many other organizations organize similar "Knowledge Days" or "Knowledge Cafés" 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 and Takeuchi 1995, 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. Knowledge that was previously tacit can somehow be written down, recorded, drawn, or made tangible or concrete in some manner. An intermediary is often needed at this stage, because it is always 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 (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).

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

For example, Canon decided to design and produce a mini-copier that can be used occasionally for personal use. This new product was very different from expensive industrial copiers, which also engendered high maintenance costs. Canon had to design something that was relatively inexpensive with reasonable maintenance costs. The Canon mini-copier project members understood that the most frequent problem was with the 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 knowledge into a new form. Some examples would be a synthesis in the form of a review report, a trend analysis, a brief executive summary, or a new database to organize content. No new knowledge is created per se—it is a new combination or representation of existing or already explicit knowledge. In other words, combination 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.

Another example is that of Kraft General Foods when they 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 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 has developed a system of documenting all customer complaints and inquiries in a database that can be accessed by all its employees. This system allows the employees to find answers to new customers' questions much more quickly because it facilitates the sharing of employees' experiences in problem solving. This system 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. It is crucial that knowledge is not halted 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 brought into contact with other organizational members, thereby starting a new spiral of knowledge creation (Nonaka and Takeuchi 1995, 69). When experiences and information are transferred through observation, imitation, and practice, then we are back in the socialization quadrant. This knowledge is then formalized and converted into explicit knowledge, through 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 thus become tacit knowledge.

Knowledge Spiral Knowledge creation is not a sequential process, but depends on a continuous and dynamic interaction between tacit and explicit knowledge throughout the four quadrants. Organizations articulate, organize, and systematize individual tacit knowledge, produce and develop tools, structures, and models to accumulate it and share it to create new knowledge through the knowledge spiral as illustrated in figure 3.2. The knowledge spiral is a continuous activity of knowledge flow, sharing, and conversion by individuals, communities, and the organization itself.

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

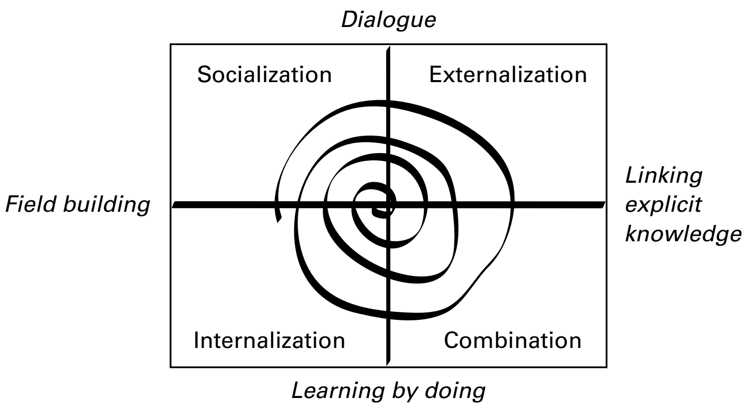


Figure 3.2
The Nonaka and Takeuchi knowledge spiral

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

Knowledge sharing and use happens through the knowledge spiral that, "starting at the individual level and moving up through expanding communities of interaction [. . .] crosses sectional, departmental, divisional and organizational boundaries" (Nonaka and Takeuchi 1995, 72). Nonaka and Takeuchi argue that an organization has to promote a facilitating context in which both the organizational and the individual knowledge-creation processes can easily take place, acting as a spiral. They describe the following "enabling conditions for organizational knowledge creation":

Intention An organization's aspiration to its goals (strategy formulation in a business setting)

Autonomy To allow individuals to act autonomously, according to the "minimum critical specification" principle, and involved in cross-functional self-organized teams

Fluctuation and creative chaos To stimulate the interaction between the organization and the external environment and/or create fluctuations and breakdowns by means of creative chaos or strategic "equivocality"

Redundancy Existence of information that goes beyond the immediate operational requirements of organizational members; competing multiple teams on the same issue; strategic rotation of personnel

Requisite variety Internal diversity to match the variety and complexity of the environment; to provide to everyone in the organization the fastest access to the broadest variety of necessary information; flat and flexible organizational structure interlinked with effective information networks

The Nonaka and Takeuchi model has proven to be one of the more robust 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)

SOM (http://www.som.com) is a leading architecture, urban design and planning, engineering, and interior architecture firm in the US (Pulsifer 2008). Founded in 1936, SOM has completed more than ten thousand 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 is 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 creative and innovative knowledge—pretty much the polar opposite of such well-documented explicit knowledge 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 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) has described a model of knowledge management that stresses sense making (largely based on Weick 2001), knowledge creation (based on Nonaka and Takeuchi 1995), and decision making (based on, among 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.

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

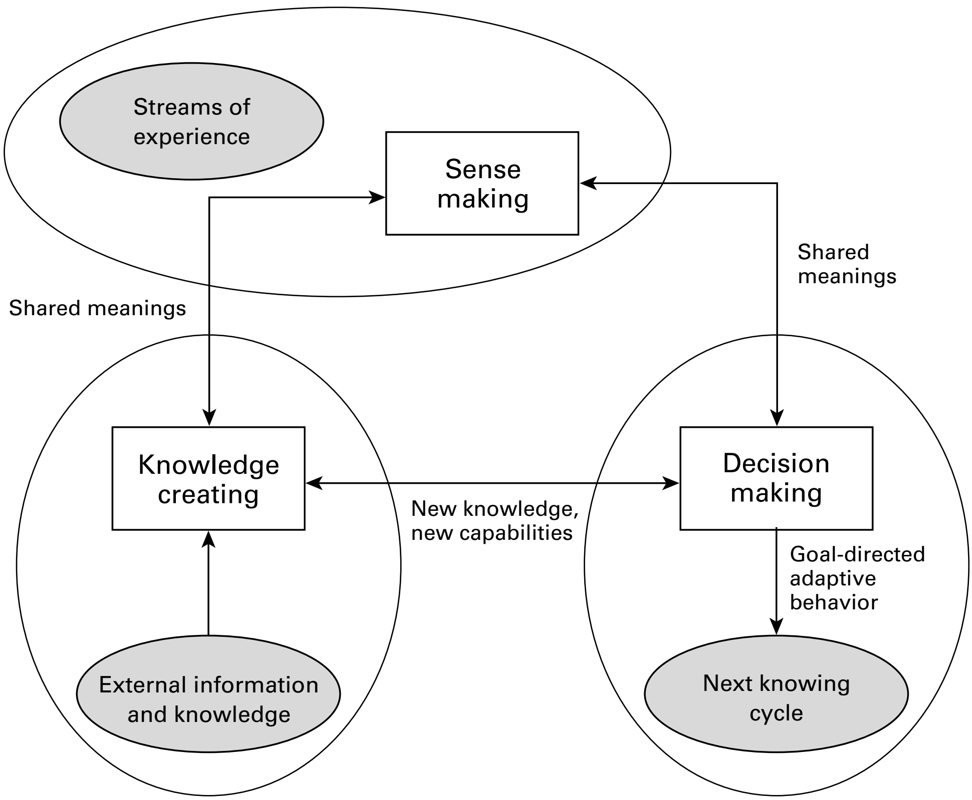


Figure 3.3
Overview of Choo's (1998) knowledge management model

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 and orderly processes in an organization through the shared interpretation of individuals. A *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) claims that sense making in organizations consists of four integrated processes:

- Ecological change
- Enactment
- Selection
- 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 dialog, 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 and Nalebuff 1991; Bierman and Fernandez 1993), chaos theory, emergent theory, and complexity theory (e.g., Gleick 1987; Fisher 1984; Simon 1969; Stewart 1989; Stacey 1992), 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, 139).

Simon (1957, 198) identified the principle of bounded rationality as a constraint for organizational decision making, stating that "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."

Simon suggested that persons faced with ambiguous goals and unclear means of linking actions to those goals seek to fulfill short-term subgoals. Subgoals are objectives that the individual believes can be achieved by allocating resources under his or her control. These subgoals are generally not derived from broad policy goals, but rather from experiences, education, the community, and personal needs. 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 that 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" (i.e., a combination 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 did manage 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 well-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 that 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 (i.e., a car) using semantic networks.

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

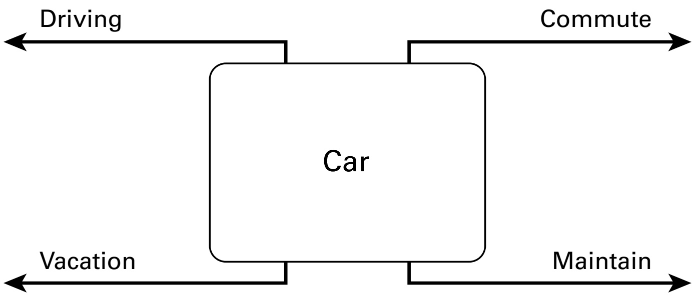


Figure 3.4
Example of a semantic network

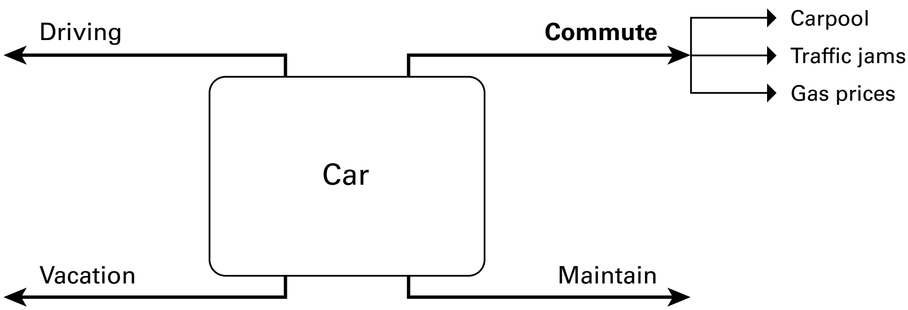


Figure 3.5
Example of a semantic network—"commute" view

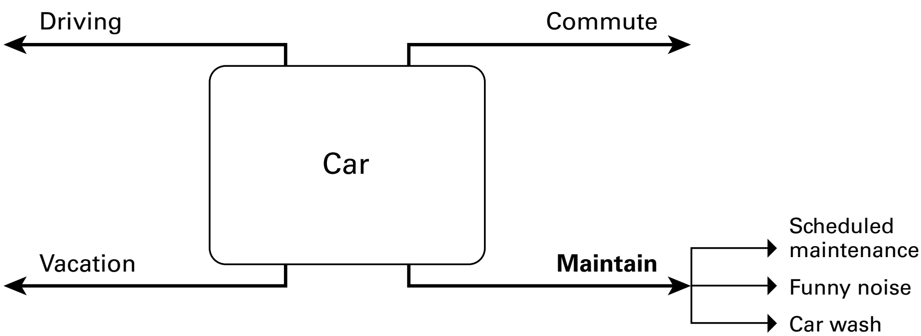


Figure 3.6
Example of a semantic network—"maintain" view

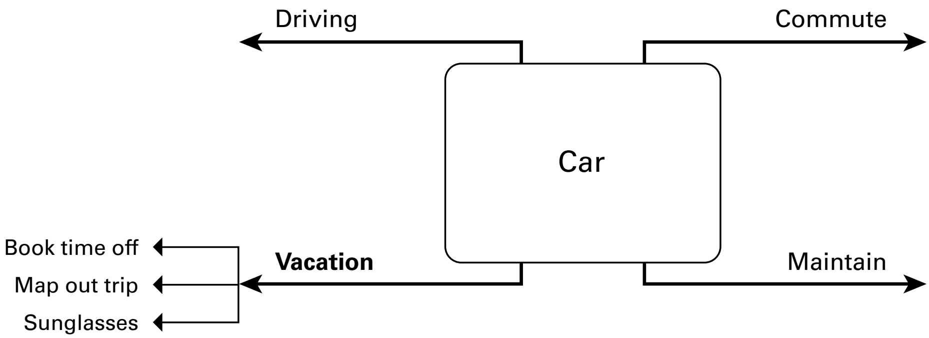


Figure 3.7
Example of a semantic network—"vacation" view

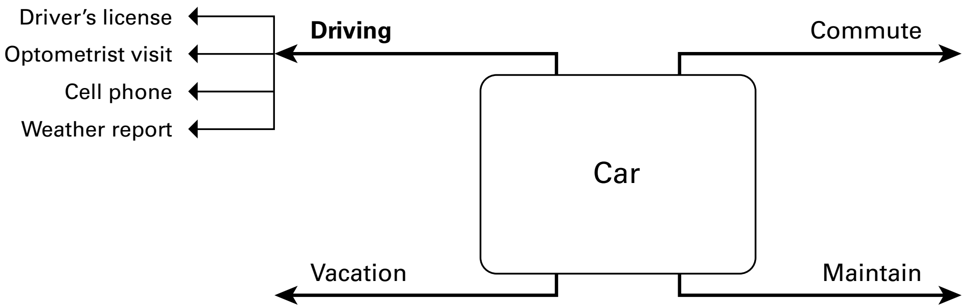


Figure 3.8
Example of a semantic network—"driving" view

general, there is a continuum of internalization, starting with the lowest level, the novice, who "does not know he does not know," that is, who does not even have 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).

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 web site. *Shared expertise* is proprietary knowledge assets that are exclusively held by knowledge workers and shared in their work or embedded in technology. This form of knowledge is usually communicated via specialized languages and representations. Although he does not use the term,

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

this knowledge form would be common in communities of practice, informal networks of likeminded professionals who typically interact and share knowledge in order to improve the practice of their profession. Finally, personal knowledge is the least accessible but most complete form of knowledge. *Personal knowledge* is typically more tacit than explicit knowledge, and is 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, readings—typically directly observable and verifiable content. *Conceptual knowledge* deals with systems, concepts, and perspectives (e.g., concept of a track record, a bull 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.

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.

Table 3.2
Wiig KM matrix

Form of knowledge	Type of knowledge			
	Factual	*Conceptual*	*Expectational*	*Methodological*
Public	Measurement, reading	Stability, balance	When supply exceeds demand, price drops	Look for temperatures outside the norm
Shared	Forecast analysis	Market is hot	A little water in the mix is 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?

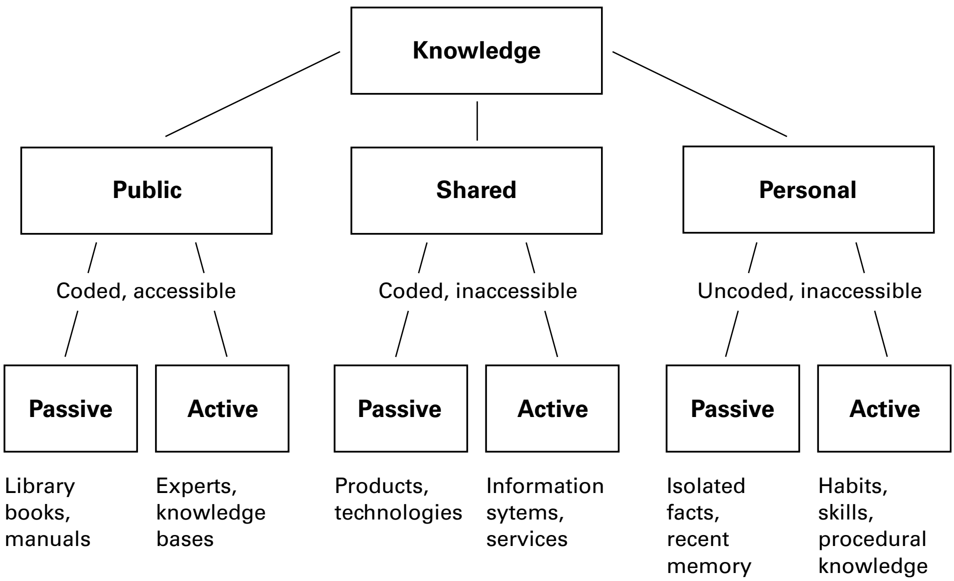


Figure 3.9
Wiig hierarchy of knowledge forms

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 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 or 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:

The more easily data can be structured and converted into information, the more diffusible it becomes.

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. The data are 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 the socialization quadrant 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):

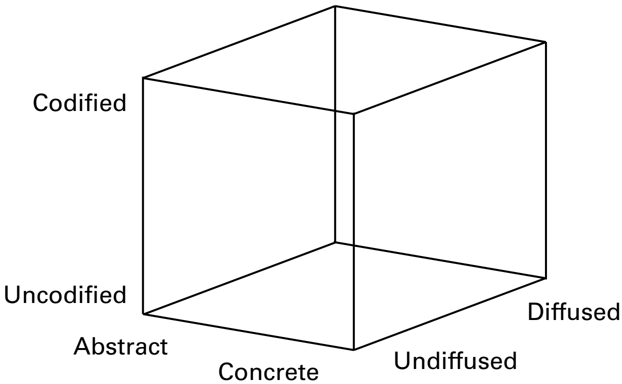


Figure 3.10
The Boisot I-Space KM model

- Codified—uncodified
- Abstract—concrete
- 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.

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 an SLC—something that is not directly addressed by the other KM models. However, the Boisot model appears to be somewhat less well known, less accessible, and as a result 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.

Table 3.3
The social learning cycle in Boisot's I-Space KM model

Phase	Name	Description
1	Scanning	• Identifying threats and opportunities in generally available but often fuzzy content • Scanning patterns such as unique or idiosyncratic insights that then become the possession of individuals or small groups • Scanning may be very rapid when the data is well codified and abstract and very slow and random when the data is uncodified and context-specific
2	Problem solving	• The process of giving structure and coherence to such insights, that is, codifying them • In this phase they are given a definite shape and much of the uncertainty initially associated with them is eliminated • Problem solving initiated in the uncodified region of the I-Space is often both risky and conflict-laden
3	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 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

Source: Adapted from Boisot (1998).

Complex Adaptive System Models of KM

The intelligent complex adaptive systems (ICAS) KM theory of the organization views the organization as an ICAS (e.g., , 1989 1981; Bennet and Bennet 2004). Beer (1981) was a pioneer in the treatment of the organization as a living entity. In his viable system model (VSM), a set of functions is distinguished that ensure 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 VSM 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 with a 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.

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

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

Snowden's Cynefin model is less concerned with tacit-explicit conversions because of its focus on descriptive self-awareness rather than prescriptive organization models.

Bennet and Bennet (2004) also describe a complex adaptive system approach to KM but the conceptual roots are somewhat different from the Beer VSM. Bennet and Bennet believe strongly that the traditional bureaucracies or popular matrix and flat organizations are not sufficient to provide the cohesiveness, complexity, and selective pressures that ensure the survival of an organization. A different model is proposed, one in which the organization is viewed as a system that is in a symbiotic relationship with its environment, that is, "turning the living system metaphor into reality" (Bennet and Bennet 2004, 25). The 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.

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

The five 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.

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 approach. Unity and a shared purpose represent the ability of the organization to integrate and mobilize 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., the number of different relevant

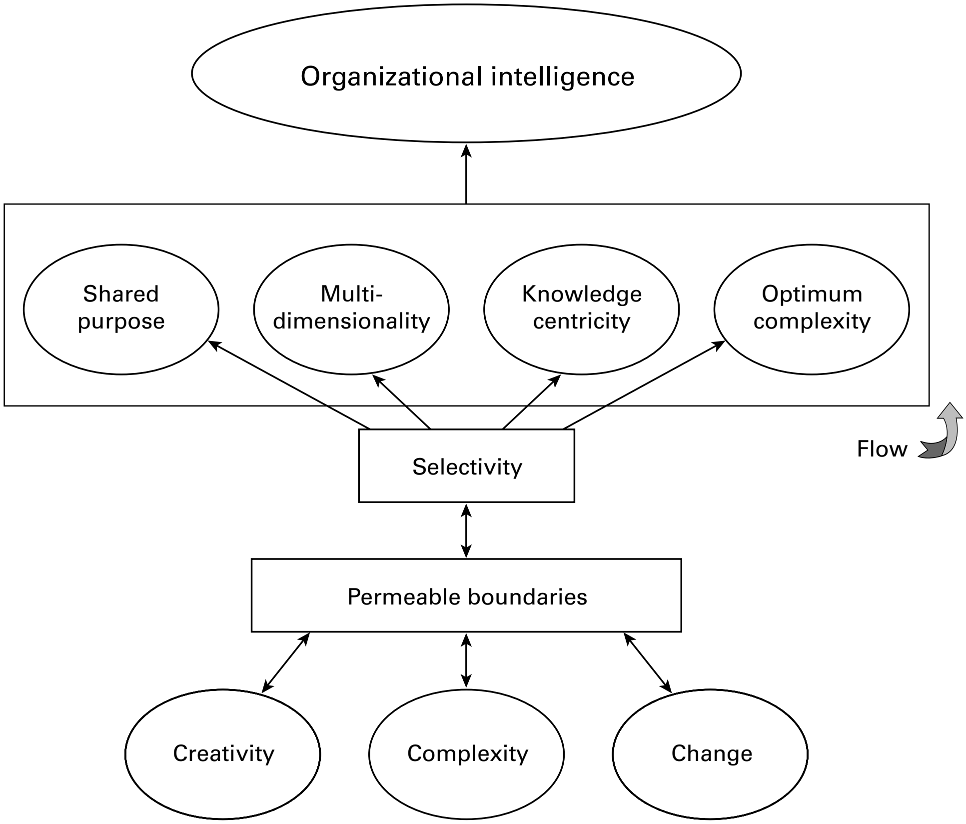


Figure 3.11
Overview of ICAS knowledge management model

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 facilities 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 that 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 (EFQM) KM Model

The 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.

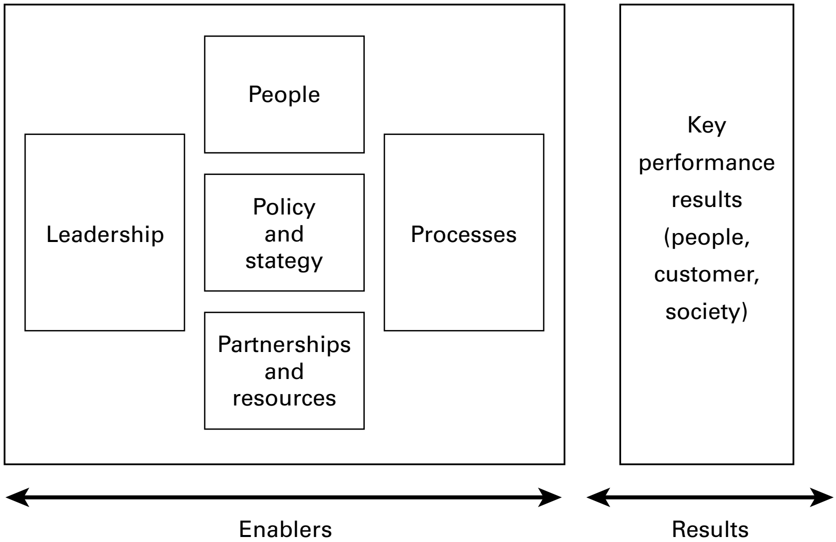


Figure 3.12
The key components of the EFQM model

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 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

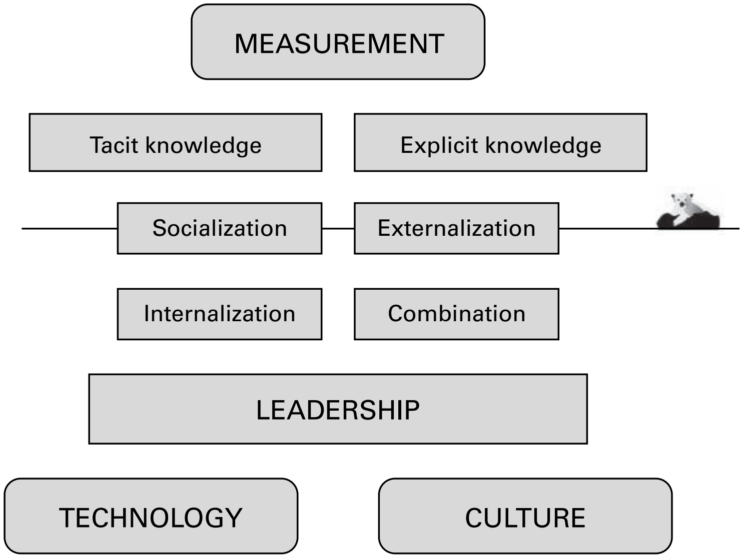


Figure 3.13
Overview of the inukshuk KM model

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.

The process element is directly derived from the SECI model (Nonaka and 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. 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 the first chapter in order to take our understanding to a deeper level. KM models are still fairly new to the practice or business of knowledge management, and yet they represent the way forward. 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 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 and Roos KM model take an organizational epistemology approach and emphasize 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 creation, 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 and Bennet (1989) and Bennet (1981) have applied this approach to describe the cohesiveness, complexity, and selective pressures that operate on 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.

Discussion Points

1. Compare and contrast the cognitive and connectionist approaches to knowledge management. Why is the connectionist approach more suited to the von Krogh KM

model? 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 (i.e., 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 and Weick KM 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 selecting a KM model for a given organization? What are some of the questions you would ask of the employees? Of the senior managers? Others?

9. How would you justify the need for a KM model?

10. What is the relationship between the KM processes described in chapter 2 and the KM models outlined in this chapter?

References

Beer, S. 1981. *Brain of the firm*. 2nd ed. New York: John Wiley.

Beer, S. 1989. The viable system model: Its provenance, development, methodology and pathology. In *The viable system model: Interpretations and applications of Stafford Beer's VSM*, edited by R. Esperjo and R. Harnden. New York: John Wiley.

Bennet, A., and D. Bennet. 2004. *Organizational survival in the new world: The intelligent complex adaptive system. A new theory of the firm*. Burlington, MA: Elsevier Science.

Bhatt, G. 2000. Organizing knowledge in the knowledge development cycle. *Journal of Knowledge Management* 4 (1):15–26.

Bhatt, G. 2001. Knowledge management in organizations: Examining the interactions between technologies, techniques and people. *Journal of Knowledge Management* 5 (1):68–75.

Bhatt, G. 2002. Management strategies for individual knowledge and organizational knowledge. *Journal of Knowledge Management* 6 (1):31–39.

Bierman, H., and L. Fernandez. 1993. *Game theory with economic applications*. Boston: Addison-Wesley.

Boisot, M. 1998. *Knowledge assets*. Oxford, UK: Oxford University Press.

Choo, C. 1998. *The knowing organization*. New York: Oxford University Press.

Clemson, B. 1984. *Cybernetics—A new management tool*. Kent, UK: Abacus Press.

Daft, R. L. 1982. Bureaucratic versus nonbureaucratic structure and the process of innovation and change. *Research in the Sociology of Organizations* 1:129–166.

Daft, R. L., and Weick, K. E., 1984. Toward a model of organizations as interpretation systems. *Academy of Management Review* 9:284–295.

Davenport, T., and L. Prusak. 1998. *Working knowledge*. Boston: Harvard Business School Press.

Dixit, A., and B. Nalebuff. 1991. *Thinking strategically*. New York: W.W. Norton & Company, Inc.

Fisher, B. A. 1984. Decision emergence: The social process of decision-making. In *Small group communication: A reader*, 4th ed., edited by R. S. Cathcart and L. A. Samovar. Dubuque, Iowa: Wm. C. Brown, 149–156.

Girard, J. 2005. The inukshuk: A Canadian knowledge management model. *KMPRO Journal* 2 (1):9–26.

Gleick, J. 1987. *Chaos—Making a new science*. Middlesex, UK: Penguin Books Ltd.

Lai, H., and T. Chu. (2000). Knowledge management: A review of theoretical frameworks and industrial cases. In Proceedings of the 33rd Hawaii International Conference on Systems Sciences, Volume 2, http://ieeexplore.ieee.org/xpl/freeabs_all.jsp?arnumber=926705 (accessed November 30, 2008).

Nonaka, I., and H. Takeuchi. 1995. *The knowledge-creating company: How Japanese companies create the dynamics of innovation*. New York: Oxford University Press.

Padgett, J. F. 1980. Managing garbage can hierarchies. *Administrative Science Quarterly* 25:538–604.

Polanyi, M. 1966. *The tacit dimension*. London: Routledge and Keagan.

Pulsifer, D. (2008). A case for knowledge management in the A/E industry. AECbytes Viewpoint #41, posted October 28. http://www.aecbytes.com/viewpoint/2008/issue_41.html (accessed November 1, 2008).

Simon, H. 1957. *Models of man: Social and rational*. New York: John Wiley.

Simon, H. 1969. *The sciences of the artificial*. Cambridge, MA: MIT Press.

Simon, H. 1976. *Administrative behavior: A study of decision-making processes in administrative organization*, 3rd ed. New York: Free Press.

Snowden, D. 2000. Complex acts of knowing: Paradox and descriptive self-awareness. *Journal of Knowledge Management* 6 (2):1–33.

Sommer, E., and D. Weiss, eds. (1995). *Metaphors dictionary*, 1st ed. Florence, KY: Thomson Publishing Company.

Stacey, R. D. 1992. *Managing the unknowable: Strategic boundaries between order and chaos in organizations*. San Francisco, CA: Jossey-Bass.

Stewart, I. 1989. *Does God play dice? The mathematics of chaos*. Oxford, UK: Blackwell.

Varela, F. 1992. Whence perceptual meaning? A cartography of current ideas. In *Self organization and the management of social system*, edited by F. Varela and J. Dupuy. New York: Springer-Verlag.

Von Krogh, G., K. Ichijo, and I. Nonaka. 2000. *Enabling knowledge creation: How to unlock the mystery of tacit knowledge and release the power of innovation*. Oxford, UK: Oxford University Press.

Von Krogh, G., and J. Roos. 1995. *Organizational epistemology*. New York: St. Martin's Press.

Von Krogh, G., J. Roos, and D. Kleine. 1998. *Knowing in firms: Understanding, managing and measuring knowledge*. London: Sage Publications.

Weick, K. 2001. *Making sense of the organization*. Malden, MA: Blackwell Publishing.

Wiig, K. 1993. *Knowledge management foundations: Thinking about thinking. How people and organizations create, represent and use knowledge*. Arlington, TX: Schema Press.

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–)

This chapter addresses the first phase of the knowledge management cycle, knowledge capture and/or 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. Knowledge capture and codification are the primary activities involved in knowledge retention strategies and the management of strategic human capital.

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.

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 do not 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).

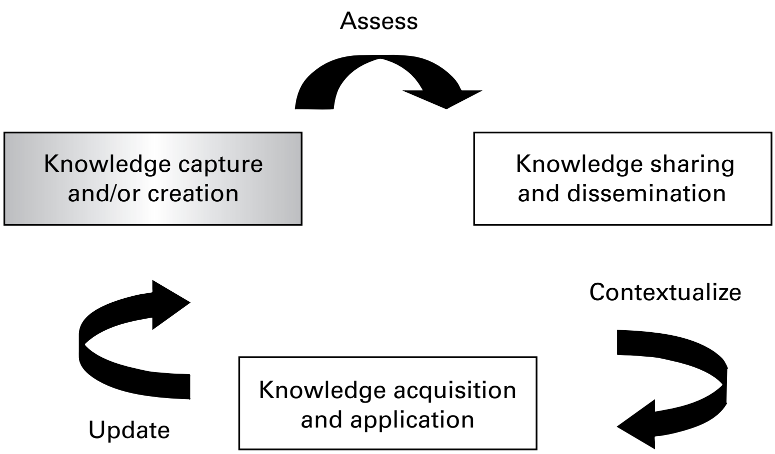


Figure 4.1
An integrated KM cycle

		Information sources	
		Known	Unknown
User awareness	Known	Know that we know	Know that we don’t know
	Unknown	Don’t know that we know	Don’t know that we don’t know

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 information technology (IT) plays only a small part in ensuring that information is available to those who 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 and 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 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 and 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, which then becomes 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 is 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 leverage it across multiple channels, including phone, e-mail, 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 and 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, Lane, and White 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

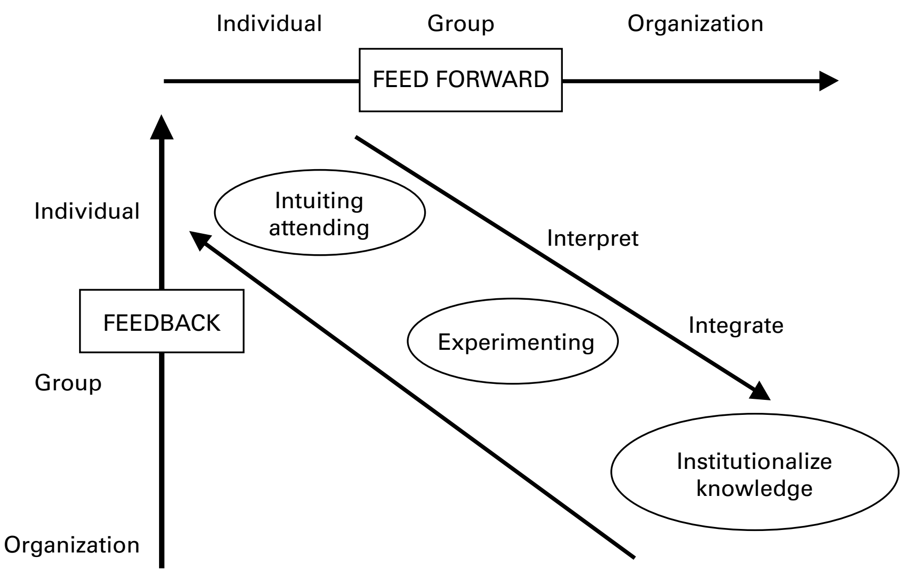


Figure 4.3
The 4I model of organizational learning (Crossan, Lane, and White 1999)

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 at the stage of interpreting.

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 and Levinthal 1990) and at some point, knowledge acquisition extends beyond the individuals and is coded into corporate memory (Inkpen 1995; Spender 1996; Nonaka and 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, 334) The value of tacit knowledge sharing was discovered in a surprising way at Xerox (Roberts-Witt 2002), which will be discussed 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 (e.g., Keritsis 2001) 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.

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 and Harrison-Briggs 1989, 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, Waterman, and Lenat 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 and Harrison-Briggs 1989, 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 perspectives, 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 one 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.

Interviewing Experts A number of techniques can be used to optimize the interviewing of experts. 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, or where the interview participants may hold very different mental models and personal characteristics such as background, attitude, training, and level of comfort with the 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 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 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 . . .

Transcripts of interviews are then analyzed in order to identify key concepts, common themes, major methods, and 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. 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. Unlike the initial interview sessions, where new content is generated and captured, subsequent interviews are more focused and target a more detailed level.

The best 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.

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. Further, stories 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—or 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 to communicate the organizational culture, and create a sense of belonging. In order to

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 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? (*an icebreaker question to help the interviewee feel comfortable and to begin talking*)

A: Over twenty 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*).

Box 4.1
(continued)

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

A: I shared my hard-earned wisdom and gray hairs with him! (Laughing)—I told him to forget 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, 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 techies 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!

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 moral 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 occur in all cultures but they definitely differ from one culture to another. Next, participants are given a fable minus the "punch line" and are asked to fill in the moral 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 aware of 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 end 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 and box 4.3.

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 that an expert performs and characterizes them in terms of prerequisite

Box 4.2
An example: 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, they make the learning memorable, and they make 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.

Box 4.3
An example: 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 Web site, 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 too. 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, and concentrate on breaking up the coffee machine cliques. However, companies should make opportunities for storytelling at informal get-togethers that are loosely organized as an off-site meeting, and through videotapes and bragging sessions.

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. This method 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 and Seale 1987; Gammack and Young 1985). Simulations are especially effective for later stages of knowledge acquisition, 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, 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 hand over 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
- Road maps
- Learning histories
- Action learning
- E-learning
- Learning from others through business guest speakers and benchmarking against best practices

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, e-mail, teleconference, and chat rooms.

Road maps are more formal in nature. They tend to be facilitated problem-solving meetings that are scheduled, convened, and that follow an agenda. The objective is to solve day-to-day problems in a public forum 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 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. 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

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 gathered from the interviews into a summary format that will make it very easy 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 subthemes as well as specific quotes to be used. The 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:

- 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 column 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 to 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 and 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

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 stand-alone 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)

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 it 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 e-mail, 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, 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, the speakers would give a seminar or workshop and leave behind a set of reference materials.

Figure 4.4 summarizes the key steps involved in knowledge acquisition at the individual and group level. 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.

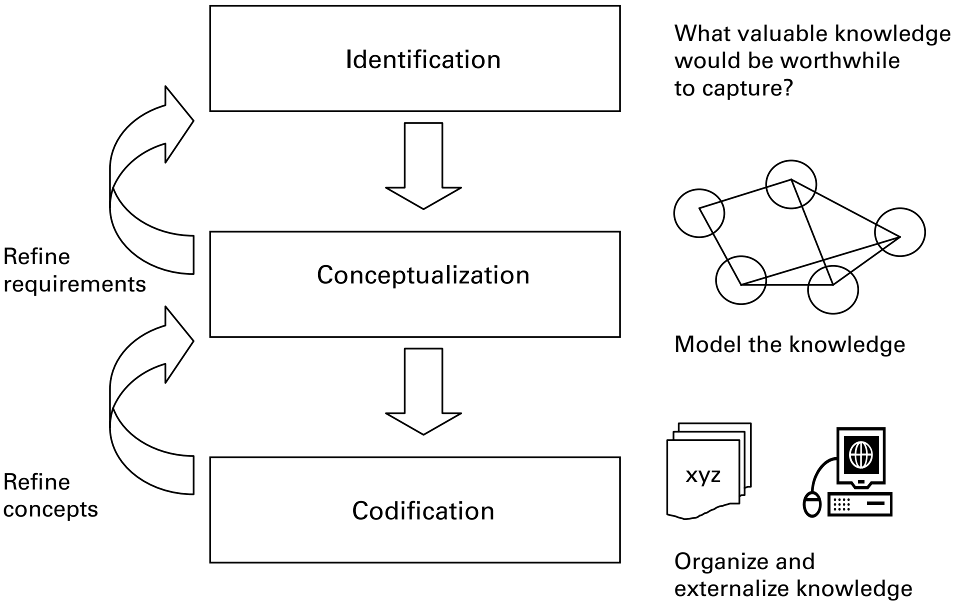


Figure 4.4
Key knowledge acquisition phases

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.

Tacit Knowledge Capture at the Organizational Level

Organizational knowledge acquisition is a qualitatively different process from those 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 on a macro level. Malhotra

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

(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 and 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, Barkema, and Douma 1994; Starbuck 1992). Argyris and 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. The type of learning is experimental and deductive, and this type of learning 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 between the different key concepts. When making cognitive maps, it is 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 between the concepts. These may be drawn manually, by taping small note pages on a wall, by using a whiteboard, or through visualization software (ranging from simple brainstorming mapping tools to 3D depictions). Figure 4.6 shows an example of a cognitive map in response to the question, "What are the major differences between tacit and explicit knowledge objects?"

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-

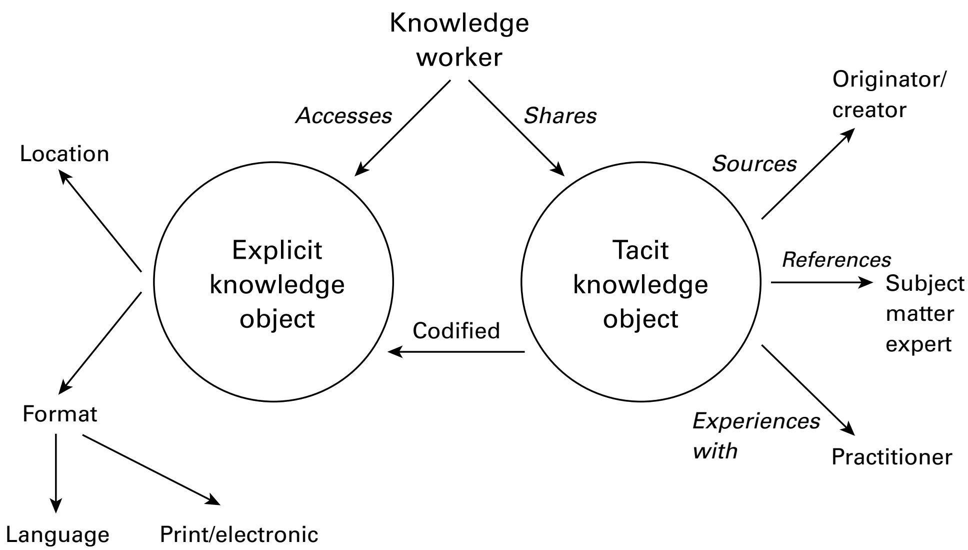


Figure 4.6
Example of a concept map

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, O'Hara, and Crow 1999), which is a knowledge engineering methodology centered on five types of 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 the 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 at 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

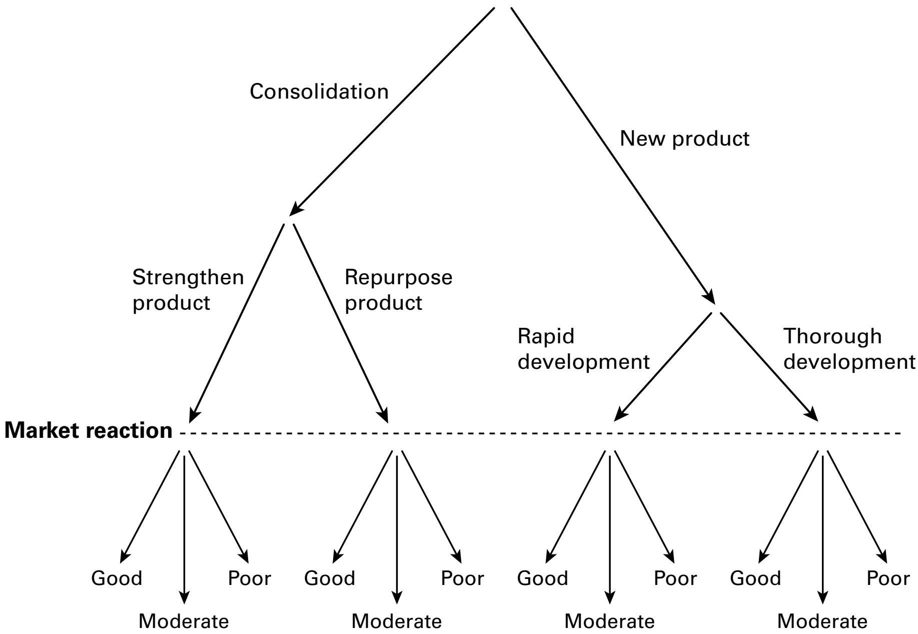


Figure 4.7
Example of a decision tree

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 of whether to consolidate or to develop a new product as a risk management 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 the 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

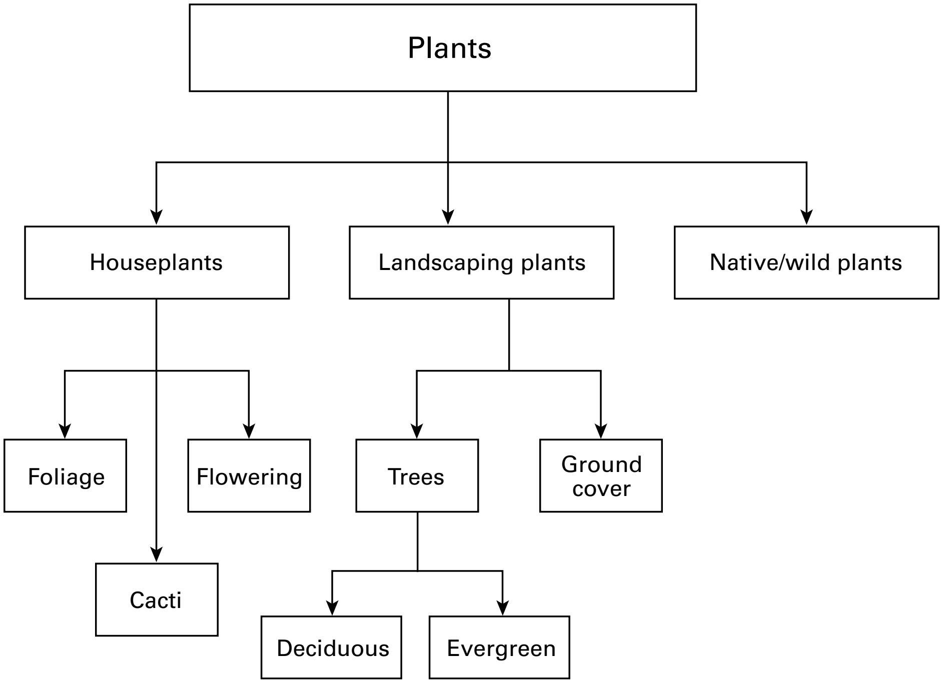


Figure 4.8
Example of a knowledge taxonomy

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.

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 that 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 e-mail folders or PC 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 e-mail subject heading and before naming a file to be sent as an attachment. Why? The names must make sense to you but also to the recipient. In the same way, 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 require the highest level of standardization and consensus. Perfect consensus is rarely feasible (and is not 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 prefer *knowledge sharing*, and yet another division may adopt *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, Durso, and Dearholt 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.

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 poly-hierarchy that makes use of more than one classification rule (or "facet"). The general guideline is that each facet must 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 should 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 is 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, and time to prepare. 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 a means of developing taxonomy while larger organizations may be better positioned

Table 4.2
Major taxonomic approaches to knowledge codification

Taxonomic approach	Key features
Cognitive or concept map	• Each key content item 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 a large amount of legacy content to sort through. • More expensive and still not completely accurate—will need to be validated and refined for maximum usefulness.

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 2009) 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 sticky-note 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. When 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 sticky 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, the most efficient grouping gives small numbers of groups (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 4.4.

Box 4.4
An example: Siemens

The Siemens AG ShareNet system 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 one hundred ShareNet managers, one in each country, who support contributors in capturing project experiences and marketing know-how. These managers drive the development of reusable knowledge. They spend 50 percent of their time on this and are supported by an eighteen-person-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 three thousand five hundred shares is granted 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.

Facet 1: Audience	Facet 2: Topic
Researcher Technology transfer officer Media liason officer Donor relations officer	Social cognition, emotional IQ Online hate content detection Bullying, cyberbullying Adolescent issues, peer pressure

Adolescent issues
  Peer Pressure
    Bullying
      Cyberbullying
	Hate literature
	  Online hate literature
	    Online detection/monitoring
	      Cyberbullying

Figure 4.9
Example of multifaceted taxonomy for cyberbullying

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 such skills 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 and 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.

The Relationships among Knowledge Management, Competitive Intelligence, Business Intelligence, and Strategic Intelligence

Knowledge management has historically focused on capturing knowledge from within the organization and from past events in the history of the organization while competitive intelligence has traditional focused on external resources (Bouthillier and Dalkir 2005). Competitive intelligence (CI) can be defined as "A systematic and ethical program for gathering, analyzing, and managing external information that can affect your company's plans, decisions, and operations." (SCIP, Society of Competitive Information Professionals, http://www.scip.org/) However, both KM and CI are concerned with "strategic intelligence," that is, information resources that are needed for decision making, which in turn benefits, the company (Liebowitz 2006). Business intelligence (BI) is often used as a synonym for CI, but really refers to the set of tools that allow

Box 4.5
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 (for the Donor Relations Group), to find someone who can answer questions from the media regarding a current event (for the Media Group), and to meet with prospect companies interested in commercializing some of the results of their research (for the Technology Transfer Group). While a number of researcher profiles existed, they tended to be scattered over personal Web sites, university departmental Web pages, and other stand-alone applications. The challenge was how to present the same research 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 users 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 cyber-bullying incident brings reporters to call the Education Department to find someone to speak on the topic (Kowalski, Limber, and Agatston 2008). Cyber-bullying 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 cyber-bullying. 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), cyber-bullying (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.

information to be gathered and used in decision making. BI therefore represents the tools used for not only CI but also for customer profiling, market research, and other analyses.

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, Boenisch, and Harden 2003). Whereas knowledge management is concerned with capturing and sharing know-how valuable to colleagues who are 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 the knowledge transfer from this departing individual to his or her successor, the problem is not so localized. Knowledge continuity should not focus solely on the specific knowledge to be transferred between individuals. Instead, 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 a departure, whether due to a baby boomer retiring or other reasons, on the communities that they 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). That is, 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 challenges 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 can be fairly vague at the level of the individual knowledge worker. The prevalence of the "knowledge is power" paradigm 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:

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.

Remember to forget The role of unlearning or reframing cannot be emphasized enough (e.g., Fiol and 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 the type of unlearning that involves 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, as quoted in *The World Book Encyclopedia* (1993) Vol. E, p. 78).

Do not spill any knowledge during transfer Conversion of tacit knowledge to explicit knowledge must be accomplished without significant loss of knowledge (e.g., Brown and Duguid 2000). The advantages of communicability do not always outweigh the disadvantages of "knowledge leakage." It is crucial to maintain links to knowers, that is, 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.

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 than explicit knowledge. 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.
- Knowledge bases must be populated and contents deployed in order to maximize efficiency and effectiveness throughout the organization.

Discussion Points

1. Why is it difficult to directly codify tacit knowledge?
2. What are some of the pitfalls that may be encountered in capturing tacit knowledge? How would you address these?
3. What is the purpose of a learning history? What are its key components?
4. 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?
5. Define knowledge continuity management and discuss its strategic implications for knowledge capture and codification.

References

Aesop. 1968. *Aesop's fables*, trans. G. F. Townsend. New York: Doubleday and Co.

Argyris, C., and D. Schon. 1978. *Organizational learning: A theory of action perspective*. New York: McGraw-Hill.

Beazley, H., J. Boenisch, and D. Harden. 2003. *Continuity management: Preserving corporate knowledge and productivity when employees leave*. New York: Wiley.

Bouthillier, F., and K. Dalkir. 2005. Knowledge management and competitive intelligence: Examination of similarities, differences and intersections. In *Knowledge management: Nurturing culture innovation and technology. Proceedings of the 2005 International Conference on Knowledge Management*, edited by S. Hawamdeh. River Edge, NJ: World Scientific, 603–610.

Brown, J., and P. Duguid. 2000. Balancing act: How to capture knowledge without killing it. *Harvard Business Review* 78 (3):73–80.

Bush, V. 1945. As we may think. *Atlantic Monthly* 176 (1):101–108.

Cohen, W., and D. Levinthal. 1990. Absorptive capacity: A new perspective on learning and innovation. *Administrative Science Quarterly* 35:128–152.

Cope, M. 2000. *Know your value? Value what you know*. New York: Financial Times Prentice Hall.

Crossan, M., W. Lane, and R. White. 1999. An organizational learning framework: From intuition to institution. *Academy of Management Review* 24 (3):522–537.

Denning, S. 2001. *The springboard: How storytelling ignites action in knowledge-era organizations*. Woburn, MA: Butterworth-Heinemann.

Dodgson, M. 1993. Organizational learning: A review of some literatures. *Organization Studies* 14 (3):375–394.

Farnum, C. 2002. Re-designing an e-business taxonomy: EGreetings project case study. *ASIS Bulletin* June–July: 10–13, http://www3.interscience.wiley.com/cgi-bin/fulltext/109861957/PDFSTART. Accessed June 4, 2010.

Field, A. 2003. When employees leave the company, how can you make sure their expertise doesn't? *Harvard Management Communication Letter* 6 (4).

Fiol, C., and M. Lyles. 1985. Organizational learning. *Academy of Management Review* 10: 803–813.

Frappaolo, C. 2006. *Knowledge management*. Oxford, UK: Capstone.

Gaffney, G. 2000. What is card sorting? *Information & Design,* http://www.infodesign.com.au/usabilityresources/design/cardsorting.asp.

Gammack, J., and R. Young. 1985. Psychological techniques for eliciting expert knowledge. In *Research and development in expert systems*, edited by M. Bramer. London: Cambridge University Press, 105–112.

George, T., and Kolbasuk McGee, M. 2003. Educational advantage: E-learning helps companies capture the knowledge of retiring employees and gain competitive edge. *Information Week*. (March 10, 2003 issue). http://www.informationweek.com/news/global-cio/training/showArticle.jhtml?articleID=8700323).

Hayes-Roth, F., D. Waterman, and D. Lenat. 1983. *Building expert systems*. Reading, MA: Addison-Wesley.

Huber, G. 1991. Organizational learning: The contributing processes and a review of the literatures. *Organization Science* 2 (1):88–117.

Inkpen, A. 1995. *The management of international joint ventures*. New York: Routledge.

Inkpen, A., and P. Beamish. 1997. Knowledge, bargaining power, and the instability of international joint ventures. *Academy of Management Review* 22:177–202.

Johnson, S. 1967. Hierarchical clustering schemes. *Psychometrika* 32:241–254.

Kawakita, J. 1991. *The original KJ method*. Tokyo: Kawakita Research Institute.

Kelly, G. 1955. *The psychology of personal constructs*. New York: Norton.

Keritsis, G. 2001. Knowledge management—Digital cloning (KES). In *IT Toolbox Knowledge Management*. http://knowledgemanagement.ittoolbox.com/pub/GK041401.pdf (accessed December 10, 2008).

Kowalski, R., S. Limber, and P. Agatston. 2008. *Cyber bullying. Bullying in the digital age*. Malden, MA: Blackwell Publishing.

Kruskal, J. 1977. Multidimensional scaling and other methods for discovering structure. In *Statistical methods for digital computers*, edited by K. Enslein, A. Ralston, and H. S. Wilf, vol. 2. London: Sage Publishers, 296–339.

Lambe, P. 2007. *Organising knowledge: Taxonomies, knowledge and organizational effectiveness*. Oxford, UK: Chandos Publishing.

Leake, D., A. Maguitman, T. Reichherzer, A. Canas, M. Carvalho, M. Arguedas, S. Brenes, and T. Eskridge. 2003. Aiding knowledge capture by searching for extensions of knowledge models. In *Proceedings of K-Cap '03*. New York: ACM.

Liebowitz, J. 2006. *Strategic intelligence. Business intelligence, competitive intelligence and knowledge management*. Boca Raton, FL: Auerbach Publications.

Linnaeus, C. 1767. *Systema naturae*. The Netherlands. In P. Lambe, 2007. *Organising knowledge: Taxonomies, knowledge and organization effectiveness*. UK: Chandos Publishing.

Malhotra, Y. 2000. *Knowledge management and virtual organizations*. London: Idea Group Publishing.

McGraw, K., and K. Harrison-Briggs. 1989. *Knowledge acquisition: Principles and guidelines*. Englewood Cliffs, NJ: Prentice-Hall.

McGraw, K., and M. Seale. 1987. Structured knowledge acquisition techniques for combat aviation. In *Proceedings of NAECON'87* 4:1340–1348.

Mintzberg, H. 1990. Strategy formation: Schools of thought. In *Perspectives of strategic management*, edited by J. Frederickson. New York: Harper Business.

Moorman, C., and A. Miner. 1997. The impact of organizational memory on new product performance and creativity. *Journal of Marketing Research* 34:91–106.

Nelson, R., and S. Winter. 1982. *An evolutionary theory of economic change*. Cambridge, MA: Belknap Press.

Nielsen, J. 1994. *Usability engineering*. San Mateo, CA: Morgan Kaufmann.

Nonaka, I., and H. Takeuchi. 1995. *The knowledge creating company*. New York: Oxford University Press.

Oppenheim, A. 1966. *Questionnaire design and attitude measurement*. New York: Basic Books.

Parsaye, K. 1988. Acquiring and verifying knowledge automatically. *AI Expert* 3 (5):48–63.

Pennings, J., H. Barkema, and S. Douma. 1994. Organizational learning and diversificiation. *Academy of Management Journal* 37:608–640.

Roberts-Witt, S. 2002. A "Eureka" moment at Xerox. *PC Magazine, March 26*. http://www.pcmag.com/article2/0,4149,28792,00.asp. (accessed June 4, 2010).

Roth, G., and A. Kleiner. 2000. Developing organizational memory through learning histories. In *The knowledge management yearbook 2000–2001*, edited by J. W. Cortada and J. A. Woods. Woburn, MA: Butterworth-Heinemann, 123–144.

Schreiber, G., H. Akkermans, A. Anjewierden, R. de Hoog, N. Shadbolt, W. Van de Velde, and B. Wielinga. 2000. *Knowledge engineering and management: The commonKADS methodology*. Cambridge, MA: MIT Press.

Schvaneveldt, R., F. Durso, and T. Dearholt. 1985. *Pathfinder scaling with network structures*. Memorandum in Computer and Cognitive Science, MCCS-85-9. Las Cruces, NM: Computing Research Laboratory, New Mexico State University.

Shadbolt, N., K. O'Hara, and L. Crow. 1999. The experimental evaluation of knowledge acquisition techniques and methods: History, problems and new directions. *International Journal of Human-Computer Studies* 51 (4):729–755.

Shaw, M. 1981. *Recent advances in personal construct theory*. New York: Academic Press.

Smith, L. 2000. Knowledge discovery, capture and creation. *Bulletin of the American Society for Information Science* 26 (2):11–12.

Snowden, D. 2001. Narrative patterns: The perils and possibilities of using story in organizations. http://www.kwork.org/Resources/narrative.pdf. (accessed June 4, 2010).

Sole, D., and D. Wilson. 1999. Storytelling in organizations: The power and traps of using stories to share knowledge in organizations. http://lila.pz.harvard.edu/_upload/lib/ACF14F3.pdf. (accessed June 4, 2010).

Spender, J.-C. 1996. Making knowledge the basis of a dynamic theory of the firm. *Strategic Management Journal* 17:45–62.

Starbuck, W. 1992. Learning by knowledge intensive firms. *Journal of Management Studies* 29:713–740.

Svenson, O. 1979. Process descriptions of decision making. *Organizational Behavior and Human Performance* 23:86–112.

Swap, W., D. Leonard, M. Shields, and L. Abrams. 2001. Using mentoring and storytelling to transfer knowledge in the workplace. *Journal of Management Information Systems* 18 (1):95–114.

Van de Ven, A., and D. Polley. 1992. Learning while innovating. *Organization Science* 3:92–116.

Walsh, J., and G. Ungson. 1991. Organizational memory. *Academy of Management Review* 16:57–91.

Warfel, T. 2009. *Prototyping: A practitioner's guide*. New York: Rosenfield Media Publishers.

Zietsma, C., M. Winn, O. Branzei, and I. Vertinsky. 2002. The war of the woods: Facilitators and impediments of organizational learning processes. *British Journal of Management* 13:S61–S74.

5 Knowledge Sharing and Communities of Practice

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

This chapter addresses the social nature of knowledge, knowledge sharing, and communities of practice (CoP). A number of important conceptual frameworks are presented to study the social construction of meaning. Knowledge-sharing groups such as communities of practice 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. Outline the major phases in the life cycle of a community and the corresponding information and knowledge management (KM) needs for each.
3. Define the major roles and responsibilities in a community of practice, with particular emphasis on the integration of library and information professionals' skills.
4. Characterize knowledge-sharing channels with respect to the dimensions of social presence and media richness.
5. Analyze the flow of knowledge in a community of practice using appropriate tools and techniques to identify enablers and obstacles to knowledge sharing.

6. Discuss how communities can be linked to organizational memory in order to foster organizational learning and innovation.

Introduction

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

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 the International Data Corporation's Content Technologies Group director, Susan 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).

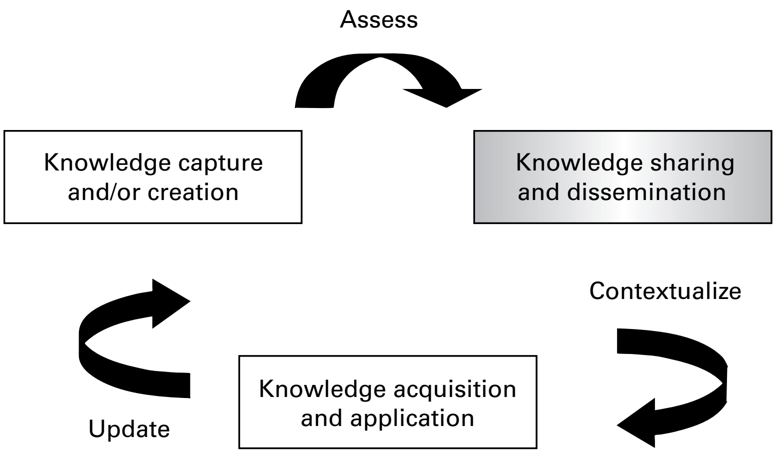


Figure 5.1
An integrated KM cycle

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 one thousand 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.

In 2000, the IBM Institute conducted a survey of forty managers at a 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

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 (extract 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:

1. Enter the number of a company's employees.
2. Enter the average number of intranet pages each employee visits per day.
3. 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 "Dammit! I'm lost." A typical range is between five and twenty seconds.
4. Enter the average employee's annual salary.
5. Push the Calculate button.

Source: http://www.dack.com/web/cost_analyzer.html

Table 5.1
Results of the IBM Institute survey

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

knowledge base was ranked only fourth among the five choices for preferred sources of information as shown in table 5.1.

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 KM systems. Only one in five knowledge workers consistently finds the information needed to do his or her job, and Cross and Parker (2004) found that knowledge workers spend more time recreating existing information they were unaware of than 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 found. In addition, the person turned to may help us to reformulate our question or query, tell us whether we were on the right track or 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 and 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 e-mail 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 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 also 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, Von Krogh, and Bach 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.

Demarest (1997) distinguished two basic orientations to KM: information-based (codifying and storing content) and people or interaction-based KM (connecting knowers). 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 noted in Seely Brown and Duguid (2000, xxv), "information and individual are inevitably and always

Box 5.2
An example: Ericsson (Gonsalves and Zaino 2001)

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 over-engineering or over-managing 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 is not necessarily organized or managed in a heavy-handed way.

Box 5.3
An example: ICL

ICL Ltd. has restructured 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. A true community spirit develops. The interest community will typically regulate itself and have an administrator to facilitate the web space and other coordination activities.

part of rich social networks." Critics maintain that this oversimplifies knowledge and in particular, ignores the social context of knowledge (e.g., Seely Brown and Duguid 2000; Conrad and 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 CoPs (Thomas, Kellogg, and Ericson 2001). This social constructivist approach to learning and knowledge transfer seems to be much better suited to the discipline of knowledge management.

The Social Nature of Knowledge

KM needs to view knowledge as something that is actively constructed in a social setting (McDermott 2000). 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 and 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 and Lassleben 1999). The social constructivist perspective views knowledge as context dependent and thus as something that cannot be completely separated from "knowers" (Lave and 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 and DeWit 2002).

Since individual memory is limited, we need to embed this knowledge in useful, more permanent forms such as documents, e-mails, and so on. This institutionalized knowledge then becomes an organizational legacy that remains in the corporate

Box 5.4

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

The Special Library at the Jet Propulsion Lab of the California Institute of Technology took the lead in forming a CoP 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 “more the merrier” mentality—with respect to membership. Everyone deemed to play a role in moving information along was 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 locator system (ELS) and included the following information for each member or organization:

- Name
- Information collected/provided
- Contact person, phone, e-mail 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 e-mail 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 a 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), is non-hierarchical, 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.

Box 5.5
An example: Thomas & Betts (Gonsalves and Zaino 2001)

Networks, by definition, connect everyone to everyone. Hierarchies, by definition, do not; 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 are 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 CoPs. CoPs create and validate competence. The boss may not know who is the best at the job, 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 also is 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 are 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.”

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, which one submitted it, and so on. Without this context, the knowledge product is not complete and cannot be successfully used, applied, or even understood.

Sociograms and Social Network Analysis

According to Krebs (2002), “social network analysis is the mapping and measuring of relationships and flows between people, groups, organizations, computers or other information/knowledge processing entities.” Social network analysis (SNA) can map and measure relationships and flows between people, groups, organizations, computers, and other information/knowledge processing entities. The nodes in the network

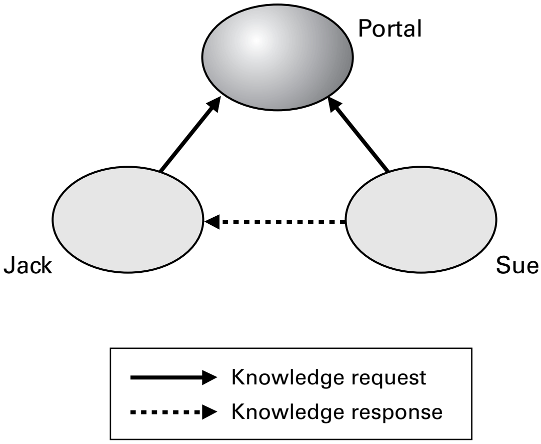


Figure 5.2
Mapping the flow of knowledge

are the people and groups, while the links show relationships or flows between the nodes (see figure 5.2). SNA provides both a visual and a mathematical analysis of complex human systems to identify patterns of interaction such as the average number of links between people in an organization or community, the number of subgroups, the information bottlenecks, the knowledge brokers, and the knowledge hoarders.

In the context of KM, SNA enables relationships between people to be mapped in order to identify 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 that shows formal relationships—who works where and who reports to whom, an SNA 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).

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 clear up information bottlenecks and to accelerate

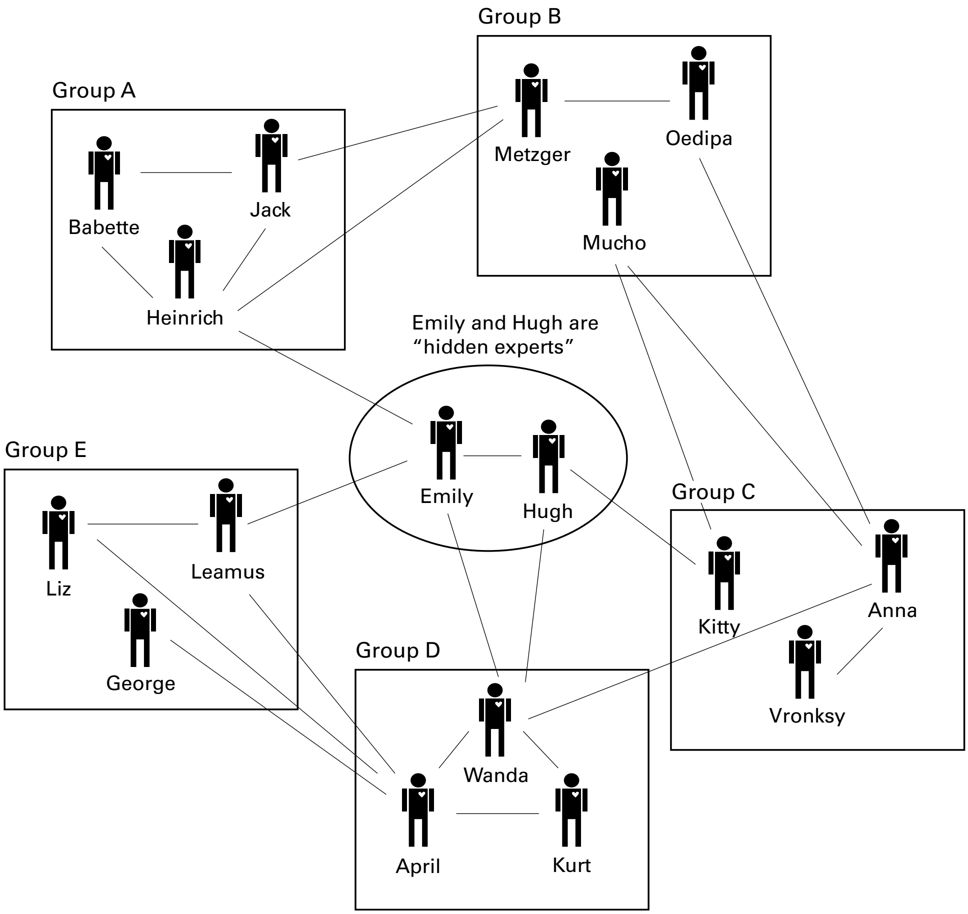


Figure 5.3
Knowledge flow analysis example (Adapted from Krebs 2000)

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 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 and 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 and 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.

Community Yellow Pages

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)

Table 5.2
Software to develop yellow pages or expertise location systems

Name	Description	Web Site
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.askmecorp.com/
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 e-mails as well as document repositories and Lotus Notes databases. Search results include experts and links to content.	http://www.tacit.com/

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 e-mails. 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 (on the order of one to two months) and they can provide almost instantaneous benefits to individuals, communities, and the organization itself.

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 are explored here from Texaco and British Petroleum.

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 (translated by Loomis, 1957). Tonnies

Box 5.6
An Example: Texaco

Texaco's knowledge-management arsenal includes PeopleNet (Gonsalves and 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 does not 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 e-mail systems are linked through KnowledgeMail from Tacit Knowledge Systems Inc., which monitors an employee's e-mail, 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 or her 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.

300 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 execs were sharing ideas on KM 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 e-mail that you're not aware of, and there are lots of hidden experts," Old says.

Box 5.7
An Example: British Petroleum

BP's yellow pages (Cohen 1999) are entirely bottom up. About 20,000 employees (of 80,000) have personal pages. It takes about ten minutes to produce one using a form filling approach, which contains a self-appraisal of skills and interests. 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.

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 exepmlified Gesellschaft.

More recently, Anselm Strauss (1978) another sociologist, 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 alternative 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, Hanor, and Harrison 2001). Psychologists have found that in face-to-face talks, only 7 percent of the meaning is conveyed by the words, while 38 percent is communicated by intonation and 55 percent through visual cues, and that up to 87 percent of messages are interpreted on a nonverbal, visual level (Telstra 2000).

Seely Brown and Duguid (2002) point out the neglect of the social aspects of knowledge sharing, noting 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 (a common goal), mutual engagement (commitment by all members), and shared repertoire (typically a virtual workspace for all members to be able to interact with one another) see (figure 5.6).

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 to 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

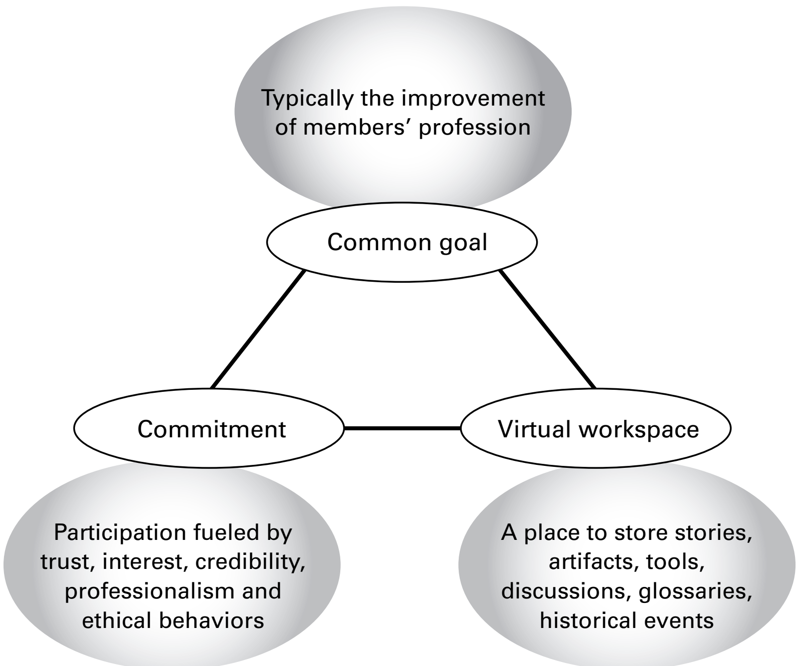


Figure 5.6
Common characteristics of CoPs (adapted from Wenger 1998)

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 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 the 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.

or on the Internet. What is important is that there is a place for real-time exchange and 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.

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, healthcare, and so on

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 and McPhee 2002).

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

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

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 10–20 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 the 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. 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, 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 Web sites 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 act as conversation managers who help keep discussions focused, inject new topics, add provocative points of view when discussion lags, and seed the 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 the 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, 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 to 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 the 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 learned, and solve problems.

Knowledge Sharing in Virtual CoPs

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

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 $100 million on repeating and reinventing knowledge 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 4000 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.

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 and 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 inter-organizational CoP. For example, it took about six months for communications to become predominately informal and e-mail-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 within CoPs in order to be ultimately incorporated

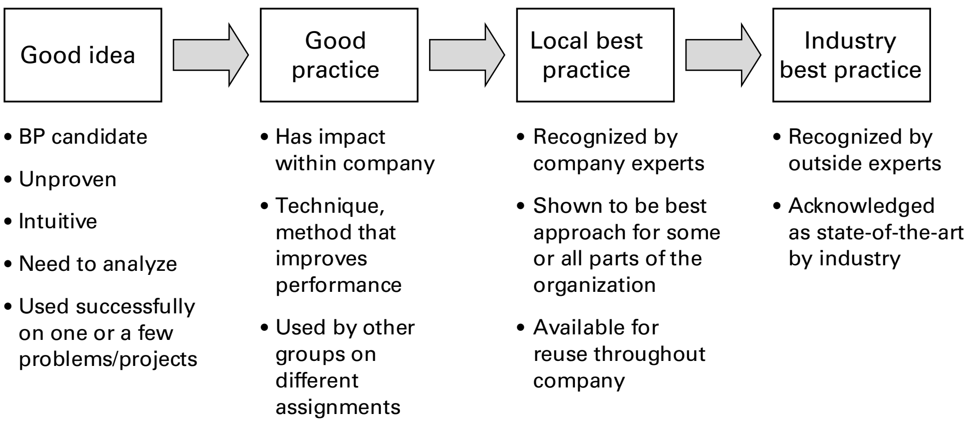


Figure 5.7
Knowledge-sharing example best practice/lesson learned (adapted from APQC 1999, American Productivity and Quality Centre, http://www/apqc.org).

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%

into the organizational memory or knowledge repository. The knowledge-sharing processes involved include searching, evaluating, validating, implementing (transferring and enabling), reviewing, and routinizing (Jarrar and Zairi 2000).

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 overcome. Social network analysis (SNA) is one technique that can help to identify such knowledge hoarding or knowledge "black holes" where content is received but nothing is ever sent out.

Virtual CoPs must rely on technology-mediated knowledge-sharing channels to a great extent. Two major characteristics are often used to characterize the channels used for 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 he or she is 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 e-mail 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, 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*, and *z*" and "I know that you know that I know *a*, *b*, and *c*." This helps create a 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 and Kellogg 2000). Babble was designed as an online multiuser environment to support the creation, explanation, and sharing of knowledge through text-based conversations.

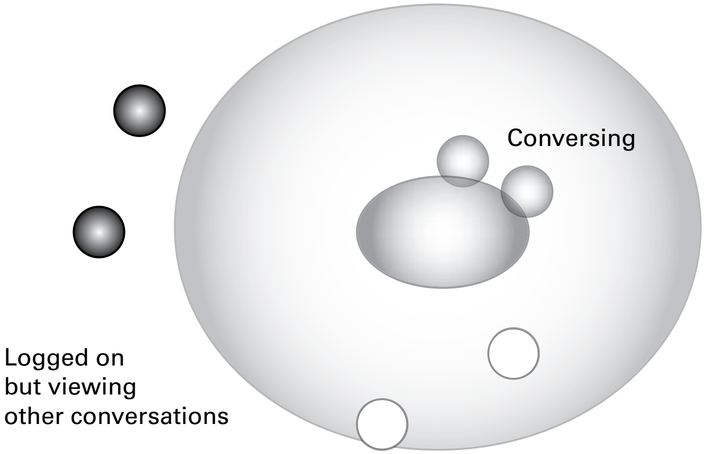


Figure 5.8
Making CoP interactions visible (adapted from the Babble system, Erickson and Kellogg 2000)

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.

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 happen 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 (Excerpt from CSC 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!

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 and 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. Social capital facilitates the creation of new intellectual capital. Organizations, as 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 and 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 between 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 Web site, 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 relationship that builds between the community members often leads 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, relevant, and add to that the fact that they come from trusted peer sources. In this case, 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 and Narayan 2000; Sveiby and 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.

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,

Box 5.10

A vignette: 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 Web site, to look up experts, and to create communities. They make use of a KM tool from Knexa (http://www.knexa.com) to stay in touch and to receive pertinent up-to-date information without having to actively search for it. This Web site 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 them to successfully do their job. Several groups can work simultaneously instead of sequentially to move ahead more quickly.

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 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 and 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 and 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:

- Connect professionals across platforms and across distances
- Standardize professional practices

- Avoid mistakes
- Leverage best practices
- Reduce time to access talent
- Build reputation
- Take 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 is 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 e-mail, telephone, groupware, videoconferencing. and intranets or Web sites.

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—even in Japan where "salarymen" are expected to work at a company for life, 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 CoPs do emerge and run on their own, a minimal level of investment and support is crucial (Wenger, McDermott, and Snyder 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 being received, and adjust accordingly. People portray themselves through conversations—bringing forth personal agendas, 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 manager, discussion moderator, knowledge editor, librarian, archivist, usage analyst, and knowledge broker.

• Virtual communities are the primary sources of social capital produced that is of value to the organization.

• 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 e-mail, blogs, wikis, and so forth can accommodate the sharing of both tacit and explicit knowledge.

• Some of the key obstacles to knowledge sharing are notions such as knowledge is property, 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 develop corporate yellow pages? How do they compare?

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?

References

Adams, E., and C. Freeman. 2000. Communities of practice: Bridging technology and knowledge assessment. *Journal of Knowledge Management* 4 (1):38–44.

ALA. 1989. *Presidential committee on information literacy. Final report*. Chicago: American Library Association. http://www.ala.org/ala/acrl/acrlpubs/whitepapers/presidential.htm.

American Heritage Dictionary. 1969. Boston: Houghton Mifflin.

Anklam, P. (2003). KM and the social network. *Knowledge Management Magazine* 6 (8). http://www.kmmagazine.com/xq/asp/sid.2CE3D98A-36A0-4D67-A4E1-7852ABAE6AC1/articleid.F79B4E31-7854-4B6A-9202-164FB18672D3/qx/display.htm.

APQC. 1999. *Creating a knowledge-sharing culture*. *Consortium benchmarking study*. Houston, TX: American Productivity and Quality Centre.

Bailey, T., and S. Hendrickson. 2004. How to grow a community of practice: The JPL information providers network. *Information Outlook* 8 (3):12–17.

Bartlett, J. 2000. Knowing people. *Knowledge Management*. December. http://www.destinationcrm.com/km/dcrm_km_article.asp?id=830.

Berger, P. L., and T. Luckmann. 1966. *The social construction of reality*. New York: Doubleday and Company, Inc.

Chua, A. 2001. Relationship between the types of knowledge shared and types of communication channels used. *Journal of Knowledge Management Practice*. October. http://www.tlainc.com/articl26.htm. (accessed May 25, 2007).

Cohen, D. 1999. Knowing the drill. Virtual teamwork at BP. http://www.providersedge.com/docs/km_articles/Virtual_Teamwork_at_BP.pdf. (accessed June 4, 2010).

Cohen, D., and L. Prusak. 2001. *In good company*. Boston: Harvard Business School Press.

Coleman, J. 1994. Social capital in the creation of human capital. *American Journal of Sociology* ('94 supplement): 97.

Conrad, C., and M. Poole. 2002. *Strategic organizational communication in a global economy*. 5th ed. Fort Wayne, IN: Harcourt College Publishers.

Cook, P. 1999. I heard it through the grapevine: Making knowledge management work by learning to share knowledge, skills and experience. *Industrial and Commercial Training* 31 (3):101–105.

Cross, R., and A. Parker. 2004. *The hidden power of social networks: Understanding how work really gets done in organizations*. Boston: Harvard Business School Press.

CSC. 2002. An interview with John Seely Brown. http://www.csc.com/features/stories/12243-john_seely_brown_talks_about_knowledge_flow. (accessed June 4, 2010).

Dalkir, K., and M. Jenkins. 2004. Social network analysis in context: from a research methodology to a business tool. In *Proceedings, International Conference on Knowledge Management (ICKM2004)*, December, Singapore.

Dalkir, K. 2007. Characterization of knowledge sharing channels on the Internet. In *Building the Knowledge Society on the Internet: Making Value from Information Exchange,* edited by Ettore Bolisani. Idea Publishing Group, 89–119.

Demarest, M. 1997. Understanding knowledge management. *Long Range Planning* 30:374–384.

Donath, J. 2002. A semantic approach to visualizing online conversations. *Communications of the ACM* 45 (4):45–49.

Erickson, T., and W. Kellogg. 2000. Social translucence: An approach to designing systems that support social processes. *ACM Transactions on Human-Computer Interaction* 7 (1):59–83.

Feldman, S. 2004. The high cost of not finding information. *KMWorld* 13 (3). http://www.kmworld.com/Articles/Editorial/Feature/The-high-cost-of-not-finding-information-9534.aspx. (accessed June 4, 2010).

Freeman, L. C. 2004. Visualizing social networks. *Journal of Social Structure*. http://www.cmu.edu/joss/content/articles/volume1/Freeman.html.

Gonsalves, A., and J. Zaino. 2001. Employees share pearls of wisdom. *Information Week*. September 10, 2001. http://www.informationweek.com/news/global-cio/training/showArticle.jhtml?articleID=6506815. (accessed June 4, 2010).

Granovetter, M., and R. Swedberg. 2001. *The sociology of economic life*. Boulder, CO: Westview Press.

Hagel, J., and A. Armstrong. 1997. *Net gain: Expanding markets through virtual communities*. Boston: Harvard Business School Press.

Hardin, G. 1968. The tragedy of the commons. *Science* (162):1243–1248.

Harris, D., ed. 1994. *Organizational linkages: Understanding the productivity paradox*. Washington, DC: National Academy Press.

Hayden, K., J. Hanor, and R. Harrison. 2001. Multipoint videoconferencing: Using constructivist strategies to engage adult learners. http://www.uwex.edu/disted/conference/Resource_library/proceedings/02_28.pdf. (accessed July 12, 2004).

Huysman, M., and D. DeWit. 2002. *Knowledge sharing in practice*. Dordrecht, The Netherlands: Kluwer Academic Publishers.

Iverson, J., and R. McPhee. 2002. Knowledge management in communities of practice. *Management Communication Quarterly* 16 (2):259–266.

Jarrar, Y. F., and M. Zairi. 2000. Internal transfer of best practice for performance excellence: A global survey. *Benchmarking: An International Journal* 7 (4):239–246.

Kim, A. 2000. *Community building on the web*. Berkeley, CA: Peachpit Press.

Klimecki, R., and H. Lassleben. 1999. Modes of organizational learning: Indications from an empirical study. *Management Learning* 29 (4):405–430.

Knack, S., and P. Keefer. 1997. Does social capital have an economic payoff? A cross-country comparison. *Quarterly Economic Journal* (112):1251–1288.

Krebs, V. 2002. The social life of routers: Applying knowledge of human networks to the design of computer networks. *The Internet Protocol Journal* 3 (4):14–25.

Lamont, J. 2003. Expertise location and the learning organization. *KMWorld Magazine* 12 (1). Available from: http://www.kmworld.com/publications/magazine/.

Lave, J., and E. Wenger. 1991. *Situated learning: Legitimate peripheral participation*. New York: Cambridge University Press.

Lesser, E., and L. Prusak. 2001. Communities of practice, social capital, and organizational knowledge. In *The knowledge management yearbook 2000–2001*, edited by J. W. Cortada and J. A. Woods. Boston: Butterworth-Heineman.

Lesser, E., and J. Storck. 2001. Communities of practice and organizational performance. *IBM Systems Journal* 40 (4):831–841.

McDermott, R. 2000. Why information technology inspired but cannot deliver knowledge management. In *Knowledge and communities*, edited by E. Lesser, M. Fontaine, and J. Slusher. Boston: Butterworth-Heineman.

Milgram, S. 1967. The small world problem. *Psychology Today* 1:60–67.

Nahapiet, J., and S. Ghoshal. 1998. Social capital, intellectual capital, and the organizational advantage. *Academy of Management Review* 23 (2):242–266.

Narayan, D., and M. F. Cassidy. 2001. A dimensional approach to measuring social capital: Development and validation of a social capital inventory. *Current Sociology* 49 (2):59–105.

Nickols, F. 2000. Community of practice start up kit. The Distance Consulting Company. http://home.att.net/~nickols/.

Ortenblad, A. 2002. Organizational learning: A radical perspective. *International Journal of Management Reviews* 4 (1):87–100.

Portes, A., and P. Landolt. 1996. The downside of social capital. *The American Prospect* 26 (May-June):18–21, 94. http://epn.org/prospect/26/26-cnt2.

Price, D. 1963. *Little science, big science*. New York: Columbia University Press.

Putnam, R. 1995. Bowling alone: America's declining social capital. *Journal of Democracy* 6 (1):65–87.

Putnam, R. 2000. *Bowling alone: The collapse and revival of American community*. New York: Simon and Schuster.

Rheingold, H. 1993. *The virtual community: Homesteading on the electronic frontier*. Reading, MA: Addison-Wesley.

Seely Brown, J., and P. Duguid. 2000. *The social life of information*. Boston: Harvard Business School Press.

Seufert, A., G. von Krogh, and A. Bach. 1999. Towards knowledge networking. *Journal of Knowledge Management* 3 (3):180-190.

Stewart, T. 2000. Why Kraken and conversation work so well. *Fortune Magazine*. http://www.fortune.com/fortune/careers/edge/2000/09/04/index.html.

Strauss, A. 1978. A social world perspective. *Studies in Symbolic Interaction* 1 (1):119–128.

Sveiby, K., and R. Simons. 2002. Collaborative climate and effectiveness of knowledge work—An empirical study. *Journal of Knowledge Management* 6 (5):420–433.

Telstra 2000. http://www.commvis.com.au/effectiveness_of_videoconferenci.htm. (accessed July 12, 2004).

Thomas, J. C., W. A. Kellogg, and T. Erickson. 2001. The knowledge management puzzle: Human and social factors in knowledge management. *IBM Systems Journal* 40 (4):863–885.

Thurlow, C., L. Engel, and A. Tomic. 2004. *Computer-mediated communication: Social interaction and the Internet*. London, UK: Sage Publications.

Tonnies, F. 1957. *Community and society: Gemeinschaft und gesellschaft*. Translated and edited by C. Loomis. Lansing, MI: The Michigan State University Press.

Vickery, S. K., C. Droge, T. P. Stank, T. J. Goldsby, and R. E. Markland. 2004. The performance implications of media richness in a business-to-business service environment: Direct and indirect effects. *Management Science* 50 (8):1106–1119.

Watts, D. 1999. Networks, dynamics and the small world phenomenon. *American Journal of Sociology* 105 (2):493–527.

Weinberger, D. 1999. The undernet. *Intranet Journal*. http://www.intranetjournal.com/articles/199912/ia_12_17_99a.html. (accessed July 12, 2004).

Wenger, E. 1998. *Learning, meaning and identity*. Cambridge, UK: Cambridge University Press.

Wenger, E., R. McDermott, and W. Snyder. 2002. *Cultivating communities of practice*. Boston: Harvard Business School Press.

Woolcock, M., and N. Narayan. 2000. Social capital: Implications for development theory, research and policy. *World Bank Research Observer* 15 (2):225–250.

Zucchermaglio, C., and A. Talamo. 2003. The development of a virtual community of practice using electronic mail and communicative genres. *Journal of Business and Technical Communication* 17 (3):259–284.

6 Knowledge Application

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.

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 KM 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.

Introduction

KM 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).

Knowledge eventually is made accessible to all the knowledge workers in the 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 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

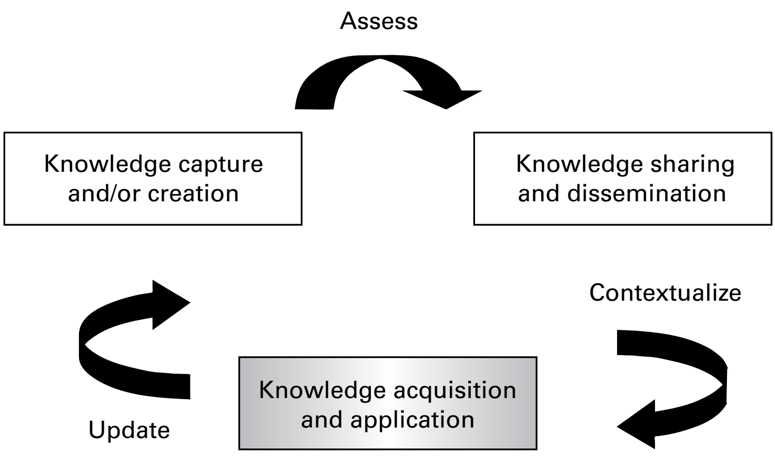


Figure 6.1
An integrated KM cycle

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 they 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 available 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 KM 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, nonroutine), 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 of 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. 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 and 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 knowledge. Individual characteristics may include, for example, personality style, their preferences regarding how they best learn, and 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

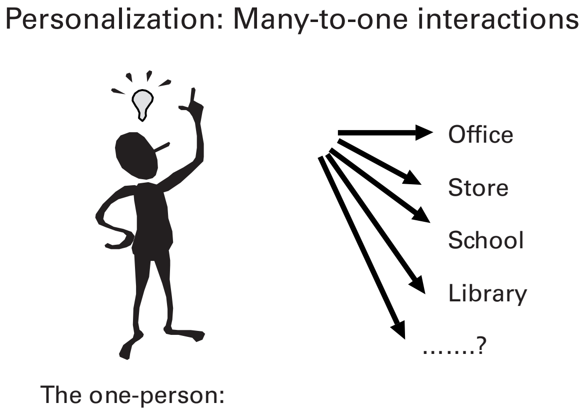


Figure 6.2
Illustration of the personalization concept

of use here is the Bloom taxonomy of learning objectives (Bloom, Mesia, and 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.

Personalization and profiling is currently a popular means of characterizing visitors to a given web site. This is particularly true of virtual stores where customer data can then be analyzed in order to improve marketing efforts. However, in KM, we are less concerned with database marketing applications of personalization than with 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.

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

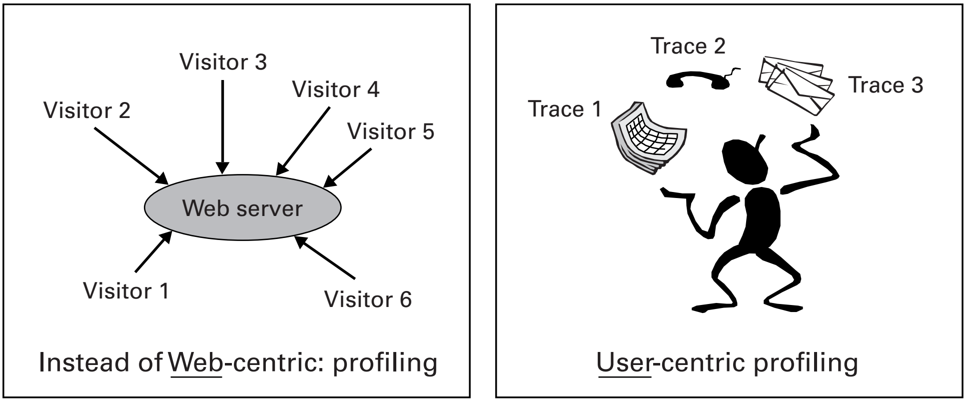
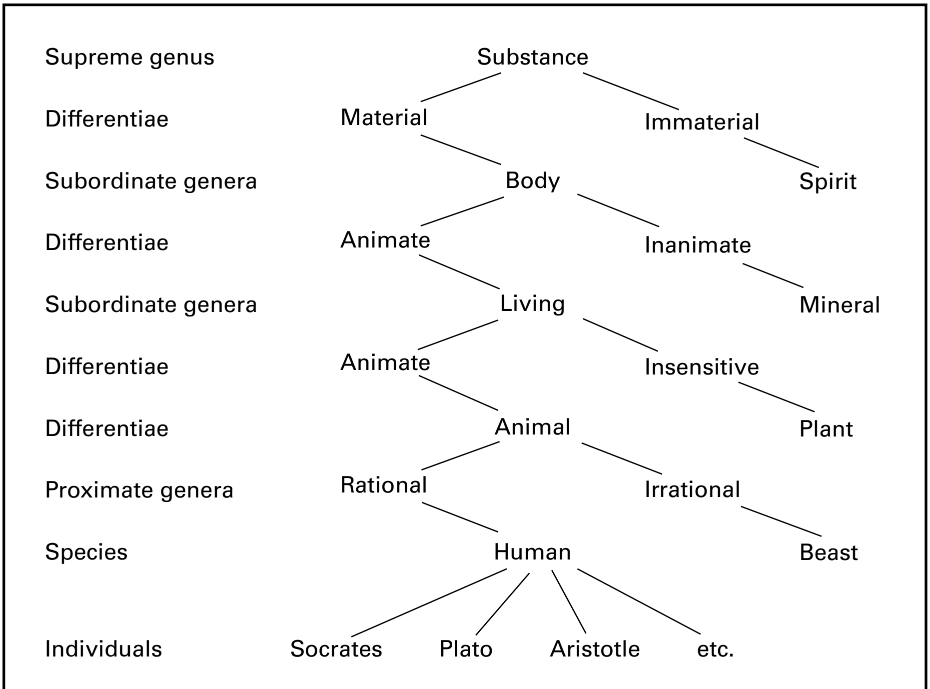


Figure 6.3
Alternative approach to personalization

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, that is, 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, or those who prefer to read text). These are often represented as semantic networks (see figures 6.4 and 6.5)

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, and 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 locating, opening,



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

and printing the file. Assistant agents that help the user to do what he or she is 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.

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).

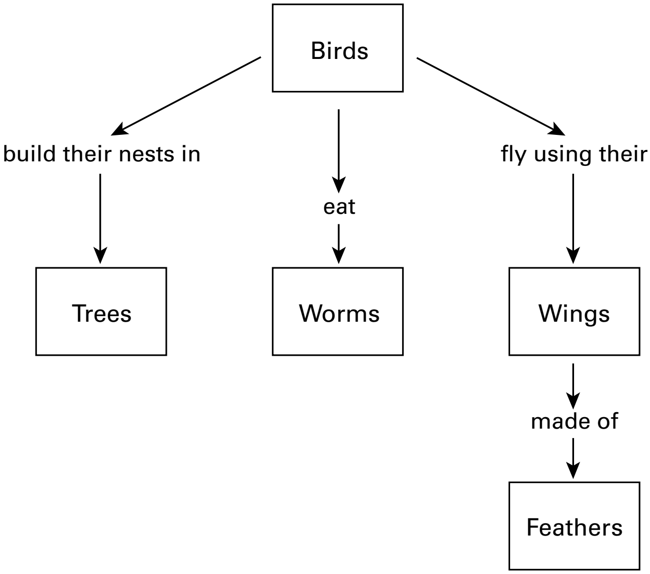


Figure 6.5
Example of a semantic network (continued)

Bloom's Taxonomy of Learning Objectives

Bloom, Mesia, and Krathwohl (1964) divided knowledge into a hierarchical scheme that distinguishes between psychomotor skills, the affective domain (e.g., attitudes), and the cognitive domain (e.g., knowledge). The latter is the one that is more commonly used although attitudinal changes are often required in KM as well. 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). 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 of affective domain are listed in table 6.2.

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.

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

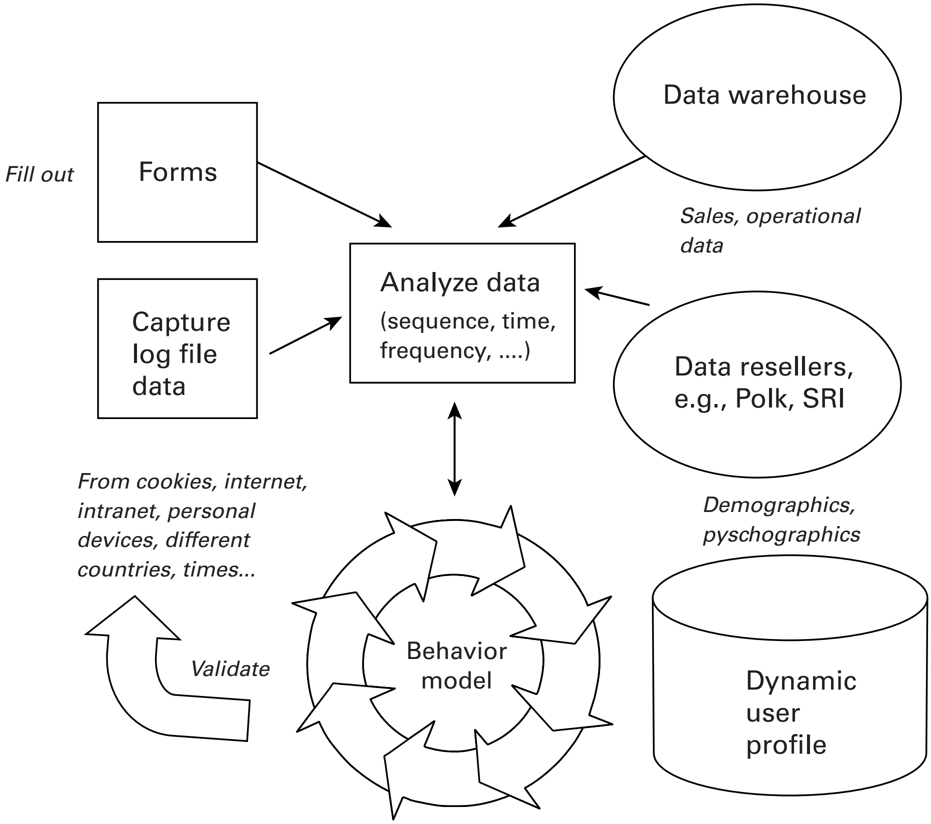


Figure 6.6
Dynamic profiling system design

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

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, and 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, and 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.

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, and so on, in order to fully understand them Knows the safety rules and practices them. *Keyword*s 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 toward individual and cultural differences (values diversity) Shows the ability to solve problems Proposes a plan for 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 standardsCreates 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

Table 6.2
(continued)

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 who 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.

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 address 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 web site 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

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 nonverbal communication cues Estimates where a ball will land after it is thrown and then moves to the correct location to catch the ballAdjusts 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; This includes mental, physical, and emotional sets; these three sets are dispositions that predetermine a person's response to different situations (sometimes called mind-sets)**	Examples: Knows and acts upon a sequence of steps in a manufacturing process Recognize one's abilities and limitations Shows desire to learn a new process (motivation) Note that this subdivision of the psychomotor domain is closely related to 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 include 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

Table 6.3
(continued)

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 that the keywords are the same as for mechanism, but will have adverbs or adjectives that indicate that the performance is quicker, better, more accurate, and so on)
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 Perform 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, initiate, makes, originates

Source: Adapted from Bloom 1956.

levels that knowledge can truly be 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 that it has not been understood. Rather, 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—the person must also believe that it is indeed a better way of doing things and that he or she stands to gain by adopting this new way of working.

The psychomotor domain is less widely used in KM, because it is often physical work and skills. An illustration of individualized learning to facilitate knowledge application appears in box 6.1.

A user model is, however, not enough for the facilitation of knowledge application. We also need to know what the users are doing, and 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 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 or just-enough knowledge. Task support systems or electronic performance support systems (EPSSs) best exemplify just-enough knowledge.

Box 6.1

An example: Hughes Space and Communications

Hughes Space and Communications (formerly part of Hughes Electronics Corporation, a subsidiary of General Motors, now part of the Boeing Company). HSC has six thousand employees who develop, produce, and launch state-of-the-art space and communications systems for military, commercial, and scientific uses. It is the world's largest producer of commercial communication satellites. At HSC, KM is not viewed in terms of traditional departmental boundaries. It is not a process, a function, or an organization. It is a skill that is part of managing a business and should be one of the tools that every manager possesses in his or her repertoire. Traditional management tends to take a "top down" approach to implementation. In KM, it is better to lead not by direction but by service, providing people with the necessary assistance to enable them to better do what they are already doing.

For example, a lessons learned system can be described as a closed loop learning system. People experience something in their work, either through analysis, discovery, or dialogue. There are both good and bad discoveries, but in either event, something is learned. The key is in extracting what was learned, and providing a connection between what was learned and what is practiced. Lessons need to be documented and disseminated to the masses in a form that is easily accessible to all. Feedback is then collected and incorporated back into the documentation process. The challenge is continuously inserting these into what is happening on the job.

HSC also has a coordinated business intelligence-gathering effort that includes a system that pulls information from over sixty online sources, a process for analyzing it, and ongoing dialoguing and sharing among HSC and other Hughes marketing people. This began as a joint project of a few marketing people and the corporate library. It received a boost when it was featured at a knowledge fair that showcased existing knowledge management activities to people from throughout HSC.

HSC does have an intranet that they did not simply install on everyone's desktop and then expected them to start using it effectively to do their jobs. Instead, they implemented the intranet gradually, selectively deploying in pilot areas that focused on supporting a high value business need such as lessons learned, gated processes, yellow pages, or a common user interface to existing systems. Using one-on-one tutorials, each person was trained on how to use the intranet and Internet to do their specific job. When pilots proved successful, they were then deployed into enterprise-wide business applications.

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 four and eight 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.

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. EPSSs were and continue to be widely used provide

Table 6.4
Example of a task analysis: Tying shoelaces

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

on-the-job learning and advice. E-learning is also currently enjoying a high level of usage and can be seen as a subset of EPSSs, as described in the next sections.

EPSS In the groundbreaking book, *Electronic Performance Support Systems*, Gery (1991) defined EPSSs 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, 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).

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

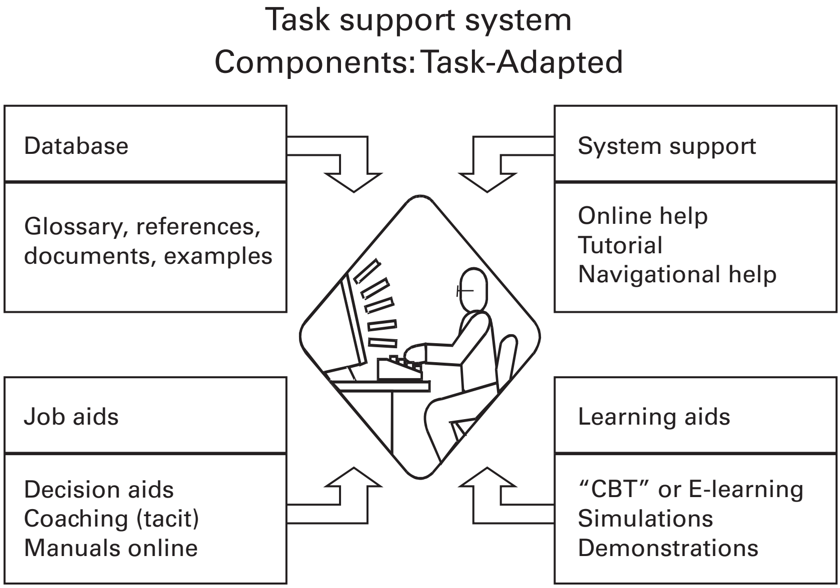


Figure 6.7
Components of an EPSS

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 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.

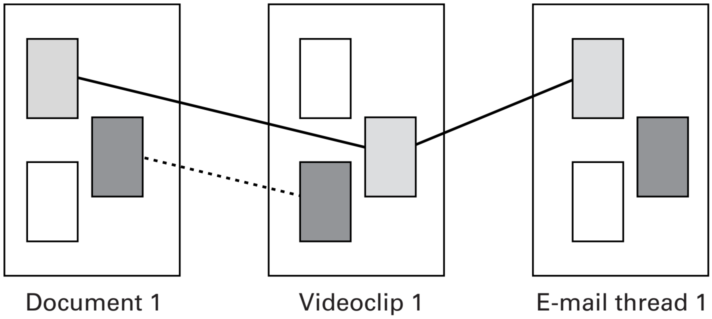


Figure 6.8
Chunking in content management

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.

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 EPSSs. Understanding the EPSS vision remains far from universal. 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 bandwagon, despite the fact that they were selling traditional CBT, online reference materials, and so on. Still, after roughly eight years since the phrase was coined, there are quite a few success stories for "true" performance support systems. What we call EPSS may change—there is 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.

EPSSs 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 work more quickly and accurately, but as a secondary benefit will also learn more about the job and the employer's business. For an update on this approach, see Dickleman (2003). An EPSS application at Sun Microsystems is explored here (box 6.2).

Box 6.2
An example: Sun Microsystems (now part of Oracle Systems)

In 1997, Sun Microsystems launched SunWEB, (Monasco 2005 an intranet linking its employees worldwide. The intranet has not only saved $25 million a year but has also helped achieve big savings by enhancing its relationships with customers and suppliers by putting knowledge online. Sun also began thinking about how to use this powerful network to enhance the knowledge, skills, and capabilities of its employees and partners. SunTAN is their intranet-based knowledge and training system, an interactive, network-based curriculum management and sales support system. SUN has tremendous learning and knowledge needs: 90 percent of its revenues are from products that are less than a year old and it has consistently experienced widening product lines and shorter life cycles. As a result, the company found it could not train its sales professionals fast or effectively enough. It could no longer rely on traditional classroom-based training, which was too long, overwhelmed people with information, and cost about $2,225 a week per individual (not counting lost sales time).

SunTAN consolidates sales training information, sales support resources, product updates and materials, competitive intelligence, and an array of other content on the Sun intranet. This distributed learning architecture ensures the richest, most bandwidth-intensive, and most actively used media (e.g., a video demonstrating the latest line of new server products) is distributed to and stored on local servers at regional sales offices rather than the company's headquarters. Users can then download them at their convenience. In the new world of distance training, you no longer need to retain knowledge. The only knowledge you need to retain is knowledge of the location of where you can get the information you need. It changes so often that it no longer makes sense to retain it. It is a pull rather than a push model. It is critical that funding for this comes from business units and that content also comes from resources other than a centralized training group. In this way, SunTAN acts a just-in-time knowledge or performance support system enabling sales personnel to rapidly access critical information while they have a customer on the phone. Moreover, they can train in self-directed way at their desktops without abandoning their customers for a weeklong training course.

SunTAN was originally developed for Sun's direct sales reps and sales engineers, but it is now available to the company's twenty thousand resellers who account for more than 60 percent of worldwide sales. Additional features that will be integrated in this environment include database technology to track and profile individual usage of the system. This will be used to create customized learning paths and alert employees when relevant resources become available. A collaborative product called Kansas will be integrated into this environment to allow users to pull in as many as nine different video feeds onto a single screen for a high-tech meeting or panel discussion. Another add-on technology will be a conceptual indexer that will allow users to search and retrieve video content with keywords much in the same way that they now search text. Some SUN customers are requesting that SunTAN's training content be made available within their own intranet firewalls. The SunTan system remains an excellent example of a knowledge management application.

Box 6.3

An example: A knowledge service center uses task modeling 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.

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 EPSSs 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 that 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.

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 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

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 KM. KMSs evolved from information management tools that integrated many aspects of computer-supported collaborative work environments (CSCW) with information and document management systems (Ganesan, Edmonds, and Spector 2001; Greif 1988; Kling 1991). Key characteristics of KMSs 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 (e-mail 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 and 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. KMSs provide support for many information functions, including:

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

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

Within business and industry, KM technology is being used to support organizational learning (Morecroft and Sterman 1994; Senge 1990). The dynamics of the global

Box 6.4
An example: British Telecommunications (Solstra 2000)

British Telecommunications and Futuremedia iLearning developed Solstra 2000, which is a new model of the jointly developed net-based learning and knowledge management system. It is the result of significant product development based on increasingly sophisticated and growing customer demand. Solstra 2000 is designed for hosting, delivering, and managing online learning and job support information. Additional enhancements to the new version include refined administration, management, and reporting capabilities, and several new flexible options that increase the availability of learning to groups and individuals at their PCs. Solstra 2000 also claims to provide the necessary technology to allow any organization to set up a virtual "Corporate University."

Highlights include the development of Solstra 2000 to map onto an organization's structure. This reportedly makes it intuitive and straightforward for HR, training, and line managers to set up a familiar framework to administrate learning across all departments and levels of the organization, providing the natural platform for a corporate university. Also, the ability of all staff to "raise their hand" electronically, alerting colleagues to their expertise, interests, and areas they are looking to improve, with their own Solstra 2000 personal homepage. Searchable throughout the organization, this information provides the foundation for a knowledge management system. Solstra 2000 has increased scalability, allowing it to be used by an unlimited number of participants. Terms and text can be customized and translated into different languages, making it suitable for use by the largest global organizations.

New participants joining a group or department using Solstra 2000 are automatically able to access the learning content previously assigned to fellow group members, bringing them instantly up to speed. Participants also have access to additional learning resources as files can accompany learning content, to provide more information and recommend related material. HR and training managers can create tailored FAQs within Solstra 2000, as well as a "news service" alerting participants directly when new relevant learning content becomes available.

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

Table 6.5
Examples: Knowledge application support technologies

Name	Description	Web site
Mindjet's Mindman	High-level visualization and mapping tool	http://www.mindjet.com
Groove	Collaboration software	http://www.groove.net
Visio	High-end flowcharting tool	http://www.microsoft.com/office/visio/
Themescape	Topographical knowledge maps	http://www.micropat.com/0/pdf/themescape.pdf
OpenText's eDocs and Livelink	Automatic taxonomy creation	http://www.opentext.com/2/global/sol-products/sol-pro-knowledge-management.htm
ClearForest's ClearTags	Automatic taxonomy creation	http://www.clearforest.com/
LotusNotes Websphere	Knowledge repository	http://www.lotus.com/home.nsf/welcome/kstation
Vignette	Content management software	http://www.vignette.com/
EPSS Central	Electronic performance support systems	http://www.pcd-innovations.com/

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 between 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 and Rossett 2000) and instructional design (Ganesan, Edmonds, and Spector 2001). Table 6.5 provides some examples of KM systems.

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

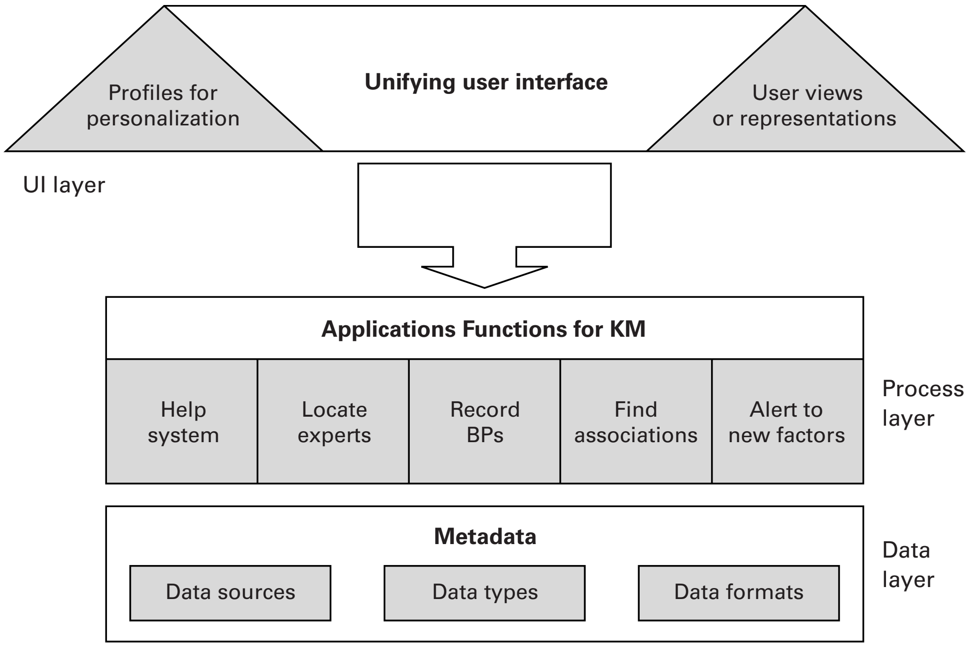


Figure 6.10
KM organizational architecture

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.

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 the 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). E-mail 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 the content. They provide a classification scheme for the organization's knowledge assets. We saw examples of these knowledge taxonomies in the previous chapter. 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). An example of knowledge reuse is described here concerning the J. P. Morgan Chase company (box 6.5).

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 and 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

Box 6.5
An example: J. P. Morgan Chase

Reuse KM initiatives have taken hold at LabMorgan, the Internet strategy and incubation unit of J. P. Morgan Chase & Co. The lab uses Intraspect Software technology to help employees filter the hundreds of business-plan referrals received for investment or incubation possibilities each month. The platform lets users access all previous expertise and feedback on similar propositions the company has received, so they can measure new proposals against them and know what questions to ask to further probe a new plan's merits. Since the deployment, the lab says it has been able to avoid duplicate screenings of similar proposals and has generated significant gains.

But the lab thought first about how it works as an organization before jumping into the technology. "The collaborative tool pushed thinking about our processes and how we work together," Feldhusen says. "The core has to be a mind-set of sharing and accomplishing a common goal. We designed the software to support the processes we use." But she acknowledges that deploying KM initiatives might be more challenging in dealing with very established processes. "How do you motivate people to move to new ways? [Our advantage is that] we're in an area that's highly innovative."

approach that has been outlined in this chapter. Markus's types of knowledge reuse 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 a physician who consults a patient's chart to see what medications had been prescribed recently by other members of the 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, which 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 context, 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 directly contact those who are more expert in using the knowledge object. EPSSs and other performance support aids such as e-learning[1] 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 be successful in work situations.

Davenport et al. (1998) makes 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, e-mails, 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 the fluid and subjective knowledge content required.

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-on-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

Box 6.6

An example: GetSmart—An E-learning solution for the National Science Digital Library (NSDL)

The National Science Digital Library (NSDL; Marshall et al. 2003) has provided students and educators with science education resources since 2002. Seamans and McMillan (1998) define a digital library as more than the digitization of a collection, but also consisting of information management tools and responsibilities to bring together collections, services, and people to create, use, disseminate, 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 KM 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 (LMS) that provide a standardized environment to support classroom learning (e.g., WebCT and Blackboard, 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 and 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.

Technologically, the GetSmart system is an XML browser based so that learners can access it from a typical university computer lab. Microsoft SQL Server is used for the databases and the map-drawing tool is a Java applet developed using Java 1.4.

At the GetSmart launch in 2002, over one hundred student users at the University of Arizona and Virginia Tech created a database of more than one thousand student-prepared concept maps with more than forty thousand relationships expressed in semantic, graphical, node-link representations.

is a stand-alone 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 meet 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.

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 web sites or internal databases to go to for 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 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 simply 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 return on 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 all others 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 chunks of executable knowledge. The knowledge nuggets should always include 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.

• KSSs 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 Web site 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?

Note

1. See the journal on KM and E-Learning at: http://kmel-journal.org/ojs/index.php/online-publication.

References

Barron, T. 2000. A smarter Frankenstein: the merging of e-learning and knowledge management. LearningCircuits, August, http://www.learningcircuits.org (accessed June 4, 2010).

Bloom, B., ed. 1956. *Taxonomy of educational objectives*. *Book 1: Cognitive domain*. New York: Longman.

Bloom, B., B. Mesia, and R. Krathwohl. 1964. *Taxonomy of educational objectives*. Volumes 1 and 2. New York: David McKay.

Chmielewski, T., and D. Dansereau. 1998. Enhancing the recall of text: Knowledge mapping training promotes implicit transfer. *Journal of Educational Psychology* 90:407–413.

Cohen, W. M., and D. Levinthal. 1990. Absorptive capacity: A new perspective on learning and innovation. *Administrative Science Quarterly* 35:128–152.

Davenport, T., D. De Long, and M. Beers. 1998. Successful knowledge management projects. *Sloan Management Review* 39 (2):43–57.

Dickleman, G. 2003. *EPSS revisited: A lifecycle for developing performance-centred systems*. Silver Spring, MD: International Society for Performance Improvement.

Dixon, N. 2000. *Common knowledge: How companies thrive by sharing what they know*. Boston: Harvard Business School Press.

Edmonds, G., and R. Pusch. 2002. Creating shared knowledge: Instructional knowledge management systems. *Educational Technology & Society,* 5 (1), http://www.informatik.uni-trier.de/~ley/db/journals/ets/ets5.html (accessed June 4, 2010).

Ford, N., T. D. Wilson, A. Foster, D. Ellis, and A. Spink. 2002. Information seeking and mediated searching. Part 4. Cognitive styles in information seeking. *Journal of the American Society for Information Science and Technology* 53 (9):728–735.

Ganesan, R., G. S. Edmonds, and J. M. Spector. 2001. The changing nature of instructional design for networked learning. In *Networked learning in higher education*, edited by C. Jones and C. Steeples. Berlin: Springer-Verlag, 93–109.

Gery, G. 1991. *Electronic performance support systems*. Cambridge, MA: Ziff Institute.

Greif, I., ed. 1988. *Computer-supported cooperative work: A book of readings*. San Mateo, CA: Morgan Kaufmann.

Hatami, A., R. Galliers, and J. Huang. 2003. Exploring the impacts of knowledge (re)use and organizational memory on the effectiveness of strategic decisions: A longitudinal case study. In *Proceedings of the 36th Hawaii International Conference on System Sciences (HICSS'03).*

Hicks, D., and K. Tochtermann. 2001. Personal digital libraries and knowledge management. *Journal of Universal Computer Systems* 7 (7):550–565.

Khan, B. 2005. *Managing e-learning: Design, delivery, implementation, and evaluation*. Hershey, PA: Idea Group Inc (IGI).

Kling, R. 1991. Cooperation, coordination and control in computer-supported work. *Communications of the ACM* 34 (12):83–88.

Kuhlthau, C. 1993. *Seeking meaning: A process approach to library and information services*. Norwood, NJ: Ablex Publishing.

Malcolm, S. 1998. Where EPSS will go from here. *Training* 35 (3):64–69.

Markus, M. 2001. Toward a theory of knowledge reuse: Types of knowledge reuse situations and factors in reuse success. *Journal of Management Information Systems* 18 (1):57–94.

Marshall, B., Y. Zhang, H. Chen, and A. Lally. 2003. Convergence of knowledge management and e-learning: The GetSmart experience. In *Proceedings of the 3rd ACM/IEEE-CS Joint Conference on Digital Libraries*, http://portal.acm.org/citation.cfm?id=827161. (accessed June 4, 2010).

Marshall, J. M., and A. Rossett. 2000. Knowledge management for school-based educators. In *Integrated and holistic perspectives on learning, instruction and technology: Understanding complexity*, edited by J. M. Spector and T. M. Anderson. Dordrecht, The Netherlands: Kluwer, 19–34.

Miller, G. 1956. The magical number seven, plus or minus two: Some limits of our capacity for processing information. *Psychological Review* 6:81–97.

Monasco, B. 2005. Sun's knowledge network enhances its selling skills. KM Talk. http://www.kmtalk.net/article.php?story=20050412032755660. (accessed June 4, 2010).

Morales, E., F. Garcia, H. Rego, T. Moreira, and H. Barbosa. 2005. Knowledge management for e-learning based on learning objects: A qualitative focus. In *Proceedings of ITHET, the 6th International Conference on Information Technology Based Higher Education and Training*, 12–17.

Morecroft, D. W., and J. D. Sterman, eds. 1994. *Modeling for learning organizations*. Portland, OR: Productivity Press.

Myers, I., M. McCaulley, N. Quenk, and A. Hammer. 1998. *Myers-Briggs Type Indicator manual*, 3rd ed. Palo Alto, CA: Consulting Psychologists Press.

Nonaka, I., and H. Takeuchi. 1995. *The knowledge-creating company: How Japanese companies create the dynamics of innovation*. New York: Oxford University Press.

Pflaging, J. 2001. Enterprise collaboration: The big payoff. *KM World,* Special Supplement, 56–57.

Preece, J., Y. Rogers, H. Sharp, D. Benyon, S. Holland, and T. Carey. 1994. *Human-computer interaction*. Reading, MA: Addison-Wesley.

Salomon, G., ed. 1993. *Distributed cognitions: Psychological and educational considerations*. New York: Cambridge University Press.

Seamans, N., and G. McMillan. 1998. Digital library definition for DLI2. http://citeseerx.ist.psu.edu/viewdoc/summary?doi=10.1.1.4.4523 (accessed December 12, 2008).

Senge, P. M. 1990. *The fifth discipline: The art and practice of the learning organization*. New York: Doubleday.

Solstra, 2000. Research shows online learning set to come of age. Notes and news. *International Journal of Educational Management* 14 (5):216–223.

Spink, A., T. Wilson, N. Ford, A. Froster, and D. Ellis. 2002. Information seeking and mediated searching. Part 1. Theoretical framework and research design. *Journal of the American Society for Information Science and Technology* 53 (9):695–703.

Webb, S. P. 1998. *Knowledge management: Linchpin of change*. London: Aslib.

Zack, M. 1999. Managing codified knowledge. *Sloan Management Review* 40 (4):45–58.

7 The Role of 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, c. 60 BC–c. AD 37)

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. Finally, the long-term nature of organizational culture dimensions is addressed by presenting major organizational and KM maturity models.

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; understand the analytic elements of organization culture, such as different types of cultures and organizational maturity models.
4. Describe how organizational culture intersects with KM.
5. Discuss the key organizational culture enablers and the key obstacles to effective knowledge sharing and KM.
6. 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.
7. Discuss to what extent organizational culture can be managed.

Introduction

There are a number of common myths that 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 other organizations 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 that the organization finds itself in will play a crucial role on what happens to knowledge management within that organization (see figure 7.1).

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, 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, and 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 join organizations from the surrounding community and bring their culture 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

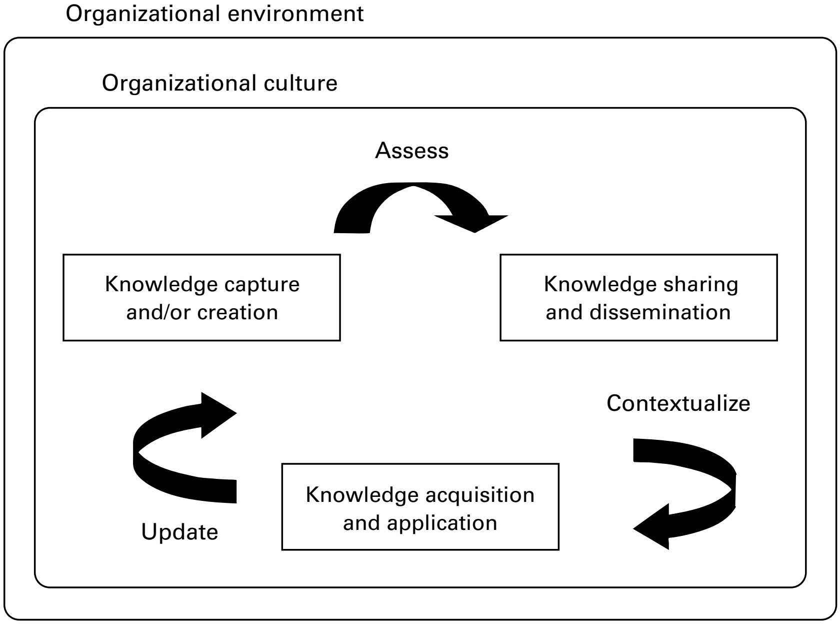


Figure 7.1
The cultural component in an integrated KM cycle

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, and further, they are 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" (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?

Schein (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, between-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, with their environment, including the physical space they occupy
- Metaphors and symbols—may be unconscious or embodied in other cultural elements

Other authors define corporate culture is 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 lives 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, 291). Cultural artifacts are both conceptual (such as language) and material. They mediate interaction with the world, coordinating people's activities 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 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 particular 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 do not 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 company, 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 CoPs that exist, the different types of professionals or skill sets that make up the company's human capital, and so forth.

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

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 of friendliness. A high sociable culture indicates that people within the culture tend to be friendly to each other without expecting something in return. Sociability is consistent with a high people orientation, high team orientation, and focus on process rather than outcomes. Solidarity, the second dimension, measures the task orientation. High solidarity means that people can work together toward common goals very well even they may have personal disputes or conflicts.

This classification scheme produces four types of organizational cultures as shown in table 7.1. These are described in greater detail below:

- 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 they often exert too much influence and other members are rarely heard from.
- In a networked culture, members are treated as friends and family. People have close contact with each other and love 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 the poor performance.
- 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.
- In an organization with a fragmented culture, the sense of belonging to and identification 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 KM is the notion of trust. When organizational members feel 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.

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.

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 underneath them (i.e., what is the 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 on 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

Table 7.2
Levels of culture

Cultural level	Description
Artifacts	The visible organizational structures and processes
Values	The stated strategies, goals, philosophies and justifications
Assumptions	The basic underlying assumptions, unconscious, taken for granted beliefs, perceptions, thoughts, and feelings

Source: Adapted from Schein 1992.

meanings of basic assumptions. Therefore, values define a set of organization 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 organization history, and in the personal history 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 organization's personnel or by certain groups and disseminated through legends, stories, or 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 organizations' personnel. An illustration of different styles of practice appears in box 7.1.

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 comprehend organizational culture refer to its philosophical and value layers. Those who want to change culture and use it as a 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 strengthen norms 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 an 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 the assumptions to

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.

the surface. He 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 in their own culture to a sufficient degree to recognize what may be its maladaptive assumptions and to learn some new ways of thinking themselves as a prelude to unfreezing and changing their organization.

A number of instruments exist that can help diagnose organizational culture (e.g., Harrison and 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 your 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. 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 junction—the resistance to any change in the organizational culture, that we first encounter the intersection between organizational culture and KM.

Culture at the Foundation of KM

KM implementations almost always require a cultural change—if not a complete transformation, at least a tweaking of the existing culture 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 just to be contrary, but they will oppose change 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 four thousand 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 three-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 writing system, and the Incas disseminated 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 a solo undertaking to a perception of participation and collaboration. This idea can be linked back to earlier discussions on the social construction of knowledge, and 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 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 30 employees and their initial questions addressed the sharing of explicit knowledge. It was found that this 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 (LotusNotes)	55 %
Intranet	40 %
Face-to-face	28 %
Shared drive	25 %

Source: From Gruber and 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 web sites.

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, and 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 were tools and taxonomies are standardized to make access and exchange easy, where there are a significant number of semi-social 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 control 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, Saxton, and Serpa (1986) characterize norms by level.

- 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 in general results in mild social sanctions.
- Relevant norms encompass behaviors that are important to group functioning. Violation of these norms often results in noninclusion in important group functions and activities.
- 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 with a group in the degree of compliance with norms? Why do some members comply with all norms, while others seem to ignore them? Individuals motivated primarily by means of acceptance, worth, and 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 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, that is, believing that the behavior dictated by the norm is truly the right and proper way to behave. Over time, many group members begin 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 key word 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 that value is shared among organizational members, and more importantly, how responsible the organization/culture was in developing that value within the individual. Value is any phenomenon that has 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). In this case, we often act in ways consistent with that value even though we do not 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 and Stevens 1983; Johnson-Laird 1983; Rogers, Rutherford, and Bibby 1992; Oakhill and Garnham 1996). The belief structure of managers can be represented as a complex set of mental models that they use for diagnosing problems and making decisions. In organizations with strong cultures, members of the organization begin 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 or 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 work hard to increase their 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 (like macros) we store and call upon when certain stimuli are present. We develop scripts over time by performing a certain task many times (like 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 (micro culture) as well as with respect to the organizational culture as a whole

Note that organizational culture is not so much a discrete "thing" that can be pointed to. Rather, organizational culture should be seen 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. One way of studying this process is to look at the evolution or maturing of a culture.

Organizational Maturity Models

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. One of the ways in which culture changes within an organization is through a maturing process. As organizations mature, so does the culture of that organization. The notion of an optimal point or a threshold point that should be reached before effective KM 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 model that describes the characteristics of good processes, thus providing guidelines for companies developing or honing their own sets of processes.” (Grenier 2007, 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 CMM 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:

Initial Processes are ad hoc, chaotic, or not well defined.

Repeatable Basic processes are established and there is a level of discipline to stick to these processes.

Defined All processes are defined, documented, standardized, and integrated into each other.

Managed Processes are measured by collecting detailed data on the processes and their quality.

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

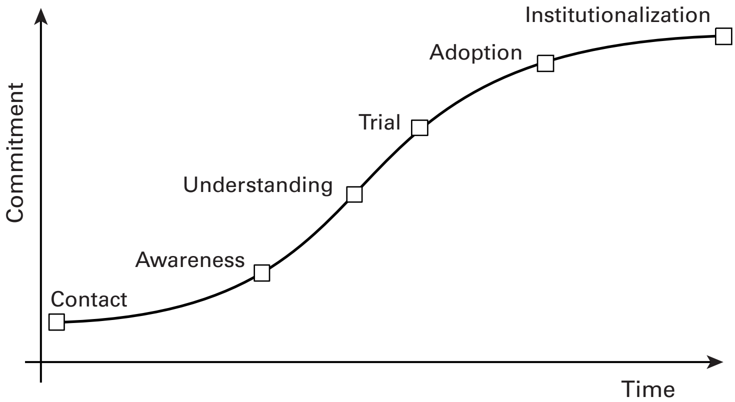


Figure 7.2
Organizational maturity model

cover KM processes that can in turn serve to assess the current level of readiness of an organization for KM. For example, the maturity model shown in figure 7.2 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.

Table 7.4 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.

KM Maturity Models

There are currently a half a dozen or so KM 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 7.5. The Infosys is also consistent with the others in

Table 7.4
Stages of organizational maturity

Maturity phase	Description
Chaotic	• Noncohesive culture • Decision making in-flight • Leadership structure vague • Operation model undefined • Employees leaving
Ad hoc	• Multiple local cultures, leadership structures, and operation models • Local decision making • Employee turnover high in some job categories
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
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
Agile	• Culture adapts strategically • Operation model changes dynamically based on environmental changes • Professionals compete to work for corporation

Source: Adapted from Fujitsu Consulting (Cheryl White, personal communication)

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.

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

Table 7.5
The Infosys KM maturity model

Level	Organizational capability	Characteristics/key result areas
Default	Complete dependence on individual skills and abilities	Unstructured on-the-job learning, accidental knowledge reuse, informal knowledge sharing, teamwork virtually nonexistent
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
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, for example, portal Dedicated KM group
Convinced	Quantitative decision 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	Customized enabling Value-added content Quantitative KM processes, for example, KM metrics such as percentage of content used, quality ratings Knowledge infrastructure management for sustainable KM
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

Table 7.6
The KPQM maturity model

Maturity phase	Description
Initial	Knowledge process quality not planned, changes randomly (chaotic)
Aware	Need for quality has been recognized and initial structures have been put into place
Established	There is systematic structure and definition of knowledge processes and they are specifically tailored to needs identified
Quantitatively managed	Performance measures are used to plan and track knowledge processes
Optimizing	Structures implemented to ensure continuous improvement and self-optimization of knowledge processes

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 7.6.

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 distribution of experiences, learning from past experiences, and so forth.

Table 7.7 shows the Forrester Group KM maturity model, which describes the different stages of maturity in terms of how people are supported throughout the KM cycle. In the first phase, assisted, other people are needed in order for knowledge workers to find valuable content and to connect with subject matter experts. In the second phase, self-service, employees are able to make use of KM systems such as

Table 7.7
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

knowledge repositories, in order to find content and link to experts by themselves. In the final phase, organic, KM has ceased to be an "extra" burden but has instead become part and parcel of how the knowledge work gets done every day.

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, 7 days a week, 365 days a year) help desk for knowledge content. Employees typically have a 1-800 telephone number as well as an e-mail address through which they can contact the KSO in order to obtain help in locating, accessing, and making use of valuable knowledge content.

The wide variety of KM maturity models makes choosing one a difficult decision. An alternative approach, advocated by Liebowitz and Beckman (2008) would be to develop a comprehensive KM maturity model, which they refer to as K3M. This integrated approach is needed to provide a foundation for KM strategy development. The authors describe K3M as the first KM maturity model that is based on learning, competencies, and business strategy.

CoP Maturity Models

Maturity models have also been applied to the CoP life cycle. A CoP 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 life-cycle 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 life-cycle model (see figure 7.3) 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 life-cycle model is particularly useful for aligning any new KM roles and responsibilities that will be needed in order to optimize KM efforts throughout the life cycle, for example, a 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.

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

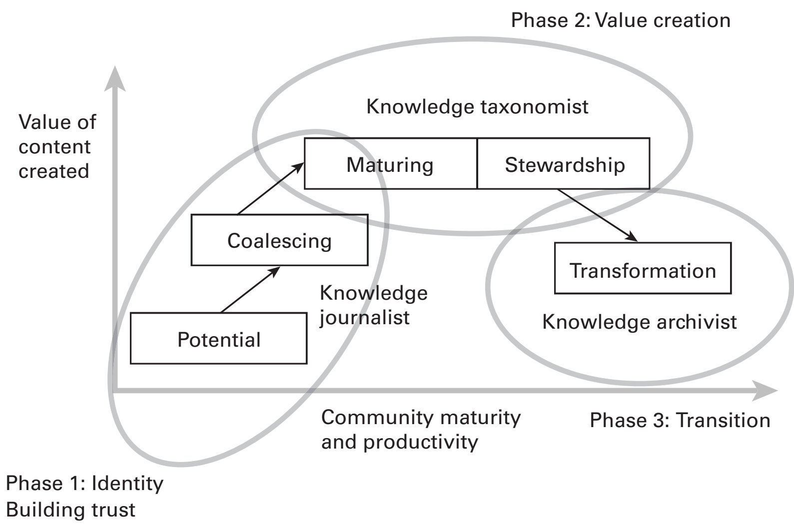


Figure 7.3
Community of practice maturity model

Table 7.8
The six maturity models

Maturity model	Key features
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
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
Infosys KM	A model that is much more specific and allows diagnosis of particular KM behaviors such as content capture, knowledge sharing, and KM metrics Greater specificity allows for more refined targeting of priority KM initiatives
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
Forrester Group KM maturity mode	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.
Wenger CoP life-cycle model	The CoP life-cycle 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 life-cycle model can also help identify key KM roles and responsibilities that should be introduced at each phase

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 7.8. 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.

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 (rule, regulations, reward systems), changing these behaviors through culture involves changing the underlying mechanisms that drive these behavioral patterns: namely norms, social values, or mental models. Since these underlying cultural control mechanisms are often taken for granted and 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 status 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. Kilmann, Saxton, and Serpa (1986) provide some good general guidelines:

• The notion of 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.

• 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 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.

• 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 and dropped when challenges arise.

• 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 was not valued and only research productivity is really valued at this particular institution.

• 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 that training is not valued. The criteria for allocation of resources often become what are valued in an organization. For example, if budgets were determined by steady past performance, it sends a different message than if they were determined by past innovation and risk taking.

• 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 President of the company bestows a gift of a fully loaded laptop to them in recognition of their excellent KM work. This organization is further described in box 7.2.

Box 7.2
An example: Buckman Labs

Buckman Labs is a specialty chemical company serving the pulp and paper, water treatment, leather, coatings, agricultural, and wood treatment industries. Its core competency is its ability to create and manufacture innovative solutions to control the growth of microorganisms. Buckman's expertise also spans specialty chemicals such as microbicides, scale inhibitors, corrosion inhibitors, polymers, dispersants, and defoamers. Evaluated in 1990 by Goldman Sachs, Buckman had a market value $175 million higher than its asset value. The difference owes a lot to the company's focus on KM and knowledge transfer as effective tools to improve and sustain its competitive advantage. They saw the need for a system that would facilitate growth in the value of knowledge that existed within the company. The best brains in the company on a particular topic were not necessarily in the US, but spread out around the eighty offices worldwide. Hence, a system was needed to facilitate communication between sister companies so that the collective knowledge and understanding of the entire organization could be brought to bear on any problem. The resulting acceleration of knowledge would lead to a strategic advantage based on the leverage of internal as opposed to external knowledge. This thinking culminated in the Knowledge Transfer Department. Its goals were to accelerate the accumulation and dissemination of knowledge by all Buckman Labs' associates worldwide, to provide easy and rapid access to Buckman Labs' global knowledge bases, and to eliminate time and space constraints in communication. The department was given a budget of about $8 million.

The primary tool employed by Buckman to enable employees to share knowledge is called KNetix, the Buckman Laboratory Knowledge Network. KNetix is an interconnected system of knowledge bases used by Buckman associates worldwide to share knowledge electronically and to collaborate closely with each other, unfettered by time and distance. The principal component of KNetix is Tech Forum, a private bulletin board that only Buckman associates are allowed to access. An employee in Malaysia needing information about a water treatment process can post a query to the bulletin board in the evening, and the next morning find answers from a researcher in microbiology based in the US office or from a field engineer in South Africa. This method of knowledge sharing recognizes that no single person can possibly know everything about a topic, and that knowledge is generally decentralized in the heads of many people, not just in single subject matter expert's head.

Employees are encouraged to both solve their own problems and to provide solutions to others' questions on Tech Forum. The top 150 people from around the world who were rated as top level performers in the Tech Forum with respect to answering questions are brought to the company's headquarters each year and presented with a state-of-the-art fully loaded IBM laptop by the CEO. Such incentives help boost employees' desire to participate in knowledge sharing. Besides the Tech Forum, other media such as virtual conference rooms, libraries, and e-mail help employees to access knowledge rapidly.

Box 7.2
(continued)

Itinerant employees are provided with laptops so that they can stay connected at all times.

Tools are only one side of the equation however—Buckman believes that tools can only act as facilitators—the company culture has to provide a good environment in which to use these tools. The most important cultural factor in KM is that of trust. Each employee must trust the other before they provide information to them. A distinctive feature at Buckman is that the focus is on direct communication between individual employees in order to minimize distortion and misunderstanding of the knowledge content.

Finally, Buckman freely shares its experience and expertise in KM with other organizations. Companies like AT&T and 3M have visited them to benchmark their internal KM processes.

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 solution to their problem. If the solution does not work, they most likely question the inputs to their decision and attempt to make a better decision next time. Argyris and Schon (1978, 1996) 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 programs for changing culture 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 they 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 do not 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. The example of the Nokia way, illustrated in box 7.3, describes one such holistic approach to culture.

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, intranets with space devoted to different communities of practice
- Change performance evaluation criteria to reflect and assess knowledge-sharing competencies and accomplishments
- Censure knowledge hoarders and reward effective knowledge-sharers
- Redesign workplaces to allow for gathering places (Cook 1997; 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,

Box 7.3
An example: Nokia

Nokia views KM as a combination of people, processes, technologies, and culture. It is through learning that organizations are able to improve what they do. Appropriate knowledge sharing facilitates effective learning. Various management approaches can be used in combination to produce a learning organization, which can in turn provide improved service—these include competence management and performance management. Organizational values must be reflected in the day-to-day running of an organization in order to impact on its knowledge strategy. The Nokia Way promotes a culture of learning that is premised on four pillars: customer satisfaction, respect for the individual, achievement, and continuous learning. The Nokia Way is facilitated through a series of mechanisms, mainly interactions between managers, colleagues, and employees placing power in the hands of the individual to develop in the organization. A jazz band analogy best captures Nokia's approach to KM: the company shares a common vision and creates the space for an ensemble to perform in unison without controlling the music or constraining the performance.

Change and people management are commonly believed to make up 80 percent of KM while IT comprises only 20 percent. At Nokia, no one person owns the KM process—everyone owns it. HR has a crucial role to play in implementing KM, as do IT, quality, and corporate planning departments. Organizational learning overlaps performance management (individual focus), competency management (organizational focus), and KM (thematic or team focus). Nokia is integrating these three approaches in order to identify best practices and lessons learned.

Nokia uses a book, the Nokia Saga, which is a novel about Nokia's history. It contains about one hundred stories which many employees read in order to better understand the company's values. The storytelling provides examples of what managers do and how they apply Nokia values. Nokia's annual report is called "No Limits," and it gives progress reports on how the company culture is moving toward a knowledge-sharing culture—with no limits on learning, participating, and building better futures.

Nokia does not have a CKO. They have a steering group of about ten persons from different functional areas coordinating KM activities. The head of the steering committee is also the head of the quality department. In many organizations, there is still a concern that sharing all its knowledge means giving all its power away. Nokia was able to change its culture to one of knowledge sharing by designing a flat, networked, global, and multicultural organization. Speed, flexibility, opportunity, and openness are the key features. Nokia's management evaluates how well employees do with respect to supporting KM in terms of creating, sharing, and reusing knowledge. They do not have incentive systems, as they believe knowledge sharing should be part of the company culture and not something that is rewarded with money. The intention is to try to capture as much organizational knowledge as possible. As in a good jazz band, the players share a common vision, and are interested in producing good products through innovation and improvisation. It is not always clear what the end result will be, but because there is a common vision guiding their performance, these professionals allow their services to be shaped by the feelings and interactions of the various players who are part of the company.

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 person.
- 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 setup 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 semi-public 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 by 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 they are not familiar with, 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 member's performance in the open space. Some examples of characteristics that are more connected with open space are individual initiative, integration, reward system, and ethical climate. The facilitators should not ignore the impact of organizational culture of the group of people who will attend the open space. Further, the facilitators 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 solutions, 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 illustrations are provided, covering GE, Viant, and ICL (boxes 7.3–7.5).

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.

Box 7.4

An example: General Electric

Sharing best practices is a “way of life” at GE—employees live and breathe it every day (Stewart 2000). A culture of what the company calls “boundarylessness” ensures that at GE, whatever one person knows, everyone knows. GE demonstrates how this process works. Beyond competence, community, and commitment, trust needs communication, both positive and negative, and both best practices and lessons learned. GE is riddled with CoPs—manufacturing councils, finance councils, technology councils—literally hundreds of interdisciplinary and inter-business groups. Here GE’s younger employees bring their ideas to share at meetings, where other members test them, improve upon them, and take them home to be implemented in their own businesses. Individual performance reviews stress the skills that contribute to the culture. Executive evaluations cover two major areas: performance and personal values. Performance is a quantitative measure, but when it comes to the qualitative measure of an executive’s personal values, the only category that supersedes boundarylessness is integrity. At GE, employees are at least as well regarded for borrowing a best practice across business lines as they are for inventing a best practice.

Face time is only one way GE shares best practices and other intellectual assets. MS exchange is standard on 50,000 desktops. In addition, GE has an intranet with the goal of making the right information available at the right place and at the right time. The intranet is an important vehicle for dynamic publishing and sharing of best practices. In all divisions, executives put even their undeveloped ideas online. Others use, and then modify those ideas using collaborative tools. For example, executives from all twelve GE divisions discuss benchmarking for computer usage via GE’s intranet. Another discussion site is devoted to enterprise resource planning. GE’s Technological Leadership Program is an online multimedia just-in-time training program, which is also available live on the intranet.

Jack Welch, who was the CEO from 1981 to 2001, committed GE to a Six Sigma Program where the goal is to allow fewer than 3.4 customer-perceived defects per 1 million opportunities to err. The linchpin to the knowledge sharing necessary to achieve that goal is an intranet-accessible data warehouse dedicated to knowledge about quality that is shared. How important is knowledge sharing at GE? If you are a CEO at GE and you mention that you have developed a great new business procedure, the first question the chairman will ask is, “Whom have you shared this with?” People who hoard an idea for personal glory simply do not do well at GE.

Box 7.5
An example: Viant

Viant (Stewart 2000) is a consulting company in Boston, public since June 1999, and is often touted as a leader in knowledge sharing. New employees start off with an initiation course of three weeks in Boston. At the end of their three weeks, they now know someone in each of Viant's offices, and have a laptop fully loaded with off-the-shelf and proprietary software. They learn team skills and consulting strategies, including a mock consulting engagement. They bond and hear company folklore. In terms of workplace layouts, Viant has a "leaky knowledge environment," balancing openness and privacy. People tend to underestimate how much private offices are used for meetings. At any given time, Viant's leadership team consists of a score of official members and about an equal number of rotating "fellows" nominated by their peers in the field. Conventional reporting relationships do not work with consultants who rotate in and out of assignments, so consultants have no fixed boss; instead senior people act as "advocates" for a number of "advocatees." Performance reviews are 360 degrees, of course, emphasizing the growth in an employee's skill levels, while stock options are used to recognize excellent knowledge sharers. As part of their everyday work, consultants complete a "quick sheet" that describes the knowledge they need, what can be leveraged from previous projects, what they will need to create, along with the lessons they hope to learn from each assignment. A longer report, a sunset review, is produced at a team meeting to learn what did and did not work well. Almost every document ends up hot-linked to Viant's intranet site. Sunset reviews are always done with a facilitator who is not part of the team, which keeps everyone honest. Every six weeks, the KM group prepares, posts, and pushes a summary of what has been learned.

Viant is also unusual in that it picks "project catalysts" from top consultants in the company. They are pulled off client work for several months and assigned to other projects where they do not supervise. They are not, however, passive—they are there to help: What are you doing? How can I help? Looks like you need an example of a business plan to adapt for your client, let me get one, and soon. This is in-your-face KM—and they are referred to as agitators. Knowledge sharing is natural, instinctive, and painless in all aspects of our lives—except our corporate ones. Companies who succeed in sharing knowledge somehow "force the issue"—at Viant, that is the job of the agitators.

Box 7.6
An example: ICL

ICL Ltd (Bhatt 2000) developed a "conversation for change" program whereby all employees are asked to provide input in setting directions. The CEO invites all employees to participate in the program. In addition, all executives use online chat sessions to discuss staff issues in an open and nonjudgmental environment. This style of openness generates a feeling of "wanting," which can be very powerful in generating commitment and loyalty. The staff feels their views and opinions are wanted and whatever they say will influence the future vision. Every view is considered valid and important. The CEO also set up a web space whereby any questions asked of him are posted with replies for all to see. ICL is an example of many companies where leaders are changing the way they lead. These leaders are not simply providing lip service, but genuinely believe that knowledge is a key asset and that asset largely consists of the people in the organization.

Box 7.7
An example: Xerox

Xerox Corporation global service technicians exchange most of what they know through informal networks (Roberts-Witt 2002). Technicians recount war stories face-to-face, but this is not effective across all the service teams. The Eureka system was designed to capture this tacit knowledge and make it more widely available. Technicians generally take a great deal of pride in their ability to innovate. Recognition, rather than financial reward, turned out to be a major motivator in the sharing of their stories. The author's name is displayed prominently next to each tip in the system in order to reinforce this incentive. Each tip is peer reviewed. In its first month, over 5,000 tips were entered into Eureka.

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 a 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 post-merger 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 of 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.

Box 7.8
An example: Sigma

Sigma is a team-oriented completely virtual German organization (Lemken, Kahler, and Rittenbruch 2000). They went from twenty founding members to two-hundred employees with home offices throughout the country. They introduced a bulletin board service and local groups met biweekly or bimonthly. All employees met face-to-face once a year. Each area, each branch ended up having its own local culture. There was a great deal of resistance to any top-down implementation of a KM system as well as to any attempts to change their culture. In the early years, Sigma was a small group of individuals who had no trouble networking. Rapid growth and increasing virtualization changed the early culture of Sigma. Technology could not replace their tradition of personal-network-based collaboration and oral sharing of knowledge. However, what did succeed was a highly flexible approach. Transparency about activities resulted in the creation of a culture of trust. KM is thus an evolutionary process that needs to be embedded into the organizational culture. By allowing organizational members to participate in the development of content, rules, and goals, greater cohesion will result and this will help move the organization to a higher level of organizational and KM maturity.

Impact of Virtualization on Culture

The basic challenges that culture faces in a virtual organization are:

- No formalization, each person 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 between 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. 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, and 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:

- Clearly define desired cultural outcomes
- Assess the current cultural state
- Diagnose the existing culture with respect to desired knowledge-sharing behaviors
- Assess tolerance to change
- Identify change enablers and barriers
- Assess the maturity level of KM within the organization
- Identify KM enablers and barriers
- 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

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 7.9).

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

Table 7.9
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

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 e-mail 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. To bring about cultural change, it is 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. An example of a KM incentive strategy at Hill and Knowlton is explored in further detail (box 7.9).

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 by Cohen and 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 who 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 chance to reframe their perception of themselves and of the planned cultural changes.

Box 7.9
An example: Hill and Knowlton

Hill and Knowlton International Public Relations-Public Affairs established a knowledge commerce methodology for its 1,700 employees worldwide. The goal was to conduct consultations in such a way that the absorbed experience of that project is captured in a knowledge base and is reusable for a new client.

A product launch with a client in the US, for instance, could be replicated worldwide without the same level of man-hours. Replication does not imply exact duplication, but rather abstraction of the key points of what makes it an effective launch. Captured knowledge could include a checklist of product launch activities, a critical path outlining execution priorities, and competitive intelligence. Hill and Knowlton's approach to KM implementation was a three-pronged one: Decide on a technology platform; get people motivated to use the KM resources; and integrate KM practices with people's daily work. IT integrated the platform with in-house e-mail and also organized editors into roles as coaches and knowledge arrangers and categorizers. Senior management rejected the idea that compensation for knowledge contributions was best conducted through infrequent performance reviews.

One of the biggest benefits of a knowledge economy has been the cross-pollination of ideas and abstract thinking across the company. H&K's work is organized around practice area (i.e., crisis management or investor relations) and industry vertical (i.e., healthcare or technology). H&K is trying to break down service silos quite a bit. If someone develops an account plan in crisis management that could be applied to other groups, they try to open up people's minds and identify information applicable to those other areas, like investor or government relations.

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 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, 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 prohibitive. 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 for sales and marketing people, whereas the interpretation of the same word by telecommunications 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 almost analogous with the concept of personality in relation to the individual and this acute sense of what an organization is—its mission, 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.

• An organization's culture may be in differing states of maturity, and these can be assessed using a variety of organizational and KM maturity models.

• 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. 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?
5. 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.

6. 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?

7. Describe how you would initiate an organizational change initiative. Provide an estimate of how long you believe each stage would last.

8. What are some of the ways of assessing whether or not the culture is changing, or maturing, toward an intended end state? Provide examples.

9. 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 CoP?

10. 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?

References

Argyris, C., and D. Schon. 1978. *Organizational learning: A theory of action perspective*. Reading, MA: Addison-Wesley.

Argyris, C., and D. Schon. 1996. *Organizational learning II: Theory, method and practice*. Reading, MA: Addison-Wesley.

Bhatt, D. 2000. EFQM: Excellence Model and Knowledge Management Implications. http://www.eknowledgecenter.com/articles/1010/1010.htm. Accessed June 4, 2010.

Bloom, H. 2000. *The global brain*. New York: John Wiley and Sons.

CMMI Project Team. 2002. Capability Maturity Model Integration (CMMI). Version 1.1. *Report CMU/SEI-2002-TR-011*. Software Engineering Institute, Pittsburg.

Cohen, W., and D. Levinthal. 1990. Absorptive capacity: A new perspective on learning and innovation. *Administrative Science Quarterly* 35:128–152.

Cook, L. 1997. Cubicle mazes to private spaces: Firms revamp office design. *Houston Business Journal*. September 26, http://houston.bizjournals.com/houston/stories/1997/09/29/focus2.html (accessed June 4, 2010).

Craik, K. 1943. *The nature of explanation*. Cambridge, UK: Cambridge University Press.

Edmondson, A., and B. Moingeon. 1999. Learning, trust and organizational change. In *Organizational learning and the learning organization*, edited by M. Easterby-Smith, L. Araujo, and J. Burgoyne. London: Sage.

Fullam, M. 2001. *Leading in a culture of change*. San Francisco: Jossey-Bass.

Gentner, D., and A. Stevens. 1983. *Mental models*. Hillsdale, New Jersey: Lawrence Erlbaum and Assoc.

Gladwell, M. 2000. Designs for working. *The New Yorker* (December, 11):60–70.

Goffee, R., and G. Jones. 2000. *The character of a corporation: How your company's culture can make or break your business*. New York: HarperBusiness.

Grenier, L. 2007. Capability Maturity Model Integration (CMMI) definition and solutions. *CIO*. http://www.cio.com/article/147100/Capability_Maturity_Model_Integration_CMMI_Definition_and_Solutions?page=1. (accessed June 4, 2010).

Gruber, H., and L. Duxbury. 2000. Does organizational culture affect the sharing of knowledge? The Case of a Department in a High Technology Company. In *Proceedings of the 28th Annual ASAC Conference, Technology and Innovation Management Division,* Montreal, Quebec.

Harrison, R., and H. Stokes. 1992. *Diagnosing organizational culture*. San Francisco: Jossey-Bass.

Hofstede, G., B. Neuijen, D. Daval Ohayv, and G. Sanders. 1990. Measuring organization cultures: A qualitative and quantitative study across twenty cases. *Administrative Science Quarterly* 35:286–316.

Johnson-Laird, P. 1983. *Mental models: Towards a cognitive science of language, inference, and consciousness*. Cambridge, UK: Cambridge University Press.

Kanter, R.M. 1989. *When giants learn to dance: Mastering the challenge of strategy, management and careers in the 1990s*. New York: Simon and Schuster.

Kilmann, R., M. Saxton, and R. Serpa. 1986. Issues in understanding and changing culture. *California Management Review* 28:87–94.

Kochikar, V. 2000. The knowledge management maturity model—A stage framework for leveraging knowledge. In *Proceedings of the KMWorld 2000 Conference,* New Jersey.

Kotter, J. 1996. *Leading change*. Boston: Harvard Business School Press.

Lemken, B., H. Kahler, and M. Rittenbruch. 2000. Sustained knowledge management by organizational culture. In *Proceedings of the 33rd Hawaii International Conference on Systems Sciences,* 64–77.

Liebowitz, J., and T. Beckman. 2008. Moving toward a knowledge management maturity model (K3M) for developing knowledge management strategy and implementation plans. *Knowledge management: An evolutionary view*, edited by I. Becerra-Fernandez and D. Leidner. Vol. 12 of Advances in Management Information Systems. New York: Springer, 163–179.

Morgan, G. 1977. Bureaucratic organizations. In *Research access*, edited by C. Brown, P. Guillet de Monthoux, and A. McCullough. Sweden: THS Co., 138–150.

Morgan, G. 1997. *Images of organization*. Thousand Oaks, CA: Sage Publications.

Neher, W. 1997. *Organizational communication*. Needham Heights, MA: Allyn & Bacon.

Oakhill, J., and A. Garnham, Eds. 1996. *Mental models in cognitive science*. Mahwah, NJ: Lawrence Erlbaum Associates.

Owen, H. 1997. *Open space technology: A user's guide*. San Francisco, CA: Berrett-Koehler.

Paulk, M. C., C. Weber, B. Curtis, and M. Chrissis. 1995. *The capability maturity model: Guidelines for improving the software process*. Reading, MA: Addison-Wesley.

Paulzen, O., and P. Perc. 2002. A maturity model for quality improvement in knowledge management. *Enabling Organizations and Society through Information Systems. Proceedings of the 13th Australasian Conference on Information System (ACIS 2002),* edited by A. Wenn, M. McGrath, and F. Burstein. Melbourne, Australia: 243–253.

Pepper, G. 1995. *Communicating in organizations: A cultural approach*. New York: McGraw-Hill.

Roberts-Witt, S. 2002. A "Eureka" moment at Xerox. *PC Magazine,* March 26. http://www.pcmag.com/article2/0,4149,28792,00.asp (accessed June 4, 2010).

Rogers, Y., A. Rutherford, and P. A. Bibby, eds. 1992. *Models in the mind: Theory, perspective and application*. London: Academic Press.

Sathe, V. 1985. *Culture and related corporate realities*, 1st ed. Homewood, IL: Richard D. Irwin.

Schein, E. 1992. *Organizational culture and leadership*, 2nd ed. San Francisco: Jossey-Bass.

Schein, E. 1999. *The corporate culture survival guide: Sense and nonsense about cultural change*. San Francisco: Jossey-Bass.

Shevlin, R., R., Maney, J., Sawyer, and B. Edwards. 1997. The stages of knowledge management. *The Forrester Report—Leadership Strategies* 3 (2).

Stewart, T. 2000. Whom can you trust? It's not so easy to tell. *Fortune* June 12.

Sveiby, K., and R. Simons. 2002. Collaborative climate and effectiveness of knowledge work—An empirical study. *Journal of Knowledge Management* 6 (5):420–433.

Tapscott, D., and D. Ticoll. 2003. *The naked corporation. How the age of transparency will revolutionize business*. Toronto, Ontario: Viking Canada Press.

8 Knowledge Management Tools

Any sufficiently advanced technology is indistinguishable from magic
—Arthur C. Clarke (1917–2008)

This chapter provides an overview of knowledge management (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 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 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 the millennial generations.

Introduction

Technology is a moving target as new tools are being continuously developed and adopted 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. 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 e-mail 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 as the net generation (Tapscott,) or 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:

- To 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 what phase of the KM cycle they occur in (refer to figure 8.1).

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. A wide range of diverse KM technologies may be used to support knowledge sharing and dissemination as well as knowledge acquisition and application. Table 8.1 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. The choice of tools to include in the KM toolkit must be consistent with the overall business strategy of the organization.

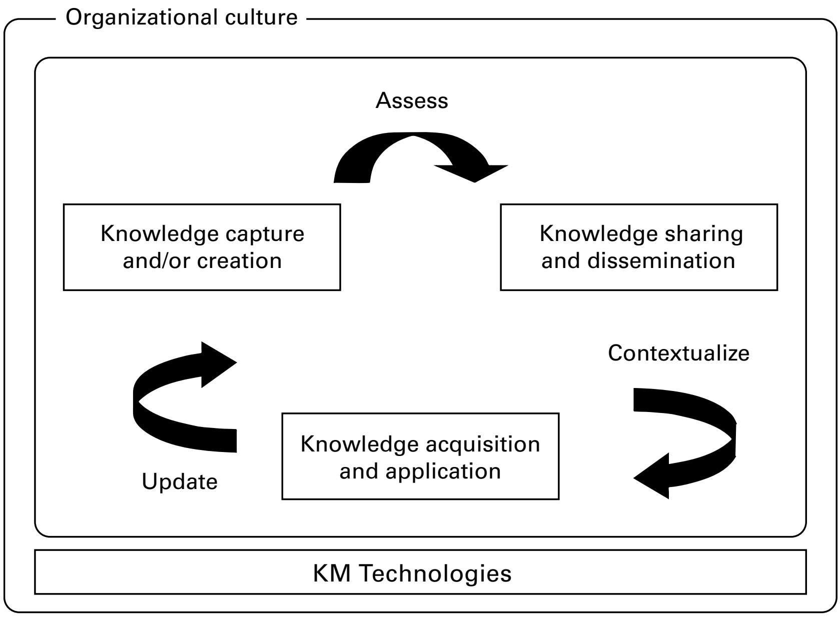


Figure 8.1
An integrated KM cycle

Knowledge Capture and Creation Tools

Content Creation Tools

Robertson (2003a) predicts that content management systems (CMS) will become a commodity in the future. Many content management system 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 communicating with and between 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

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 • Blogs • Mashups	Communication and collaboration technologies • Telephone/Internet telephone/Fax • Videoconferencing • Chat rooms/instant messaging/iwitter • E-mail/discussion forums/ wikis • Groupware • Work flow management • Folksonomies • Social networking • Web 2.0/KM 2.0	E-learning technologies • CBT • WBT • EPSS Emerging technologies • Folksonomies • Metadata
Content management • Taxonomies • Folksonomies • Metadata tagging • Classification • Archiving • Personal KM	Networking technologies • Intranets • Extranets • Web servers, browsers • Knowledge repository • Portal	Artificial intelligence technologies • Expert systems • DSS • Customization/personalization • Push/pull technologies • Recommender systems • Visualization • Knowledge maps • Intelligent agents • Automated taxonomy systems • Text analysis—summarization

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., 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 and Knowledge Discovery

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 are 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).

A large number of inputs are 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).

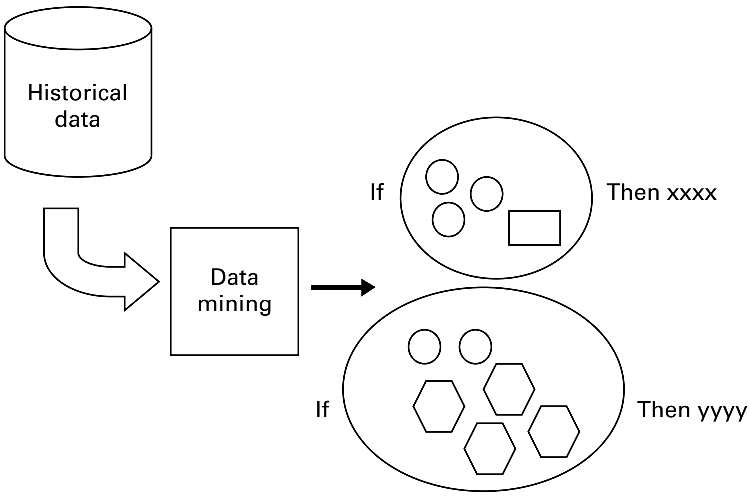


Figure 8.2
Predictive models

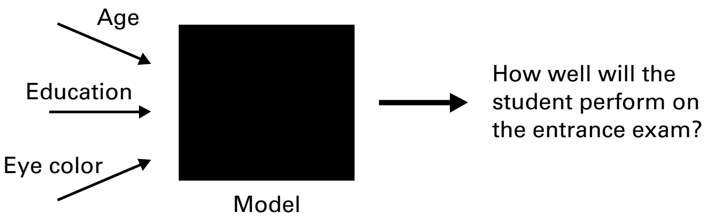


Figure 8.3
Black box models

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 (i.e., that are found in the same basket at checkout). One of their hypotheses was to place all infant care-related items together and 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.

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 the vignette). 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. The famous example is that of the relationship between purchases of beer and purchases of diapers.

Some data mining tools that are currently in use include:

- Statistical analysis tools (e.g., SAS)
- Data mining suites (e.g., EnterpriseMiner)
- Consulting/outsourcing tools such as EDS, IBM, Epsilon (note that these tools are models, not just software)
- Data visualization software that coherently present a large amount of information in a small space. They make use of the human computer—your eyes—to detect patterns, for example, virtual reality and simulation software—to walk around the data points.

It is also possible to apply this technique and use these tools to mine content other than data, namely text mining, thematic analysis, and web mining to look at what content, how often, 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 e-mail 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 e-mails. 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).

Blogs

A *blog* is a term for a web log—a popular and fairly personal content form on the Internet. A 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/). 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. Further, blogs are becoming much more common, as businesses, politicians, policy makers, and even libraries and library associations have begun to blog as a way of communicating with their 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 important, 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.

Right now, the majority of blogs are published exclusively in text. The next generation of blogs, however, will implement audio and video elements, bringing a sophisticated multimedia blend to the medium (Dames 2004). The overwhelming 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 web site 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 (2004) 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. Because blogs can be updated on the fly, they frequently have unfiltered information faster from war zones and sites of natural disasters than the mainstream media outlets. Blogs are also good sources of unfiltered information on either faulty or very useful products.

In the beginning, blogs appeared in search results alongside regular web pages. Since blogs are not technologically any different from other web pages (i.e., they are HTML, XML, JavaScript, etc., and it is their format, not their coding, that is different.), spiders and bots collect posts the same way they collect other online information. Search engines that place greater value on sites that are recently and frequently updated and are highly linked tend to rank blog posts very highly. Since the barrier to publication is so low in blogs, arguably much lower than for standard web pages, these high rankings were introducing a lot of noise into online searches. Odds are that you have run across several archived blog posts if you have searched on a controversial topic in the past year. Recently, most major search engines have altered their algorithms to push blogs down in the search results. Engines that only return two results from any one site use this feature to limit the impact of blogs on the search results.

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. At this time, blog search engines are where general search engines were before the Google Age. There are many competing smaller products but no outstanding products dominating the scene.

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 new emergent technology (Zang, Rosson, and Nasser 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 to date 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 are aggregate content. However, mashups do so in a much more dynamic way (portals are discussed later in this chapter).

Content Management Tools

Content management refers to the management of valuable content throughout the useful life span of the content. Content life span 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 life span. 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. 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, for example, 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) 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 semi-automatic) 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.

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 three types. Administrative metadata is the information needed to manage the information resource over its life cycle 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. Structural metadata relates to the actual computer elements involved such as tables, columns, and indices—all the logical units of the information resource. 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, keywords). 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 web site and then tagging these sites with your own metadata. Early sites include: del.icio.us (http://www.delicious.com), Furl (http://www.furl.net/), web page bookmarking sites, and Citeulike (http://www.citeulike.org/), a social citation site for scholarly publications. Other users can then view the bookmarks by category, 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, that is, a list of standard keywords. So 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 data) can include annotations about 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 (CoP), 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 of 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 do not 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 keywords. 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.

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 e-mail 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 are brought together and arranged on the 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, e-mails, and bookmark collections.

Knowledge Sharing and Dissemination Tools

Rollet (2003) made a distinction between communication technologies, such as telephone and e-mail, and collaboration technologies, such as work flow management. Yet it is very difficult to draw a line between the two. Communication and collaboration are invariably intertwined. 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 (work groups) attached to a communication network (e.g., LAN) organize their activities. Typically, groupware supports the following operations:

- Scheduling meetings and allocating resources
- E-mail
- Password protection for documents
- Telephone utilities
- Electronic newsletters
- File distribution

Communication technologies used typically include the telephone, fax, videoconferencing, teleconferencing, chat rooms, instant messaging, phone text messaging (SMS), Internet telephone (voice over IP or VOIP), e-mail, and discussion forums. Communication is said to be dyadic when it occurs between two individuals, for 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 (audiovisual). 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 cell phone rather than through the Internet.

E-mail continues to be one of the most frequently used communication channels in organizations. Although e-mail 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

Table 8.2
Classification of groupware technologies

	Same time synchronous	Different time asynchronous
Same place, colocated	Voting presentation support	Shared computers
Different place, distant	Videophones Chat	E-mail Work flow

work. Collaboration technologies are often referred to as groupware or as work group 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 e-mail, newsgroups, videophones, or chat.

Groupware technologies are typically categorized along two primary dimensions (see table 8.2):

- Whether users of the groupware are working together at the same time (real-time or synchronous groupware) or different times (asynchronous groupware), and
- Whether users are working together in the same place (co-located or face-to-face) or in different places (non-co-located or distance).

Coleman (1997) developed the taxonomy of groupware that lists twelve different categories:

- Electronic mail and messaging
- Group calendaring and scheduling
- Electronic meeting systems
- Desktop video, real time synchronous conferencing
- Non-real time asynchronous conferencing
- Group document handling
- Work flow
- Work group utilities and development tools
- Groupware services
- Groupware and KM frameworks
- Groupware applications
- Collaborative Internet-based applications and products

E-mail is by far the most common groupware application (besides, of course, the traditional telephone). While the basic technology is designed to pass simple messages between two people, even relatively basic e-mail systems today typically include interesting features for forwarding messages, filing messages, creating mailing groups, and attaching files with a message. Other features that have been explored include automatic sorting and processing of messages, automatic routing, and structured communication (messages requiring certain information).

Newsgroups and mailing lists are similar in spirit to e-mail 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).

Work flow systems allow documents to be routed through organizations using a relatively fixed process. A simple example of a work flow application is an expense report in an organization. An employee enters an expense report, submits it, a copy is archived, and then routed to the employee's manager for approval. The manager receives the document, electronically approves it, and sends it on. The expense is registered to the group's account and forwarded to the accounting department for payment. Work flow 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 multi-user 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) and 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 is 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 tele-pointers, which are color coded or labeled to identify each person.

Twitter is a newer technology that is about as real as real-time can get. The major use of Twitter is to continuously answer the question, "what are you doing now?" It is a miniblogging service that allows users to send tweets or minitexts up to 140 characters in length to their user profile web page. 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 e-mail, on Facebook, and so on. Twitter started out in life as an R&D project in podcasting (Glaser 2007). While Twitter remains largely a novelty application used by early adopters, there are potential applications within a KM context. Anthony 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).

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 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 chatlike systems are possible using non-text 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.

Groupware applications from Teamware, the U.S. Army, Chevron, and BP are further illustrated in boxes 8.2 and 8.3.

Wikis

Wikis are web-based software that supports concepts such as open editing, which allows multiple users to create and edit content on a web site (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 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. In the last year or two, corporations have been harnessing the power of wikis to provide interactive forums

Box 8.2
An example: Teamware

Teamware Group, a Fujitsu subsidiary, implemented an interactive web community solution for the city of Kerava in Finland. The solution enhances communication between and within the city managers, city board, city council, and other elected officials, and offers them facilities to interact and distribute information regardless of time or location. The objective of the system is to facilitate the daily work of the city administrators by providing them with a new virtual means of interaction in addition to the traditional meetings and sessions. "It has become more and more difficult for the city administrators to take care of their duties within the normal working hours and premises. Therefore, it is essential to provide them with facilities to communicate and obtain information without the boundaries of time or location," says IT manager Ari Sainio from the city of Kerava.

The new system was built on the Teamware Pl@za platform and integrated with the existing Teamware Office groupware solution, which means that now e-mail, city archives, electronic calendars, and bulletin boards will be available for the city administrators through a standard web browser. In order to enhance interaction between the city officials, the system is augmented with discussion facilities where individuals can exchange opinions and discuss different issues. Various archives and files are created for content management purposes. Different user groups are provided with their own virtual workspaces that can be accessed only by authorized members. Thanks to Teamware Pl@za's decentralized and easy-to-use updating functionality, the city officials can update the pages themselves.

for tracking projects and communicating with employees over their in-house intranets.

An example is Wikipedia (http://en.Wikipedia.org/Wiki/Main_Page), a free encyclopedia written by literally thousands of people around the world. Wikis exist for thousands of topics (http://www.worldwideWiki.et/Wiki/SwitchWiki). 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 web sites 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 offices space in another city. Outside the office, it means customer service representatives can interact with customers more readily, which should advance e-commerce (Leuf and Cunningham 2001). Cunningham, a programmer, decided to build the most minimal working database possible and started the first wiki in 1995. The idea was to provide a simple web site where programmers could quickly and easily

Box 8.3

An example: U.S. Army/Chevron/BP

The Army's after action review (AAR) is an excellent example of a process that ensures lessons are learned after an event (Bhatt 2000). British Petroleum (BP) and Chevron have introduced similar systems whereby they learn before, during, and after the undertaking of a large project. Major cost savings have been realized by introducing these learning processes. For example, Chevron introduced a lessons learned tool for their drilling processes. Every time they drill in a particular area, lessons are recorded. Next time drilling takes place in a similar area, lessons learned during the last drilling operations are available. This results in fewer errors and less reinventing of the wheel. Chevron has also recorded waste savings in their drilling operations.

The United States Air Force (USAF) is utilizing Open Text's Livelink to manage its Business Solutions Exchange (BSX), which involves integrating the people, process, and policies of the USAF's service contracting into a single system, paving the way for the group to meet the Pentagon's goal of a completely paper-free acquisition process. Prior to installing Livelink, the USAF employed a variety of client-server based systems that had difficulty managing this process across different geographic locations. With the new collaborative KM approach, the USAF has reduced the time spent from identifying the point of need to completing a performance requirement document (PRD) from seven months to eight weeks, a 70% reduction in processing time.

The USAF's KM initiative is part of the Pentagon's requirement to simplify and modernize the US Defense Department's acquisition process in the area of contract writing, administration, finance, and auditing. Since July 1998, the USAF has been using Livelink on a variety of outsourcing projects. The first and largest project can be found at the Maxwell Air Force Base in Alabama. The goal of the business solutions exchange (BSX) process is to continually improve USAF business practices. BSX goes to work as soon as a requirement is identified and a business strategy team is formed. The collaborative software is used throughout the life cycle of the project, from requirements definition to contract closeout, connecting a cross-functional team dispersed across a given base and the command.. A team, often composed of people from six different locations within the US, is formed to create a PRD and uses the collaborative software as its central knowledge library to gather market research, establish an acquisition plan, record baseline costs, eliminate regulatory constraints, draft requirements, and gather feedback from customers and industry on the contract requirements. The BSX team works together throughout the planning, execution, and supplier management phases. Teams use the public folders (http://www.bsx.org) to gather feedback from industry on ways to improve existing requirements documents. In addition, the public sites include process-oriented libraries of best practices that are available to other agencies, whether or not they use the collaborative capabilities of Livelink.

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 and 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 e-mailing updates back and forth to the team members. It is faster than e-mail since updates are available instantly and more efficient than e-mail 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 it 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 for information to 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 Networking, 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, 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 address similar goals to solve problems, increase efficiency, and 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 increasingly become used in KM applications (Durkheim 1964, Drucker 1989, Granovetter 1973, Lewin 1951). Valdis 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 and Duguid 1991). SNA is one of the ways of identifying experts and expertise to develop an expertise locator system. The basic steps to develop a survey tool (e.g., a questionnaire) to collect the required data are to identify network members and their exchange patterns. Next, the data are 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.

The combination of social networking, 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://en.oreilly.com/web2008/public/content/home). 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
- Re-mixable 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 e-mail 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 allows someone to subscribe to a webpage 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 developed a social networking tool called Pass It Along (a free demonstration is available at http://www.ibm.com/developworks/community/passitalong) to promote knowledge sharing and skills development. Pass It Along integrates knowledge management, social networking, and Web 2.0 concepts to help users share and apply information. Each user can decide how widely they want their content to be shared and who they would like to collaborate with, for example, new hires, include external partners or not or limit to a particular community of practice. Users can visually map out their knowledge assets so others can see them.

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 are less concerned with control and availability of the underlying technologies. A surprising example is the Central Intelligence Agency (see the vignette). 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.

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

Box 8.4
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, The 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 sixteen 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 sixty-one-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 locator system integrated within this system as users can find out who has expertise on a particular topic, a particular country, and so forth. After two years in operation, Intellipedia has over forty thousand registered users who have made almost two million edits on the web pages (which number around three hundred thousand). 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 amount of people and most likely through e-mail (which only served to add to employee information overload). Intellipedia defines and enables the US intelligence community and is a clear contrast to what 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 mind-set of the individuals and the collective mind-set that prevails as the organizational culture.

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 Rnowledge 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 more detail in the next section) can then periodically access, assess, 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, Van Der Spek, and Kruizinga (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 communication processes to detect knowledge.

Davenport and Prusak (1998) divide between three types of knowledge repositories:

- External knowledge repositories (such as competitive intelligence)
- Structured internal knowledge repositories (such as research reports, product-oriented market material)
- 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 mini-portals distributed across an organization.

Most repositories will contain the following elements (adapted from Tiwana 2000):

- Declarative knowledge (e.g., concepts, categories, definitions, assumptions—knowledge of what)
- Procedural knowledge (e.g., processes, events, activities, actions, manuals—knowledge of how or know-how)
- Causal knowledge (e.g., rationale for decisions, for rejected decisions—knowledge of why)
- 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 mini-portals 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 LotusNotes platform and will be run as an intranet within the organization with appropriate privacy and security measures in place. An example is described in box 8.5.

Knowledge portals provide access to diverse enterprise content, communities, expertise, and to internal and external services and information (Collins 2003;

Box 8.5
An example: Price Waterhouse Coopers (PWC)

Price Waterhouse Coopers focused on sharing knowledge across what had been boundaries following the merger of Price Waterhouse and Coopers & Lybrand. The chief knowledge officer, Ellen Knapp, supported this effort by putting into place the KnowledgeCurve, where employees can find a repository of best practices, consulting methodologies, tax and audit rules, news services, online training, directories of experts, and more, plus links to specialized sites for various industries or skills. The site gets eighteen million hits a month, mostly from workers downloading forms or checking news, but also from employees looking things up. Yet there is a feeling that it is underused. When looking for expertise, most people still go down the hall.

In parallel, a British-based PWC consultant and his colleagues set up a network where they could be more innovative. Over five months they set up a Lotus Notes e-mail list with no rules, no moderator, and no agenda other than what is set by the messages people sent. Any employee was able to join. Kraken, as it came to be known, now has five hundred members and although it still has unofficial status, it has become the premier forum for sharing. As an analogy, Kraken is to KnowledgeCurve what Carlos was to Eureka. On a busy day, members may get fifty Kraken messages but they are welcomed because they are relevant and useful.

What are some of the reasons for this grassroots CoP success over corporate top-down KM systems? It is demand-driven ("does anyone know…"); it gets at tacit knowledge; it allows fuzzy questions rather than structured database queries; it is part of the everyday routine; and it is full of opinions—points of view rather than dry facts. KnowledgeCurve preserves explicit knowledge—Kraken enables the sharing of tacit knowledge. Kraken is about learning; KnowledgeCurve is about teaching. You cannot have one without the other.

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.

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 content 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. An application is described in box 8.6.

Box 8.6
An example: KPMG

KPMG International implemented KWORLD, an advanced global knowledge management system. KWORLD, an online messaging, collaboration, and knowledge-sharing platform, is reportedly the first system of its kind built entirely from standard Microsoft components—Microsoft Windows NT Server, including Microsoft Exchange, Site Server, and Microsoft Office, Outlook, and Internet Explorer. KWORLD is KPMG's digital nervous system based on the Microsoft concept.

KPMG invested over one year and $100 million in developing this universally accessible knowledge-sharing environment, which allows its nearly one hundred thousand professional workers to conduct active conferences and public exchanges, locate customized and filtered external and internal news, and access global- and country-specific firm information. As acknowledged by Microsoft, KPMG is one of only five organizations to embark on its fast-track program to exploit fully the power of the web browser, integrate Microsoft-based messaging, collaboration and knowledge-sharing applications, and push current web technology to the "limit." Knowledge is content in context, and KPMG's global communities of practice—who marry knowledge about complex services to specific industries—determine KWORLD's contextual frames. KWORLD brings qualified internal content and filtered external content to each community with a click. KPMG foresees developing KWORLD extranets to make KPMG a virtual extension of its clients.

Mashups were discussed in an earlier section as a form of portal (see the previous section on Knowledge Creation and Codification Tools). Both mashups and portals 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, often adhere to standards, are updated according to an established schedule, 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. This is often shared with others in a limited way (e.g., often within their own community of practice). Mashups may have a limited life span 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 and Hong 2007).

Knowledge Acquisition and Application Tools

A number of technologies play an important role in how successful knowledge workers are in acquiring and applying 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. 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 acquire and apply valuable knowledge better. 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 or tutoring systems (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.

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 or 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 and 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, Tor, and Lee 1998):

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.

Social ability The ability to interact with, when they deem appropriate, other software agents and humans.

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.

Personalization The ability to adapt to its users needs by learning from how the user reacts to the agent's performance.

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 Agents a very helpful and time saving tool.

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.

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). These include personalized information management (such as filtering e-mail), 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, Tor, and Lee 1998):

Watcher agents Look for specific information

Learning agents Tailor to an individual's preferences by learning from the user's past behavior

Shopping agents Compare "the best price for an item"

Information retrieval agents Help the user to "search for information in an intelligent fashion"

Helper agents 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:

Information filtering We must go through an enormous amount of information to find the small portion that is relevant to us.

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 these 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 and Hawkins 1994).

Some companies receive so much e-mail that they have to employ clerical worker to sift through the flood of e-mail, answering basic queries and forwarding others to specialized workers. Others use intelligent filtering software such as GrapeVine for Lotus, which reads a pre-established 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. Some additional examples of information filtering agents are shown in table 8.3.

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 on, 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.

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

Table 8.3
Sample information filtering agents

Name	Description	Reference
Search pad	An advanced bot that finds and categorizes relevant information based on the users preferences, also learning from them	http://www.searchpad.com
Copernic	An agent that carries out net searches by simultaneously consulting the most important search engines on the web	http://copernic.com
Citizen 1	Finds thousands of the best databases on the Internet and indexes them into a hierarchy of files, making the Internet look like an extension of a PC file system	http://www.download.com/PC/Result/TitleDetail/0,4,0-21278-g.html
NetAttachePro v1.0	A "second generation web agent" which features a powerful information-filtering intelligent agent that organizes off-line browsing	http://www.tympani.com/

Table 8.4
Examples of personalized news services

Name	Description	Reference
myCNN	Personalized news service	http://my.cnn.com
Excit News Tracker	Pulls information from a collection of databases	http://nt.excite.com
Infoseek Personal News	Personalized news service	http://www.infoseek.com/news?pg=personalize.html
Dogpile	Fast, efficient news service that draws upon a large database for its searches	http://www.dogpile.com

highway can help reduce cost, effort, and time. Yet the development of intelligent agents is still in its infancy. As they gain in popularity and use, we can expect to see more sophisticated and better-developed intelligent agents.

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, Pejtersen, and Goodstein 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, Sproule, and Gupta (2003) made use of a similar conceptual framework to explore goal-directed behavior in online shopping environments. Choo, Detlor, and Turnbull (2000a) 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) adopted an information vantage point that views enterprise knowledge portals as more than tools to merely deliver content. He instead see them 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.

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 and Techniques

Historically, the IT horse has always been placed before the KM carriage. 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. An illustration is provided in box 8.7.

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.

Box 8.7
An example: Mercedes-Benz

The Mercedes-Benz Customer Assistance Center in Maastricht, The Netherlands, serves as a central customer contact point for the whole of Europe, handling all customer needs in seventeen European countries, in twelve languages, twenty-four hours a day, 365 days a year. In order to share knowledge of product information, technical information, and business procedures as well as sample letters, FAQs, and best practices, a web-based knowledge management solution was developed for Mercedes-Benz by CMG, a leading European IT services business. Called BRAiN (backbone repository for archiving information), this KM-based IT solution enables Mercedes-Benz Customer Assistance Center employees to share and retrieve knowledge through the company's corporate intranet. Full text searching and dynamic knowledge maps allow users to navigate intuitively to the information needed. Direct search facilities enable quick retrieval of all information related to a specific vehicle, country, or market, and have been fine-tuned to support business needs. Web technology facilitated a quick rollout within the organization and helps to minimize maintenance. Attention was paid to all business aspects throughout the project phases. A staged business approach, supported with incremental system development (RAD, rapid application development), was applied. Both technical and organizational goals were identified at each stage. Procedures were defined for sharing knowledge, and these were directly supported by the knowledge management system. BRAiN offers the possibility to identify knowledge users, publishers, advanced publishers, and knowledge administrators, each with their own rights and authorities.

Practical Implications of KM Tools and Techniques

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 is important is 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 lists 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?

References

Bhatt, D. 2000. EFQM: Excellence Model and Knowledge Management Implications. http://www.eknowledgecenter.com/articles/1010/1010.htm. (accessed June 4, 2010).

Blood, R. 2002. *The weblog handbook: Practical advice on creating and maintaining your blog*. Cambridge, MA: Perseus Publishing.

Bradley, A. 2008. Twitter and knowledge management: Synergy or oxymoron? http://blogs.gartner.com/anthony_bradley/2008/09/29/twitter-and-knowledge-management-synergy-or-oxymoron/ (accessed September 29, 2008).

Brown, J., and P Duguid. 1991. Organizational learning and communities of practice: Toward a unified view of working, learning, and innovation. *Organization Science* 2 (1): 40–57.

Choo, C. W., B. Detlor, and D. Turnbull. 2000a. Working the web: An empirical model of web use. *Proceedings of HICSSS 2000,* http://www.choo.fis.utoronto.ca/esproject.

Choo, C. W., B. Detlor, and D. Turnbull. 2000b. Information seeking on the web: An integrated model of browsing and searching. *First Monday* 5 (2), http://www.firstmonday.org/issues/issue5_2/choo/index.html.

Coleman, D. 1997. *Groupware: Collaborative strategies for corporate LANS and intranets*. San Francisco: Prentice-Hall.

Collins, H. 2003. *Enterprise knowledge portals*. New York: AMACOM.

Cope, M. 2000. *Know your value. Value what you know*. London: Pearson Education Ltd.

Davenport, T., and L. Prusak. 1998. *Working knowledge: How organizations manage what they know*. Boston: Harvard Business School Press.

Dames, M. 2004. Social software in the library, http://www.llrx.com/features/socialsoftware.htm (accessed July 26, 2004).

Dearstyne, B. 2007. Blogs, mashups, and wikis: Oh, my! *Information Management Journal* 41 (4):24–33.

Detlor, B. 2003. Internet-based information systems use in organizations: An information studies perspective. *Information Systems Journal* 13 (2):113–132.

Detlor, B. 2004. *Towards knowledge portals: From human issues to intelligent agents*. Dordrecht, The Netherlands: Kluwer Academic Publishers.

Detlor, B., S. Sproule, and C. Gupta. 2003. Pre-purchase online information seeking: Search versus browse. *Journal of Electronic Commerce Research* 4 (2):72–84.

Drucker, P. 1989. *The new realities*. Oxford, UK: Butterworth-Heinemann.

Durkheim, E. 1964. *The rules of sociological method*, edited by G. E. G. Catlin, translated by S. A. Solovay, and J. H. Mueller. New York: The Free Press. (Orig. pub. 1895)

Eisner, S. P. 2005. Managing generation Y. *SAM Advanced Management Journal* 70 (4):4–15.

Elst, L., V. Dignum, and A. Abecker, eds. 2004. Agent mediated knowledge management. *International Symposium AMKM 2003*. *Lecture Notes in Computer Science Series*. *Lecture Notes in Artificial Intelligence Subseries*. *Volume 2926*. New York: Springer-Verlag.

eMarketer. 2008. Teen social networking still growing, http://www.emarketer.com/Article.aspx?id=1006245&src=article_head_sitesearch (accessed June 4, 2010).

Firestone, J. 2003. *Enterprise information portals and knowledge management*. Burlington, MA: Butterworth-Heinemann.

Frank, M. 2004. Four dots American intelligence failed to connect. http://www.time.com/time/printout/0,8816,993906,00.html (accessed June 4, 2010).

Glaser, M. 2007. Twitter founders thrive on micro-blogging constraints, http://www.pbs.org/mediashift/2007/05/twitter-founders-thrive-on-micro-blogging-constraints137.html (accessed May 17, 2007).`

Granovetter, M. 1973. The strength of weak ties. *American Journal of Sociology* 78 (6):1360–1380.

Greenberg, J., et al. 2001. Author-generated Dublin core metadata for web resources: A baseline study in an organization. *Journal of Digital Information* 2 (2): article no. 78.

Higgison, S. 2004. Your say: Personal knowledge management. *KM Magazine* 7 (7), http://www.kmmagazine.com/xq/asp/sid.7551F69D-2683-471C-A18C-C3365B30C312/articleid.DDDD6EE3-47C6-49CD-9070-F1B1547FD29F/qx/display.html. (accessed June 4, 2010).

Jones, M. 2001 Collaborative Knowledge Management, Social Networks, and Organizational Learning. *Proceedings of HCI International 2001: Ninth International Conference on Human-Computer Interaction*. http://human-factors.arc.nasa.gov/publications/collab_know_paper.pdf.

Khoo, L.P., S. Tor, and S. Lee. 1998. The potential of intelligent software agents in the World Wide Web in automating part procurement. *International Journal of Purchasing and Materials Management* 34 (1):46–47.

Knowles, A. 1995. Software "bots" filter web data; Agent technology delivers customized information for BBN's PIN. *PC Week* 12 (17):112–113.

Krebs, V. 2008. Social network analysis: A brief introduction, http://www.orgnet.com/sna.html.

Kulthau, C. 1991. Inside the search process: Information seeking from the user's perspective. *Journal of the American Society for Information Science* 42 (5):361–371.

Kulthau, C. 1993. A principle of uncertainty for information seeking. *Journal of Documentation* 49 (4):339–355.

Lee, J. 2003. Twitter, Facebook and the future of enterprise KM. http://kmedge.org/cgi-bin/mt/mt-search.cgi?tag=expertise%20location&blog_id=1 (accessed June 4, 2010).

Lee, M., and Y. Lan. 2007. From web 2.0 to conversational knowledge management: Towards collaborative intelligence. *Journal of Entrepreneurship Research* 2 (2):47–62.

Leuf, B., and W. Cunningham. 2001. *The wiki way: Collaboration and sharing on the Internet*. Boston: Addison-Wesley.

Lewin, K. 1951. *Field theory in social science; Selected theoretical papers* edited by D. Cartwright. New York: Harper & Row.

Liebowitz, J., and T. Beckman. 1998. *Knowledge organizations: What every manager should know*. Boca Raton, FL: CRC Press.

Maes, P. 1994. Agents that reduce work and information overload. *Communications of the ACM* 37 (7):30–40.

Mathes, A. 2004. Folksonomies—Cooperative classification and communication through shared metadata.http://www.adammathes.com/academic/computer-mediated-communication/folksonomies.html. (accessed June 4, 2010).

Merrill, D. 2006. Mashups: The new breed of web app, http://www.ibm.com/developerworks/xml/library/x-mashups.html (accessed June 4, 2010).

O'Reilly, T. 2009. What is web 2.0? Design patterns and business models for the next generation of software. http://en.oreilly.com/web2008/public/content/home (accessed January 4, 2009).

Pikas, C. 2004. Trends in blog searching. *Bulletin of the Information Technology Division of SLA* 21 (2), http://units.sla.org/division/dite/bite/MarApr2004/TrendInBlog.pdf (accessed May 5, 2010).

Raines, C. 2003. *Connecting generations: The wourcebook for a new workplace*. Menlo Park, CA: Crisp Publications.

Rasmussen, J., A. Pejtersen, and L. Goodstein. 1994. *Cognitive systems engineering*. London: John Wiley.

Robertson, J. 2003a. Looking towards the future of content management, http://www.steptwo.com.au/papers/cmb_future/index.html (accessed June 4, 2010).

Robertson, J. 2003b. Stakeholder interviews as a simple knowledge mapping. *CM Briefing 2003-13*. http://www.steptwo.com.au/papers/cmb_interviews (accessed June 4, 2010).

Roesler, M., and D. Hawkins. 1994. Intelligent agents: Software servants for an electronic information world (and more!). *Online* 18 (4):18–29.

Rogers, R.1985 quoted in Torrent of print strains the fabric of libraries, by Colin Campbell. *The New York Times,* Feb. 25, 1985, A10.

Rollet, H. 2003. *Knowledge management processes and technologies*. Norwell, MA: Kluwer Academic Publishers.

Ruggles, R. 1997. *Knowledge tools: Using technology to manage knowledge better*. Boston: Butterworth-Heinemann.

Scott, J. 2000. *Social network analysis: A handbook*, 2nd ed. Thousand Oaks, CA: Sage.

Smith, G. 2004. Folksonomy: Social classification, http://atomiq.org/archives/2004/08/folksonomy_social_classification.html (accessed June 4, 2010).

Spink, A. 1997. Study of interactive feedback during mediated information retrieval. *Journal of the American Society for Information Science*48 (5):382–394.

Surowiecki, J. 2004. *The wisdom of crowds: Why the many are smarter than the few and how collective wisdom shapes business, economies, societies and nations*. New York: Doubleday.

Sveiby, K. E. 1999. What is knowledge management? An online learning manual, http://www.sveiby.com/articles/KnowledgeManagement.html (accessed June 4, 2010).

Taylor, A. 2004. *The organization of information*. Westport, CT: Libraries Unlimited.

Tiwana, A. 2002. *A knowledge management toolkit: Orchestrating IT, strategy and knowledge platform*, 2nd ed., Upper Saddle River, N.J.: Prentice Hall.

Van Heijst, G., R. Van Der Spek, and E. Kruizinga. 1997. Corporate memories as a tool for knowledge management. *Expert Systems with Applications* 1 (13):4–54.

Wailgum, T. 2008. Inside the CIA's extreme technology makeover, Part 4, http://www.cio.com/article/441819/Inside_the_CIA_s_Extreme_Technology_Makeover_Part (accessed December 12, 2008).

Webb, W. 1995. Intelligent agents on the Internet. *Editor & Publisher* 128 (12):50–52.

Wilson, T. 1981. On user studies and information needs. *Journal of the American Society for Information Science* 37 (1):3–15.

Wilson, T. 1994. Information needs and uses: Fifty years of progress? *Fifty years of information progress: A Journal of Documentation Review*, ed. B. Vickery. London: Aslib, 15–51.

Wingfield, N. 1995. Internet apps to get intelligent search agents. *InfoWorld* 17 (20): 16–17.

Wladawsky-Berger, I. 2005. Social networks; Knowledge management done right. http://irvingwb.typepad.com/blog/2005/11/social_networks.html (accessed June 4, 2010).

Wong, J., and J. Hong. 2007. Making mashups with marmite: Towards end-user programming for the web. *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*. New York: ACM Press, 1435–1444, http://doi.acm.org/10.1145/1240624.1240842 (accessed June 4, 2010.).

Woolridge, M., and N. Jennings. 1995. Intelligent agents: Theory and practice. *Knowledge Engineering Review* 10 (2):115–152.

Zang, N., M. Rosson, and V. Nasser. 2008. Mashups: Who? What? Why? *Proceedings of the Conference on Human Factors in Computing, CHI'08*. New York: ACM Press, http://doi.acm.org/10.1145/1358628.1358826 (accessed June 4, 2010.).

9 Knowledge Management Strategy

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 apply and gain benefit from knowledge management (KM) applications. The major steps involved in developing a KM strategy are presented: the knowledge audit, the gap analysis, the elicitation of KM objectives, the short-term road map, 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.

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. Discuss and evaluate the different approaches that may be undertaken in order to achieve an optimal balance between creativity and organizational structure.
5. List the different types of knowledge assets that result from KM initiatives.

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).

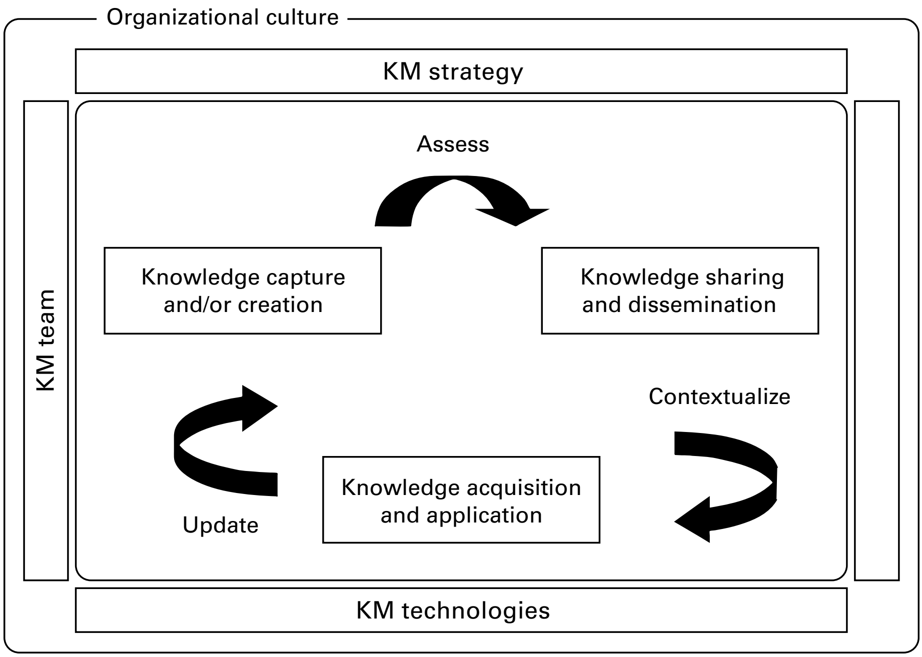


Figure 9.1
An integrated KM cycle

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 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, 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:

- External structure initiatives (e.g., gain knowledge from customers, offer customers additional knowledge)
- Internal structure initiatives (e.g., build a knowledge-sharing culture, create new revenues from existing knowledge, capture individual's tacit knowledge, store it, spread it and reuse it, and measure knowledge creating processes and intangible assets produced)
- 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:

- Discovery (innovation)
- Organizational practices
- 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, improvements will result from some combination of these types of sources, as is illustrated in the discussion about the World Bank (box 9.1).

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:

- Imminent retirement of key personnel
- Need for innovation to compete in dynamic, challenging business environment
- Need for internal efficiencies in order to reduce cost and effort (e.g., time to market a new product)

Box 9.1
A vignette: 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 anti-malarial preparation using only materials he had on hand. He sent a query via the World Bank's Web site 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:

People A focus on knowledge workers and connecting them via knowledge communities (CoPs)

Culture Shifting the culture from an individualistic focus to a team and knowledge-sharing culture

Accountability Clear roles and responsibilities established for knoweldge managers and coordinators

Technology System to capture, organize, and disseminate knowledge to all stakeholders of the Bank

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 locator 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 composed of five people oversees all communities of practice. This core KM team has overall coordination and facilitation responsibilities. They identify any

Box 9.1
(continued)

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, e-mail, 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 CoP leaders spend approximately 25 percent of their time on KM 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 thirteen thousand staff in eighty 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 organizational innovation and entrepreneurial culture 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, access to knowledge-sharing methods, and innovation were also the focus of the 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 American Productivity and Quality Centre (APQC) found the World Bank to be one of the five global best practice leaders. By 2001, The World Bank ranked fourth place in the Most Admired Knowledge Enterprises Award and was been recognized again in 2002, 2003, and 2004. The organizations in this study are recognized for their world-class efforts to manage knowledge, leading to superior performance. Knowledge sharing had become a way of doing business at the Bank.

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 and 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:

• Which KM approach, or set of KM approaches, will bring the most value to the organization?

• 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 composed 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, 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, informal networks, and reciprocity (e.g., willingness to experiment, take risks or able to fail without fear of repercussions)

c. Infrastructure capital: physical knowledge resources, for example, 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, for example, a best practices database, a lessons learned database

b. Store for future use, for example, 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 CoPs 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:

Identification What information is there? How is it identified and coded?

Ownership Who is responsible for different information entities and coordination?

Cost and value A basic model for making judgments on purchase and use

Development Increasing its value or stimulating demand

Exploitation Proactive maximization of value for money

A knowledge audit is often carried out in conjunction with a KM assessment, which provides a baseline on which to develop a KM 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 (box 9.2).

A KM 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 KM technology is a proper knowledge audit to determine exactly what tools and solutions are most appropriate to enable better KM 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

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 tacit knowledge 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, polling nearly five thousand employees with a ninety-seven-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' 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 30 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 ten-person KM team to identify subject matter experts and capture the content of their expertise. After creating about one hundred knowledge cells and identifying two hundred subject matter experts within those cells, the KM council turned their attention to knowledge capture. The team created web sites for each of the knowledge cells and logged information about the knowledge experts into an expert locator 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. For example, 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 the ACS bureaucracy.

Box 9.2
(continued)

The ACS 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 communities of practice 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, and 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 nine hundred previously encountered experiences. If it is a new problem, he or she 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 lesson 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, expert locator, knowledge capture, media management, and collaboration, as these 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 the pilot phase. The KM team plans to conduct follow-up audits every eighteen months or so to keep tabs on the evolution of KM initiatives and the knowledge-sharing culture.

system is purchased and implemented. This is where the knowledge audit plays a pivotal role in a new KM 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.

It is of vital importance that an organization's KM initiators or practitioners always seek to assess the company's current KM health, before proceeding to implement KM. 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 KM program. The knowledge audit is also extremely useful as a regular review and assessment of existing KM practices in the company. Management and exploitation of corporate knowledge is

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 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 encryption 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 previously, and no one had thought to make a backup of the key.

The knowledge audit results showed that problems existed at the information access, preservation, and retrieval level. 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.

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. In the questionnaire in table 9.1 (adapted from Liebowitz et al., 2000, 5–6), knowledge categories refer to the types that you need to know to do your job; for example, 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.

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.

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):

• What are the major differences between the current and desired KM states of the organization?

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	Besides 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; or (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 (one to two years)? (b. in the long term (three to five years)?

Source: Adapted from Liebowitz et al. 2000, 6.

• List barriers to KM implementation (e.g., culture where "knowledge is power" or where individual possession of knowledge is consistently rewarded)

• List KM leverage points or enablers (e.g., existing initiatives that could be built upon)

• Identify opportunities to collaborate with other business initiatives (e.g., combine knowledge continuity goals with succession planning initiatives in human resources)

• 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)

• Identify redundancies within the organization (e.g., the case of the right hand not knowing what the left hand is doing)

• Identify knowledge silos (e.g., groups, departments or individuals that hoard knowledge or block fluid knowledge flows to other groups, departments or colleagues)

• Determine how the organization ranks 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. A second set of questions (adapted from Liebowitz et al. 2000, 7), as shown in table 9.2, can help complete this step of the analysis required for a KM strategy.

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

Table 9.2
Questionnaire to identify missing knowledge

Question number	Question text
1	What kinds of knowledge do you reuse? Can you think of examples where reuse would be beneficial but is not being done?
2	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?
3	What kinds of questions do you ask repeatedly?
4	Do you know whom you should direct your question to?
5	What kinds of questions are you asked? What do you do if you do not know the answer?
6	What mechanisms might be helpful for encouraging knowledge sharing and transfer in your organization?
7	What aspects of your organization seem to provide barriers to effective KM? What constraints impede knowledge sharing and transfer?
8	What are the main reasons why you could have made errors/mistakes on the job?
9	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?
10	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, 7

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.

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 issues such as:

• How will the organization manage its knowledge better for the benefit of the business?

Box 9.4

A vignette: What should KM focus on within our rrganization?

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 locator 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, with the result that when they 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 postmortems with peers before reporting more formally up the hierarchical levels of authority. Additional recommendations were made, including short term training of teams so that they could better perform in crisis situations through role playing and simulations in the short term; and beginning the journey to cultural change by encouraging employees to send anonymous e-mails directly to the CEO and rewarding them for risk-taking.

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 (voice over Internet) 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 one hundred thematic communities to better harness the expertise that they provided to third world countries.

Box 9.4
(continued)

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 proceedings seemed quite chaotic to an outsider. For example, 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, and there was no one to chair or to take 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. There was also 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. This would require the organization to identify the types of knowledge they have and that they need to have, and to figure out how to render these more visible and therefore easier to access by others.

- Content (management of explicit knowledge) and community (management of tacit knowledge) priorities
- Identification of processes, people, products, services, organizational memory, relationships, knowledge assets as high priority knowledge levers to focus on
- What is the clear or direct link between KM levers and business objectives?
- What are some quick wins (i.e., early relatively inexpensive KM successes)?
- 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). 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, discussed in chapter 7), 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) time horizon. 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 9.3. 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 together with the required skill set and training (KM roles and responsibilities are discussed in chapter 12) and a way of assessing whether or not implementation was successful (KM metrics, discussed in chapter 10).

An illustration of the critical importance of closely aligning KM strategy to the overall organizational business goals is described in the detailed look at Ford (box 9.5).

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 9.2).

Table 9.3
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 two 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 one to three years with cost-benefit analysis, resources, and metrics identified
6b	Long term	Strategic objectives with results projected in the next three to five 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

Box 9.5
An example: Ford

Ford and Firestone suffered the death of a thousand cuts, in part because of a catastrophic failure to share knowledge. Information that might have alerted the companies to the calamitous mismatch of Ford Explorers and Firestone tires was scattered in different places in both companies, each item innocuous in isolation. Yet Ford's knowledge-sharing scheme is one of the best in the world. The company's Best Practices Replication Process has produced a billion-dollar benefit for the automaker. Why did it not help in this case?

The Ford process was started in 1995 when a VP of manufacturing on a trip to Europe saw that the plant there had ideas Americans could use and vice versa. Back home, he assembled his operations people and asked them to figure out a way to share best practices. At the same time, another Ford group was addressing reengineering issues through the Rapid Actions for Process Improvement Deployment (RAPID) program. These were workshops aimed to eradicate small inefficiencies. They soon turned to the challenge of replicating the solution so the RAPID need not be reinvented again. The two merged to become Ford's Best Practices Replication Process. In 4.5 years, more than 2,800 proven superior practices have been shared across Ford's manufacturing operations. The documented value of this shared knowledge so far is $850 million. Another $400 million stands to be won from work in progress, bringing the grand total to $1.25 billion. Royal Dutch/Shell and Nabisco have licensed the process and portions have been patented.

Ford made three key decisions: first, the process would be managed with distinct roles and responsibilities. Second, no practice would get into the system unless proven. Third, every improvement would be described in the language of the work group involved: time, head count, gallons, and quality. These work groups are communities of practice. Each CoP has a company-wide administrator, picked by the director of manufacturing. The role takes a half a day a week. At the plant level, each CoP chooses someone as the focal point and that role takes one to two hours a week. No one is paid extra. The best practices process has forty-two steps. The focal point looks for a neat new process (or its inventors go to him or her). He or she makes up a web page that prompts him or her to quantify benefits such as time or material saved. The focal point then e-mails it to the community administrator, who compares it with other plants, and if it passes muster, designates it as a gem. It is then immediately posted on the intranet and e-mailed to every focal point in the community. One way or another, each focal point must report a decision: to adopt or adapt it, and say when; to investigate it; or to reject it and explain why. The web displays a scorecard to all users—by community and by plant. It may show, for example, that of sixty-one gems in painting, the St. Louis plant has done or agreed to forty-two, was investigating two, had rejected seven as inapplicable and nine as economically not feasible, and had originated and contributed two.

Box 9.5
(continued)

So if Ford is so good at knowledge sharing, why did no one know about the tire problem? Two reasons: first, knowledge is best shared within communities—people with something in common talk more than strangers do. Neither Ford's nor Firestone's social networks were rich enough to support the kind of extramural communication that might have uncovered the problem. Second, the more widely dispersed the knowledge is, the more powerful the force required to share it. Every year, Ford headquarters hands down a "task" to managers—they are required to come up with a 5–7 percent gain in, say, costs, throughput, or energy use. The best practices database is the first place they turn to—like a magnet, the task draws knowledge from its hiding places. This is an important lesson for KM: if KM isn't tightly linked to your business model, it will never amount to much.

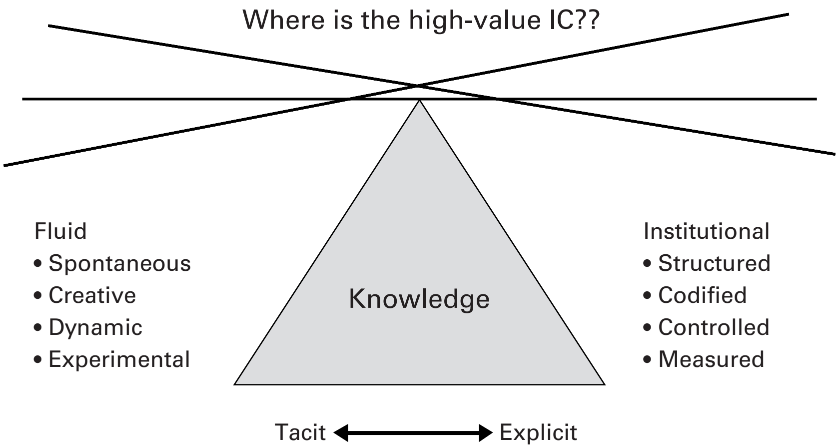


Figure 9.2
Balance between fluidity and institutionalization (adapted from Klein 1999)

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
- Stress placed on personal freedom, cooperation, and community
- Top leaders serve 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. 3M 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 each employee's time should be set aside to pursue personal research interests. 3M also instituted a storytelling culture with such chestnuts 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 ninety countries where Buckman has its offices. The users are both the sales and technical workforce. K'Netix connects the Buckman CoPs. The KM application consists of e-mail 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. They 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:

- How changeable is the knowledge?
- What is the useful half-life of knowledge?
- What type of information technology is being used for knowledge sharing?
- 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 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. However, managers do not 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 more fully recognize the role these assets play in marketplace success, efforts to more accurately identify and value them 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 put in. A more organizationally appealing approach was introduced by Stewart (1997) where intellectual assets are classified as:

- A semipermanent body of tacit and explicit knowledge about a task, person, or organization
- 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 US corporations now considered intellectual assets, organizations are increasingly looking for ways to identify, quantify, and capitalize on those intangibles. Over the last seven years, the value of intellectual assets has increased by 700 percent. An organization's intellectual assets are computed in 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 (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.

For example, Microsoft (www.microsoft.com) paid $425 million for WebTV (www.webtv.com), a company with few fixed assets and only modest revenue. However, WebTV held 35 patents for delivering the Internet over television. For that intellectual property and the expectation of revenue it could generate, Microsoft was willing to pay dearly. 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:

- *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.
- *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.
- *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 the customers 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 directions, test methods, alliance relationships, business plans, strategic directions, vendor terms, competitive analyses, 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 at 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 re-engineering of 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 the 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 and 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).

Key Points

- KM 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 measuring components.

• The proposed KM strategy should not only clearly address business objectives (not KM objectives) but should 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.

Discussion Points

1. Compare and contrast KM applications that are driven by an objective of reuse versus 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. What are some criteria that may be used to prioritize both KM objectives and KM recommendations?

6. What are the major differences between the short-term and long-term strategy? How do they fit together?

7. 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 KM applications upset this balance?

8. List and provide examples for some different types of knowledge assets. What are some typologies that can be used to categorize them?

9. What are the relationships among human, structural, and relationship capital?
10. Why are intellectual assets difficult to manage?

References

Bolita, D. 2001. Intellectual assets—Corporate value moves from top minds to bottom lines price on (what's in) your head. *KM World* 8 (2). http://www.kmworld.com/Articles/Editorial/Feature/Intellectual-assets--Corporate-value-moves-from-top-minds-to-bottom-linesa-price-on-(what's-in)-your-head---9062.aspx / (accessed June 4, 2010).

Edvisson, L., and M. Malone. 1997. *Intellectual capital: Realizing your company's true value by finding its hidden brainpower*. New York, N.Y.: Harper-Business.

Grey, D. 1999. Knowledge mapping: A practical overview. http://kmguru.tblog.com/post/98920. (accessed June 4, 2010).

Klein, D. 1999. *The strategic management of intellectual capital*. Boston: Butterworth-Heinemann.

Lev, B. 2001. *Intangibles – management, measurement and reporting*. Washington, D.C.: Brookings Institute Press.

Liebowitz, J., B. Rubenstein-Montano, D. McCaw, J. Buchwalter, C. Browning, B. Newman, and K. Rebeck. 2000. The knowledge audit. *Knowledge and Process Management* 7 (1):3–10.

Pommier, M. 2007. How the World Bank launched a knowledge management program. http://www.knowledgepoint.com.au/knowledge_management/Articles/KM_MP001a.html (accessed June 4, 2010).

Robertson, J. 2004. Developing a knowledge management strategy. *KM Column*. August 2. http://www.steptwo.com.au/papers/kmc_kmstrategy/ (accessed June 4, 2010).

Skyrme, D. 2001. *Capitalizing on knowledge: From e-business to k-business*. Boston, MA: Butterworth-Heinemann.

Srikantajah, T., and M. Koenig. 2000. *Knowledge management for the information professional*. Medford, NJ: Information Today.

Stewart, T. 1997. *Intellectual Capital—The New Wealth of Organizations*, 1st ed. New York: Doubleday / Currency.

Sullivan, P. 2001. *Value driven intellectual capital: how to convert intangible corporate assets into market value*. New York: John Wiley and Sons.

Sveiby, K. 2001, A Knowledge-based theory of the firm to guide astrategy formulation, *Journal of Intellectual Capital* 2 (4):344–358.

Zack, M. 1999. Developing a knowledge strategy. *California Management Review* 41 (3):125–145.

Willard, N. 1993. Information Resources Management. *Aslib Information* 21 (5):201–205.

10 The Value of 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 knowledge management (KM) is assessed. The major types of KM measurement frameworks are introduced: benchmarking, the balanced scorecard method, the house of quality, and the results-based assessment metric. In addition, the various ways in which value is produced by communities of practice (CoPs) are discussed.

Learning Objectives

1. Understand the major advantages and shortcomings of the three KM metrics.
2. Apply the benchmarking, house of quality metric, balanced scorecard method, and results-based metric to knowledge management performance measurement systems.

Introduction

This chapter discusses different metrics framework to monitor progress toward those 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).

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). KM metrics include quantitative, qualitative, and anecdotal methods. Each method presents different advantages and disadvantages, and often a combination of different measures may be called for.

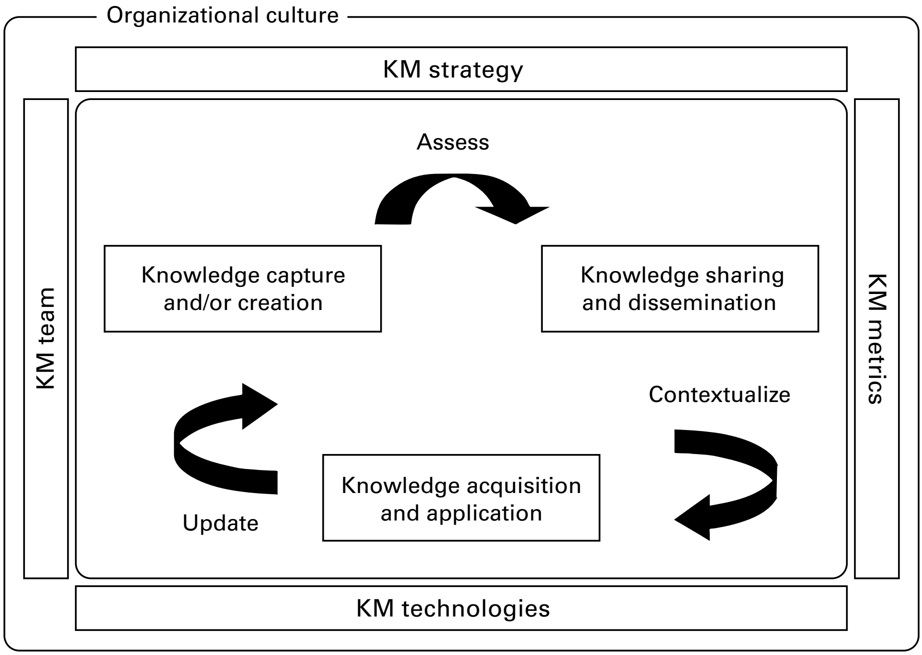


Figure 10.1
An integrated KM cycle

The best place to start is with a KM measurement strategy that answers the five basic questions:

- Why are we measuring?
- What are we measuring?
- For whom are we measuring?
- When are we measuring?
- 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 phrase "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 improvement 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% of employees are highly or very satisfied with their membership in their CoP." There are a number of problems with this approach. For example, 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 the 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 did. There are typically three main categories of stakeholders:

Program funders 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)

Managers 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)

Employees/participants 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 un-representative 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. During a pilot project phase, we can focus on measures that show how KM is impacting 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 two hundred 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, for example, 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 measures 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). 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). The International Accounting Standard Number 38 named “Intangible Assets” only discusses patents, copyrights, goodwill, and research and development 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 and Woodland 1999). Traditional financial statements would not show the loss of intellectual capital, and the subsequent impact to the company, if one thousand employees would suddenly leave the company (Roos and 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 had lost knowledge of best practice information, and 10 percent had 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 and Roos 1998). 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 1997). Roos and Roos (1998) made a similar comparison with Microsoft. A recent study by the Brookings Institute in Washington shows that this "missing value" grew from 38 percent of a company's market capitalization in 1982 to 62 percent in 1995 (Dzinkowski 1999).

Skandia, a Swedish insurance company, has made strides to quantify its 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 and Roos 1998). In Skandia's annual Intellectual Capital Prototype Report, these terms are defined with supporting details regarding how calculations of value are made. Skandia's advancements, as well as efforts by KPMG (Andriessen 2000), 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 and King 1999).

The Skandia Intellectual Capital model is called the Skandia Navigator (Wall, Kirk, and Martin 2004). Four key dimensions of business form the core of this model:

- Financial focus, represented in monetary terms
- Customer focus, a financial and nonfinancial measure of the value of customer capital
- Process focus, addressing the effective use of technology within the organization
- 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. The navigator can be thought of as a combination of Sveiby's (1988) 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). Keeping with the earlier Intel example, these estimates would place the cost of managing knowledge within Intel between $595 million and $1.7 billion in 1997. 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 13–18 percent a year. Some additional examples are provided here in discussions of Accenture and Chevron (boxes 10.1 and 10.2).

The shift toward knowledge-driven business models has created a strong need for knowledge management metrics. The literature has only recently begun to explore the cost of KM, with little empirical data showing true organizational costs (Harvey and Lusch 1999). 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 are the stakeholders and determine what they need to know.
3. Determine which measurement framework(s) is best to align KM measures with the business objectives.
4. Modify the framework(s) based on measurements are needed.
5. Decide on a data collection and analysis strategy.
6. Get management to sign off on the measurement strategy.
7. Implement measures and present the results in a form that is most appropriate for each stakeholder.

Three popular approaches, benchmarking, the balanced scorecard method, and the house of quality are presented here.

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

Box 10.1

An example: Accenture

Accenture and the Intellectual Capital Management (ICM) Group (International Knowledge Management News, October 1, 1999) formed an alliance to help organizations identify and measure the value of their intangible assets, and use those assets to generate new revenue. Services provided to firms included evaluating a company's intangible assets—patents, licenses, trademarks, copyrights, and all the knowledge or know-how of its employees—and then recommending and implementing systems and processes to manage those assets. Clients can expect to pay in the region of $25,000 for an analysis of their intellectual property portfolios.

In 1995, the ICM Group cofounded the ICM Gathering, which included more than thirty global companies dedicated to improving the way they manage their intellectual assets and maximizing their financial return. ICM views intellectual assets as ideas that can be converted into profit. Organizations are sitting on untapped wealth in the form of hundreds of ideas that were never developed. Arthur Andersen and the ICM Group enable organizations to find these hidden gems and translate them into increased revenue and higher market value. The alliance also will emphasize the link between research and development and business strategy, as organizations need to look at where new value is being created and focus the dollars spent on R&D. Organizations need to understand how intellectual assets are created and managed in order to get the most benefit from those assets. R&D can help organizations identify future market direction and the competitive landscape.

Box 10.2

An example: Chevron

In Chevron's case, the guiding concept of KM has not been a buzzword, but a culture, dubbed "The Chevron Way." This concept, which provides an integrated framework for the company's objectives and principles, actively encourages the internal transfer of information to make every employee's life easier. For Chevron—like other oil companies—the sharing of knowledge is a necessity. By using best practice sharing, Chevron can cut costs, reduce production cycle times, and still grow in targeted areas.

That extends to ensuring that the projects the company undertakes are the most important ones, and offer the best rate of return. Knowledge is applied to the entire business, and sharing knowledge is no longer merely a performance issue—it is a reputation issue as well. Knowledge directly affects every major company's ability to win new business and keep top employees.

One of the drivers for Chevron's focus on sharing best practices throughout the organization was a series of benchmarking studies that showed Chevron's management that

Box 10.2
(continued)

the company was spending more than its competitors on large projects. The oil industry is very capital intensive—and any way of cutting investment costs will improve the company's bottom line. Based on the survey results, a tool was created and deployed throughout the company called the Chevron project development and execution process—better known throughout Chevron as "Chip-Dip"—which is estimated to have resulted in a 15 percent improvement in capital efficiency since 1991. Chip-Dip is, in effect, a best practice sharing work process system involving networks of Chevron staff to help improve capital project selection and execution. At the same time, achieving best practice sharing can also have a marked effect on safety and environmental performance. In a world where disasters are headline news—as Exxon found to its cost with the Alaskan oil disaster in 1989—Chevron believes its employee safety performance has improved by 50 percent through facilitating the transfer of knowledge throughout the company. Overall, although there are hundreds of individual areas within the company that contribute to best practice sharing, key labels under which they could be categorized include: exploration, production, refining operations, energy management, marketing, and transportation.

Chevron's goal has been one of steady, "continuous improvement," based more on cultural, rather than technology, buy-in. The key factor for Chevron was not just that everyone within the company had IT tools, but that the tools were "standardized, compatible, and connected." Web usage within the company is also growing rapidly, doubling every hundred days. Training to encourage the growth of the knowledge-sharing culture across the company, especially for new employees, is also important. Chevron's best practice culture extends to the evaluation of employees for salary purposes. An individual's evaluation is based on individual growth and team performance. Those who practice the sharing of knowledge are more likely to be the ones rising up the organizational ladder. If staff are not ingrained with the culture, they will probably either not know who to share information with, or they will not share their information because they do not feel it is of value to anyone. It is establishing that culture—and most important, doing it for business needs—that is the difference between those who practice knowledge management, and those who just talk about it. Best practice sharing has helped Chevron to cut annual operating costs by \$1.8 billion, reduce cost structure by \$400 million, reduce debt by \$2.3 billion in two years, cut capital project costs by 15 percent since 1991, and improve employee safety performance by 50 percent.

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 US. Xerox wanted to know why this was so, and whether or not they could emulate the Japanese companies. 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 10.3
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 internally, 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, industry group measurements, best practice studies, and cooperative benchmarking.

Industry group measurements This involves the measurement of various facets of your operation compared to similar measurements from other companies. Often, the measures have little to do with productivity, customer satisfaction, or "best practices." 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).

Best practice studies These are 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 was a study of best practices.

Cooperative benchmarking This involves 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, and 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.

Competitive benchmarking This is 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 selecting 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:

- Overall productivity of knowledge investments
- Service quality
- Customer satisfaction and the operational level of customer service
- Time to market in relation to other competitors
- Costs, profits, and margins
- Distribution
- Relationships and relationship management

Benchmarking can help an organization evolve to higher maturity levels to become a learning organization by identifying where they stand with respect to KM in relation to the competition.

Andersen Consulting (now Accenture) developed a knowledge management assessment tool (KMAT) that is essentially a benchmarking questionnaire where responses by a given company can easily be 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 (see http://www.kwork.org/White%20Papers/KMAT_BOK_DOC.pdf).

The first step in benchmarking is to identify the 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 (Kaplan and Norton 1992, 1993, 1996). 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:

- Long-term and short-term objectives
- Financial and nonfinancial measures
- Internal and external perspectives
- Lagging and leading indicators
- Objective and subjective measures
- 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.

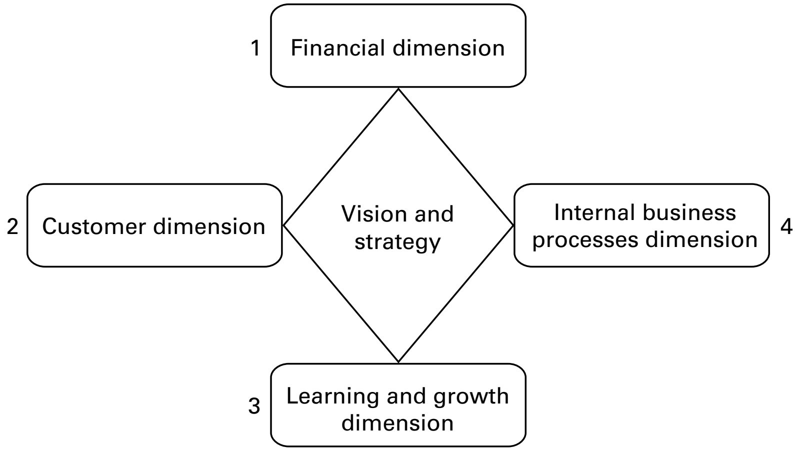


Figure 10.2
High-level balanced scorecard

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.

Variations in the basic design are common. Typical changes include changes in the categorization of perspectives (e.g., innovation and learning, or employees, in place of learning and growth) and the number of perspectives (e.g., adding stakeholders as a separate, fifth perspective). 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 on.

The major steps in applying the balanced scorecard metric are:

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.

Table 10.1
Sample BSC implementation

	Objectives	Metrics	Targets	Initiatives
Financial				
Customer				
Internal processes				
Learning and growth				

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.

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. It is applicable to both nonprofit and for profit 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 are available to help in the implementation of a BSC from, for example, Six Sigma (available at http://www.isixsigma.com/me/balanced_scorecard/) and QPR (available at http://www.qpr.com/balancedscorecard/).

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.

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.

As shown in figure 10.3, 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 of the house of quality is on maximizing customer satisfaction as measured by metrics such as repeat business and market share. It focuses on

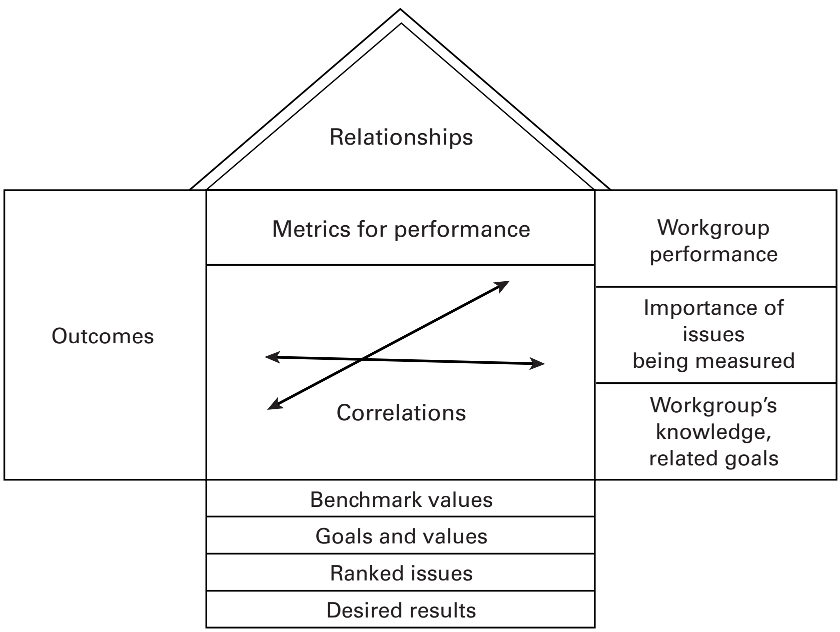


Figure 10.3
High-level house of quality matrix

delivering value by seeking out both spoken and unspoken needs, translating these into design targets, and communicating this throughout the organization. Further, the house of quality 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 balanced scorecard, 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 20 percent 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 as shown in figure 10.3. Ideally, these desired outcomes should be short to mid-term and observable. Some examples would be:

• 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., postmortems and AARs)

• The percent 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 also available(http://www.gsm.mq.edu.au/cmit/hoq/Example%20HOQ%20Matrix.doc). 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 widely used framework for 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 has 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. It is fairly easy to adapt 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 2004).

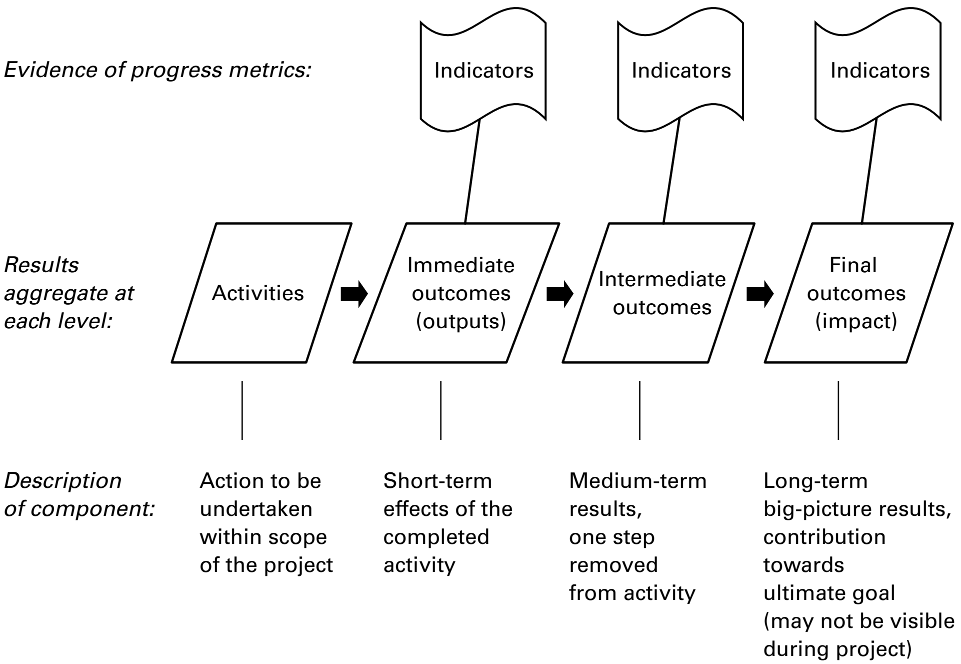


Figure 10.4
High-level RMAF

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 forms the foundation of 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

Table 10.2
Sample template for data collection using the results map metric

Organization:		Purpose:		
Business unit:		Date:		
Project name:		Date last revised:		
How?		What?		Why?
Inputs	Activities	Outputs	Outcomes	Impacts
Indicators				
Assumptions and anticipated risks				

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.

The results-based metric is easily adapted to include KM activities and outputs that in turn can 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.

Measuring the Success of Communities of Practice

Finally, there are a number of metrics that are particularly well suited to measuring the value created by communities of practice. In general, there are three types of value that can result (Krebs 2008):

Structural value The creation of connections in a network; the amount of time spent in interacting with others; the flow of knowledge between network members (typically measured using social network analysis (SNA) techniques

Relational value The maintenance of connections; their longevity; the degree of reciprocity in network interactions (typically assessed through surveys and anecdotes)

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 not have happened without this CoP in place?"
- "Did you save time because you had access to 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 been 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 can 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 decisions, searching for information, processing information, and 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 and Millen 2004; Lesser and 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 formulas 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 and Millen 2004).

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 who, what, when, why, and how of metrics.
- 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.

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

• 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. 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?
7. What does the results-based approach offer that other methods do not?
8. How would you go about assessing the value of a CoP:

a. To an individual

b. To the community

c. To the host organization

References

Andriessen, D. 2005. Implementing the KPMG Value Explorer® critical success factors for applying ic measurement tools. http://www.weightlesswealth.com/downloads/Implementing%20the%20value%20explorer.PDF. (accessed June 4, 2010).

Angus, R. 2003. KM's father figure: Robert Buckman. *InfoWorld* March 14. http://www.itworldcanada.com/news/kms-father-figure-robert-buckman/118164. (accessed June 4, 2010).

APQC. 2001. Measurement for Knowledge Management. http://www.providersedge.com/docs/km_articles/Measurement_for_KM.pdf. (accessed June 4, 2010).

Brown, R., and M. Woodland. 1999. Managing knowledge wisely: A case study in organizational behavior. *Journal of Applied Management Studies* 8 (2):175–198.

Camp, R. 1989. *Benchmarking: The search for best practices that lead to superior performance*. Milwaukee, WI: ASQC Quality Press.

Davenport, T. 1996. Some principles of knowledge management. *Strategy and Business* 10 (5):105–116.

Dzinkowski, R. 1999. Managing the brain trust. *CMA Management* 7 (8):14–18.

Fontaine, M., and D. Millen. 2004. Understanding the benefits and impact of Communities of Practice. In *Knowledge Networks: Innovation through Communities of Practice,* edited by Paul Hildreth and Chris Kimble, 184–201. Hershey, PA: Idea Group Publishing.

Harvey, M. G., and R. F. Lusch. 1999. Balancing the intellectual capital books: Intangible liabilities. *European Management Journal* 17 (1):85–92.

Hauser, J., and L. Clausing. 1988. The house of quality. *Harvard Business Review* 3:63–73.

Henry, J., and A. King. 1999. Valuing intangible assets through appraisals. *Strategic Finance* 81:32–37.

International Accounting Standards Committee (IASC). 1998. *International accounting standard IAS 38: Intangible assets*. Wimbledon, UK: Clifford Frost Limited.

Kaplan, R., and D. Norton. 1992. The balanced scorecard—Measures that drive performance. *Harvard Business Review* (Jan-Feb):71–79.

Kaplan, R., and D. Norton. 1993. Putting the balanced scorecard to work. *Harvard Business Review* (Sept-Oct):134–147.

Kaplan, R., and D. Norton. 1996. Using the balanced scorecard as a strategic management system. *Harvard Business Review* (Jan-Feb):75–85.

Krebs, V. 2008. Social network analysis: A brief introduction, http://www.orgnet.com/sna.html (accessed).

Lesser, E., and J. Storck. 2001. Communities of practice and organizational performance. *IBM Systems Journal* 40 (4):831–841.

Lev, B. 1997. The old rules no longer apply: Intellectual capital measurement. *Forbes Magazine* 72 (13):34–38.

Mazur, G. 1993. QFD for service industries: from voice of customer to task deployment. *Transactions of the Fifth Symposium on Quality Function Deployment*. Ann Arbor, MI:QFD Institute.

McDermott, R. 2002. Measuring the impact of communities. KM Review 5 (7):26–29.

Plan net. 2003. Splash and Ripple! Planning and Managing for Results. Calgary: Plannet Limited, September 2003. http://www.plannet.ca. (accessed June 4, 2010).

Roos, G., and J. Roos. 1998. Intellectual capital. New York: New York University Press.

Spendolini, M. 1992. *The benchmarking book*. New York: AMACOM.

Sveiby, K. E. 1997. *The new organizational wealth: Managing and measuring knowledge-based assets*. San Francisco: Berrett-Koehler.

Sveiby, K. 1998. The intangible assets monitorhttp://www.sveiby.com.au/IntangAss/CompanyMonitor.html. (accessed June 4, 2010).

Sveiby, K. 2001. What is knowledge management? http://www.sveiby.com/articles/KnowledgeManagement.html (accessed June 4, 2010).

Tiwana, A. 2000. *The knowledge management toolkit*. Upper Saddle River, NJ: Prentice Hall PTR.

Wall, A., R. Kirk, and G. Martin. 2004. *Intellectual capital. Measuring the immeasurable?* Burlington, MA: CIMA Publishing (Elsevier).

Warren, L. 1999. Knowledge management: Just another office in the executive suite? *Accountancy Ireland* 31 (6):20–22.

Additional Resources:

Journal of Intellectual Capital.

Vallejo-Alonso, B., A. Rodriguez-Castellanos, and G. Arregui-Ayastuy, Eds. 2010. *Identifying, measuring, and valuing knowledge-based intangible assets: New perspectives*. Hershey, PA: IGI Global Publishing.

11 Organizational Learning and Organizational Memory

Those who cannot learn from history are doomed to repeat it.
—George Santayana (1863–1952)

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.

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. Compare and contrast the components of leading organizational memory 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). Tacit 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. Tacit knowledge in this sense 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, individuals are increasingly responsible for value creation.

Although many organizations have succession plans in place, 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 not only combats corporate amnesia, but it 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

Box 11.1
An example: NASA organizational memory

NASA faces a challenge in collecting 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 have 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 only accept opinions that agree with their own. The bureaucratic structure kept important information from reaching engineers and managers alike, stifling the spread of critical information.

Even when documents endure, they can be devoid of meaning, and human context is often needed. A computerized knowledge base was designed by Dr. Richard Ballard (see the NASA web site 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 was unique in that it used semantic nets and representational modeling. This knowledge base combines data retention with contextual relationships that provide meaning to information, and 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.

newcomers (connections), will help mitigate the cost of lost, forgotten, or untransferred knowledge and know-how.

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., LotusNotes, 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 and 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 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:

- Mental models
- Shared vision

• Personal mastery
• Team learning
• 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, that is, 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 or encouragement to participate in communities of practice (CoPs; often excellent vehicles of learning as discussed in chapter 5). 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.

Frameworks to Assess Organizational Learning and Organizational Memory

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 7). 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 Büchel (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:

Speed of learning How quickly the organization is able to complete each learning cycle (planning, implementing, and reflecting)

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

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 and Schon 1996).

The Management of Organizational Memory

Knowledge management is an essential capability in the emerging knowledge economy. In particular, organizations have a valuable asset in the informal knowledge that is

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/nonwork 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

the daily currency of their knowledge workers, but this asset usually lives only in the collective human memory, and thus is poorly preserved and managed. There are significant technical and cultural barriers to capturing informal knowledge and making it explicit. As outlined in chapter 8, groupware tools such as e-mail and Lotus Notes tend to make informal knowledge explicit, but they generally fail to create an accessible organizational memory. On the other hand, attempts to build organizational memory systems have generally failed because they required additional documentation effort with no clear short-term benefit, or, like groupware, they did not provide an effective index or structure to the mass of information collected in the system.

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 creating 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 the antonym of organizational intelligence.

There is a fourth barrier to organizational memory that should be mentioned. Spurred by their legal departments, a few American corporations are adopting a policy of systematic destruction of all unneeded personal notes and documents at regular intervals. The thinking behind this policy is that, in the event of litigation or criminal prosecution, it is dangerous for anything to exist in writing that could be used against the corporation since the legal mechanism of discovery allows lawyers from the outside access to *any* documents that are not explicitly protected under client attorney privilege. The risk of expensive judgments against the corporation may have created an economic incentive for amnesia. Such thinking, where it exists, creates a major obstacle for the creation of organizational memory. It insists that only the most formal and sanitized forms of knowledge may be allowed to persist. It puts everything that is written down or stored in a computer under the lens of "can this information possibly be used against us." Most adults know that you learn the most if, when you make a mistake, you acknowledge it and reflect on what you have learned from it. But in an organizational amnesia environment, mistakes must be avoided at all costs, and denied if they occur. How can organizational learning possibly take place in this environment?

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

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 teachers 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 that student.

the organizational intellect, becoming a basis for communication and learning. Organizational memory contributes to the overall 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 the source of immediate health as well as long-term survival (McMaster 1995, 113).

An organizational memory that consists only of formal knowledge is bare and lifeless. Conklin (1993) likens this to describing a ball game by giving the statistics or the mystery novel by simply relating the plot outline. Such formal, structured content also lacks the history and context behind the formal documents, and as a result, the organizational memory is essentially an immense heap of disconnected things, a giant "organizational attic." Documents that contain formal knowledge that the organization has paid dearly to create, live somewhere on the corporate network with enlightening names like h:\org\finan\arc\drg\9plan.doc.8. If, however, an organization embraces its informal knowledge, then the rationale behind decisions and documents becomes the glue that holds the formal knowledge documents together and preserves their meaning (Conklin 1993).

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, in 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, e-mail, and so on. The primary goal is not always to find a right answer as 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 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.

A shared memory for the project team or a community of practice 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.

The third challenge for an effective organizational memory system is that for a system that includes informal knowledge, that 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

Workgroup computing, or groupware tools, take an important step in the direction of facilitating knowledge work, and their databases inherently create some degree of organizational memory. But the problem is that knowledge must be organized and indexed as it is being captured, without creating a burden to the people who create it. The concept of organizational memory, and the possibility of an effective organizational memory system, has growing importance in the global knowledge economy, but many organizations are letting their most valuable asset, informal knowledge, disappear.

Current implementations of organizational memory fail for a variety of reasons, including a broad cultural focus on work products over process and a lack of tools which make capture and reuse of knowledge transparent. The challenge is to design an organizational memory system that offers sufficient short-term payoffs to knowledge workers that they will use the system, both to capture knowledge as they are

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 previously. 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 move forward. The conventional wisdom said, "a slow dime is worth more than a fast penny," or 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?

creating it and to look for and reuse existing knowledge. The next step in the evolution of organizational memory is the use of a display system to focus knowledge workers on improving shared understanding and coherence in their project meetings, and capture the group's information and knowledge in context and link it with the project's formal products in an easy and natural way.

Once a team or organization has recognized the value in its informal knowledge, and has begun to capture and manage it appropriately, the group has the key raw ingredients of project memory, and ultimately of organizational memory. Of course, as the size of the organization and its memory increases, new problems of scale emerge that are both technical and cultural in nature. The good news is that the short-term payoffs from using display systems generally pay for the cost of implementing them, thus easing the evolution toward a complete organizational memory system.

Organizational Learning

The key processes required to both populate an organizational memory and to retrieve valuable knowledge for reuse from the same memory consists of the same steps as in the KM life cycle (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 (1999) defines a lesson learned in the following way.

> A lesson learned is 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. . . . A lesson must be significant in that it has a real or assumed impact on operations; valid in that is factually and technically 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. (Secchi 1999)

In general, the concept of lessons learned includes the following aspects:

- Contains knowledge gained by experience
- Can be positive or negative, and address a success or a failure

• Implies that the knowledge is captured and its reuse is promoted to increase organizational learning (i.e., to avoid recurrence or to promote repeat application)

Lessons learned are typically obtained after performing one or more project postmortem sessions, after action reviews or any type of reflective exercise that asks participants to identify what worked well and what could be improved. Other tools include continuity books, knowledge books, dark-side reviews, and any other process that documents what has been learned in order to preserve this knowledge in the organizational memory and in order to be able to pass along or transfer this knowledge to people who will have to perform the same tasks.

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 a 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, as described in figure 11.1 (adapted from US GAO 2002).

The steps of the process include:

Collection Capture of lessons through structured or unstructured processes, such as after-action or project reviews, meetings, training evaluations, and so on. Capture may be done at all levels: individual, community, and organization.

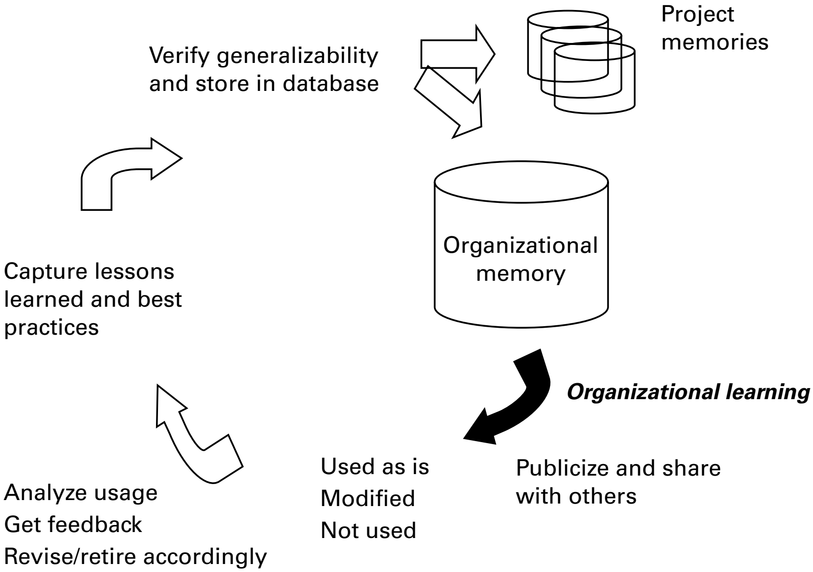


Figure 11.1
Lessons learned process

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.

Store 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.

Disseminate 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).

An illustration from the NASA lessons learned database is presented in box 11.4.

Organizational Learning and Organizational Memory Models

A knowledge resource can therefore be defined as valuable organizational knowledge that has been packaged either as a discrete digital unit of content or that can be

Box 11.4
An example: NASA lessons learned information system (LLIS)

After a period of decreased budgets, a reduced work force, and some very public failures such as the Mars Polar Lander, NASA (web site http://km.nasa.gov/) conducted a study in 2000 to identify actions to improve its approach to executing programs and projects). One of the recommendations from this report dealt with the improvement of capturing and applying lessons learned from projects and missions, to prevent NASA from having to "relearn" lessons of the past. As a result of this study, NASA's lessons learned program was thoroughly evaluated by the Government Accountability Office (GAO) in 2001–2002.

At the time of the study, NASA had an established, agency-wide lessons learned information system (LLIS) that managers were required to review on an ongoing basis to gain lessons from past programs and projects and to submit to in a timely manner about any significant lesson throughout the life of a project. NASA also used training, program reviews, and periodic revisions to agency policies and guidelines to communicate lessons learned. In addition, several NASA centers and programs maintained their own lessons learned systems geared toward their own activities. However, this impeded agency-wide sharing of lessons learned.

To improve the way it captured and shared information, NASA developed a strategic plan, assembled a management team to coordinate knowledge management and activities at NASA's centers, and begun several information technology pilot projects. The LLIS was revamped and its public interface can be found at the NASA Engineering Network (http://www.nasa.gov/offices/oce/llis/home/). The new LLIS includes a multifaceted taxonomy to improve searching and browsing, allowing navigation by year, mission directorate, NASA center, collection, and topics. It also includes a new search engine.

NASA then conducted another survey to evaluate their lessons learned database. The results showed that although failure reports were useful, users preferred a stronger focus on positive lessons, as they were considered more helpful in many cases than negative ones, providing more efficient and effective solutions that could be emulated. Ideally, a balance between positive and negative lessons should be maintained, as NASA explains: "if an organization focuses only on failures, its overall program's effectiveness will be reduced and it will miss opportunities to improve all its processes" (US GAO 2002).

There is another KM system for obtaining and sharing lessons learned from past missions—the NASA engineering network. Prior to the Columbia disaster, NASA had been using a voluntary database to share lessons learned, but employees rarely checked the database to get information. Now employees can search and browse forty-eight NASA engineering repositories using semantic search technologies to search both structured and unstructured data. Content is from only accredited data sources, not informal blogs or notes. Next, NASA will deploy a CoP portal—part chat, part search—as an interactive message board with online conversations recorded for future reference. They also plan on implementing an expertise locator feature will allow users to find experts by inputting a keyword search. Finally, NASA has created an agency-wide lessons learned steering committee with members from each of the NASA centers. So far, people are getting a lot more information easier and quicker than before.

represented as one, by converting tacit into explicit knowledge (usually through interviewing and modeling the appropriate people). Examples of a knowledge resource would be the description of a best practice or innovation, a set of validated FAQs, a how-to guide for a complex procedure, a set of lessons learned from a project, or an anecdotal story that illustrates the cultural values of the company. It is essential to process these valuable knowledge resources through a life cycle in order to create or capture explicit knowledge, to share and disseminate this widely for use and reuse, and to then store or remove this content so that the organization can benefit from best practices (e.g., become more efficient, more innovative) and lessons learned (to avoid repeating past mistakes).

Today's information saturated society recognizes knowledge as the key to competitive advantage and organizational success (Marquardt 2002). Knowledge is defined as information plus people (or human experience) as it incorporates many intangibles such as experiential learning, judgment, and intuition, to create extra value for an organization by informing decisions and improving actions. Choo, Detlor, and Turnbull (2000) note that information becomes knowledge at the point when people justify or validate their true beliefs about the world. Some knowledge can be easily communicated, stored, and accessed for later use. Other knowledge, however, is largely in the heads of individuals (tacit) and is never communicated until someone else needs to reuse it (e.g., Nonaka and Takeuchi 1995). Explicit knowledge is tangible and visible knowledge such as reports, user manuals, procedures, and e-mails and more often than not tends to exist in digital form and be stored in databases, wikis, blogs, or intranets. Knowledge management (KM) is the discipline that helps organizations systematically build, renew, and apply both explicit and tacit knowledge within a given organization (Wiig 1993). Effective KM initiatives help organizations to capture knowledge of significant value and usefulness and to ensure its use and reuse to avoid reinventing the wheel. The benefits of KM can be seen in improved performance on the individual, group, and organizational levels, cost savings, advanced competitive standing, and effective organizational learning (Lesser and Prusak 2004).

Knowledge processing has been studied in such fields as information studies, information architecture, and knowledge management, but in a fragmented way. This has led to disparate theories and conceptual frameworks that only partially address knowledge-processing practices. Most studies observed knowledge processing on a short-term basis, yet successful and sustainable knowledge processing requires a significant period of time.

"Knowledge is more than just information. In addition, it contains experiences, skills and insights. These forms of knowledge are produced during day-to-day interactions" (Huysman and de Wit 2002, 21). Knowledge management consists of the systematic processes for acquiring, organizing, sustaining, applying, sharing, and renewing both tacit and explicit knowledge by employees to enhance the organizational performance and create value (Davenport and Prusak 1998; Allee 1997; Alavi and Leidner 2001; Al-Hawamdeh 2003; Choo 2006). Knowledge processing (also referred to as knowledge sharing in the KM literature) supports learning that occurs in organizations.

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 postmortem 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 time-saving 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 as intranets (used to preserve and make available organizational knowledge to individuals). Knowledge "use" refers to the manner by which organizational members (e.g., policy makers, practitioners, and researchers) use policy, evidence, and experience as knowledge. The sub-concepts 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 e-mails and discussion forums; (3) application of the knowledge as new policies, guidelines, or practice routines. Majchrzak et al. (2004) specify two types of knowledge resource "reuse": the reuse of knowledge for routine tasks (e.g., use of templates, boilerplates, 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).

Huysman and de Wit (2002) studied ten different case studies of knowledge sharing in companies. They selected companies that were mature and had worked on KM for a number of years and conducted interviews and analyzed existing documentation at each site. They found that obstacles to knowledge sharing were: lack of motivation, lack of time, and lack of a means to share the knowledge. In particular, Huysman and de Wit (2002) found that "employees regularly avoided using the technology: "In practice, Information and Communication Technologies' (ICT) role seems limited while social personal networks are more important to knowledge sharing. . . . The role of ICT in this should be more about connecting people and not so much about acquiring and disseminating knowledge" (p. 159). Conklin (2001) also maintains that knowledge management fails for a variety of reasons, including a broad cultural focus on work products over process, and a lack of tools that make the sharing and reuse of knowledge transparent.

"Organizational learning is the process through which an organization constructs knowledge or reconstructs existing knowledge" (Huysman and de Wit 2002, 30). This definition of organizational learning is anchored in social constructivism, where individual knowledge is transformed into organizational knowledge, encapsulated in rules, procedures, technologies, and other operational routines (Berger and Luckman 1966; Gergen 1994). Organizational knowledge is that knowledge that an individual can access, use, and reuse because they are a part of that organization—often referred to as corporate or organizational memory (Kransdorff and Williams 2000).

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 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, 2010). 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 and 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.

A Three-Tiered Approach to Knowledge Continuity

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). Most successful organizations will state that their two greatest assets are the people who work for them and the knowledge they possess. 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 the people leave the organization (LaBarre 2001).

The traditional response has been to mentor, coach, or carry out job shadowing, which is not only time-consuming and complex, but just not possible in many cases, due to a lack of advance warning, lack of time, or a lack of mentoring skills. This problem can be tackled from a different angle: by ensuring that tangible legacy materials are produced, shared, and fed into the corporate storehouse of intellectual capital in an ongoing and seamless manner. Intellectual capital management (ICM) can help capture, transfer and retain valuable knowledge using a three-tiered approach that addresses the individual, the community of practice, 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.

Individual structured interviews focus on "knowledge archeology," that is, 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 on. 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 (2001) of the World Bank is a leading advocate of storytelling to capture the tacit culture surrounding intellectual assets and as a means of catalyzing the cultural changes that need to occur before an organization becomes effective at knowledge sharing.

At the group level, knowledge is often circulated within project teams, organizational units, and more informal communities of practice. Wenger and Snyder's (2000) definition of a community of practice is a group formed so that members can share what they know and so they can learn from one another regarding all aspects of their practice. 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. A number of surveys such as the one by Johnson (2004) have shown that even in a company with an effective KM infrastructure, far and away, people 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, CoPs are voluntary, informal gatherings and sharing of expertise where synergies occur, best practices are identified and shared, lessons learned are analyzed and discussed, problems are identified, and often 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, culture—in short, a communal mental model of the company, how it works, and the environment in which it works.

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 11.2 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.

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

Table 11.2
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 expert 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 levels	Strategic consensus regarding 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 stories Historical knowledge (organizational "saga")

Source: Adapted from Dalkir 2002.

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 1999). 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 an organizational legacy).

Box 11.5
An example: 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. Initially, they had specific questions to explore.

1. Identify critical human resources.

a. Whom do others turn to in a crisis?

b. Who are the subject matter experts (SMEs)?

c. Who has long-term corporate memory?

d. Who is doing a one-of-a-kind job?

e. Who has a unique set of skills/knowledge?

f. 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 (Transport Canada 2003) included:

- Obtain buy-in from senior management.
- Raise awareness, generate enthusiasm.
- Managers should take ownership of the process of KT.
- Human resources personnel should provide significant and sustained support to managers and SMEs through the 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 demographics to identify your vulnerabilities (i.e., where would 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, whenever possible, bring in a replacement before the SME retires.
- Extract critical knowledge held by these experts, customizing your methods to fit your subjects.

Box 11.5
(continued)

- 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:

Stakeholder maps Identify internal and external interactions with stakeholders and partners—personal and professional networks of SMEs

Knowledge maps Conceptual representation of job tasks, key resources, how to obtain and reuse knowledge, and a summary of SME expertise

Task support systems Online tools to support specific processes and info needed to complete specific tasks—glossaries, demos, templates, references, resource lists, case studies, simulations, computer based training (CBT) modules

Dashboard Single stop shop, customized work tools to hold knowledge maps, stakeholder maps, task support systems, and other information such as answers to frequently asked questions (FAQs), relevant legislation and regulations, a calendar of events, scholarly articles, recent news, and useful tools

Transport Canada found that it was necessary to address both explicit and tacit knowledge. They found that IT worked best for explicit knowledge, while 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 why's, the justification, why alternatives were discarded).
- Focus on intellectual capital.
- Be proactive—do not wait until key people retire.
- Promote intergenerational knowledge sharing (under 35, 35–45, and over 45) through communities of practice.

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 here.

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.

• 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.

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 element 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. 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?

7. How would you assess the success of your OM systems, for example, 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?

8. 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, 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.

9. 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?

10. How would you integrate OL and knowledge continuity 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).

References

Alavi, M., D. E. Leidner. 2001. Review: Knowledge management and knowledge management systems: Conceptual foundations and research issues. *MIS Quarterly* 25 (1):107–136.

Al-Hawamdeh, S. 2003. *Knowledge management cultivating knowledge professionals*. Oxford: Chandos Publishing.

Allee, V. 1997. *The knowledge evolution: Expanding organizational intelligence*. Boston, MA: Butterworth-Heinemann Business Books.

Argyris, C., and D. Schon, Eds. 1996. *Organizational learning*, vol. 2. Reading, MA: Addison-Wesley.

Berger, P., and T. Luckman. 1966. *The social construction of reality: A treatise in the sociology of knowledge*. Garden City, New Jersey: Doubleday.

Choo, C. W., B. Detlor, and D. Turnbull. 2000. *Web work: Information seeking and knowledge management on the World Wide Web*. Dordrecht, Netherlands: Kluwer Academic Publishers.

Choo, C. 2001. Environmental scanning as information seeking and organizational learning. *Information Research* 7 (1). http://InformationR.net/ir/7-1/paper112.html.

Choo, C. 2003. Perspectives on managing knowledge in organizations. *Cataloging & Classification Quarterly* 37 (1/2):205–220.

Choo, C., C. Furness, S. Paquette, H. van den Berg, B. Detlor, P. Bergeron, and L. Heaton. 2006. Working with information: Information management and culture in a professional services organization. *Journal of Information Science* 32:491–510.

Choo, C. W. 2006. *The knowing organization: How organizations use information to construct meaning, create knowledge, and make decisions*. 2nd ed. New York: Oxford University Press.

Conklin, E. 1993. Capturing organizational memory. In *Proceedings of GroupWare*, edited by D. Coleman. San Mateo, CA: Morgan Kaufmann, 133–137.

Conklin, J. 2001. Designing organizational memory—Preserving intellectual assets in a knowledge economy. *CogNexus Institute*. http://cognexus.org/dom.pdf (accessed June 4, 2010.).

Crossan, M., and I. Bedrow. 2003. Organizational learning and strategic renewal. *Strategic Management Journal* 24:1087–1105.

Crossan, M., H. W. Lane, and R. E. White. 1999. An organizational learning framework: From intuition to institution. *Academy of Management Review* 24:522–537.

Dalkir, K. 2002. How to stem the loss of intellectual capital: A three-tiered approach. In *Proceedings of the Fifth World Congress on Intellectual Capital Management,* Hamilton, Ontario, January.

Davenport, T., and L. Prusak. 1998. *Working knowledge: How organizations manage what they know*. Cambridge, MA: Harvard Business School Press.

Denning, S. 2001. *The springboard story. How storytelling ignites change in organizations*. Boston, MA: Butterworth-Heinemann.

Garvin, D. 1993. Building a learning organization. *Harvard Business Review* 71 (4):78–91.

Dieng-Kuntz, R., and N. Matta. 2002. *Knowledge management and organizational memories*. Boston: Kluwer Academic.

Gergen, K. 1994. Exploring the postmodern. Perils or potentials? *American Psychologist* 49:412–416.

Huysman, M., and D. de Wit. 2002. *Knowledge sharing in practice*. Dordrecht, The Netherlands: Kluwer.

Johnson, C. 2004.Choosing people: The role of social capital in information seeking behavior. *Information Research 10* (1). http://informationr.net/ir/10-1/paper201.html. (accessed June 4, 2010).

Keong, L. C., and S. Al-Hawamdeh. 2002. Factors impacting knowledge sharing. *Journal of Information and Knowledge Management* 1 (1):49–56.

Kransdorff, A. 1998. *Corporate amnesia*. Oxford, UK: Butterworth Heinemann.

Kransdorff, A., and R. Williams. 2000. Managing organizational memory (OM): The new competitive advantage. *Organization Development Journal* 18 (1):107–117.

LaBarre, P. 2001. People go, knowledge stays. *Fast Company*. http://www.fastcompany.com/magazine/17/wyp17.html. (accessed June 4, 2010).

Lesser, E., and D. Prusak. 2004. *Creating value with knowledge. Insights from the IBM Institute for Business Value*. Oxford, UK: Oxford University Press.

Markus, M. L. 2001. Toward a theory of knowledge re-use: Types of knowledge re-use situations and factors in re-use success. *Journal of Management Information Systems* 18 (1): 57–93.

Marquardt, M. 2002. *Building the learning organization*, 2nd ed. Palo Alto, CA: Davies-Black Publishing, Inc.

McMaster, M. 1995. *The intelligence advantage: Organizing for complexity*. Douglas, Isle of Man, UK: Knowledge Based Development Co. Ltd.

Nonaka, I., and H. Takeuchi. 1995. *The knowledge-creating company*. Oxford: Oxford University Press.

O'Dell, C., and C. J. Grayson. 2001. Identifying and transferring internal best practices. *Destination KM*, http://www.destinationKM.com/articles/default.asp?ArticleID=271&ml=3 (accessed March 28, 2006).

Ott, J., and J. Shafritz. 1994. Toward a definition of organizational incompetence: A neglected variable in organization theory. *Public Administration Review* 54 (4):370–377.

Patriotta, G. 2004. MOn studying organizational knowledge. *Knowledge Management Research & Practice* 2:3–12.

Petch, G. 1998. The cost of lost knowledge. Knowledge Management Magazine, October.http://www.kmmagazine.com.

Probst, G., and B. Büchel. 1997. *Organizational learning*. London, UK: Prentice-Hall.

Secchi, P., ed. 1999. *Proceedings of alerts and lessons learned: An effective way to prevent failures and problems* (Technical Report WPP-167). Noordwijk, The Netherlands: ESTEC.

Senge, P. 1990. *The fifth discipline: The art and practice of the learning organization*. New York: Doubleday.

Senge, P. Roberts, C., Ross, R., Smith, B., and Kleiner, A. 1994. *The fifth discipline fieldbook: Strategies and tools for building a learning organization*. London: Nicholas Brealey.

Senge, P. 1999. *The dance of change: The challenges of sustaining momentum in learning organizations*. London, UK: Nicholas Brealey.

Stein, E. W., and V. Zwass. 1995. Actualizing organizational memory with information systems. *Information Systems Research* 6 (2):85–117.

Taylor, R. 1986. *Value-added processes in information systems*. Norwood, NJ: Ablex Publishing.

Transport Canada. 2003. *Avoiding knowledge collapse—Proactive solutions for regulatory/inspection organizations*. Ottawa, Ontario: Government of Canada, Regulatory Inspection Secretariat, Transport Canada.

United States General Accounting Office (US GAO). 2002. NASA—Better Mechanisms Needed for Sharing Lessons Learned. GAO-02-195, http://www.gao.gov/new.items/d02195.pdf (accessed November 26, 2008).

Wenger, E., and W. Snyder. 2000. Communities of practice: The organizational frontier. *Harvard Business Review* (Jan-Feb):139–145.

Wilson, T. 1981. On user studies and information needs. *Journal of Documentation* 37 (1):3–15.

Wilson, T. D. 1999. Models in information behaviour research. *Journal of Documentation* 55 (3):249–270.

Wilson, T. D. 2000. Human information behavior. *Informing Science* 3 (2):49–56.

Wilson, T. D. 2010. Fifty years of information behavior research. *ASIST Bulletin* 36 (3):27–34.

Wiig, K. 1993. *Knowledge management foundations*, vol. 1. Arlington, TX: Schema.

Additional Resources

Girard, J., Ed. 2009. *Building organizational memories: Will you know what you know?* Hershey, PA: IGI Global Publishing.

12 The KM 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 knowledge management (KM) team. The key skill set required to carry out KM responsibilities is described using a variety of frameworks. The roles of CKO (chief knowledge officer) and CLO (chief learning officer) are introduced and their evolution from the more traditional CIO (chief information officer) is discussed. The new role of chief human capital 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 12.1).

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 up to now (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 (www.tfpl.com) is a specialist recruitment, advisory, training, and research services company with offices in London focusing on knowledge management, library

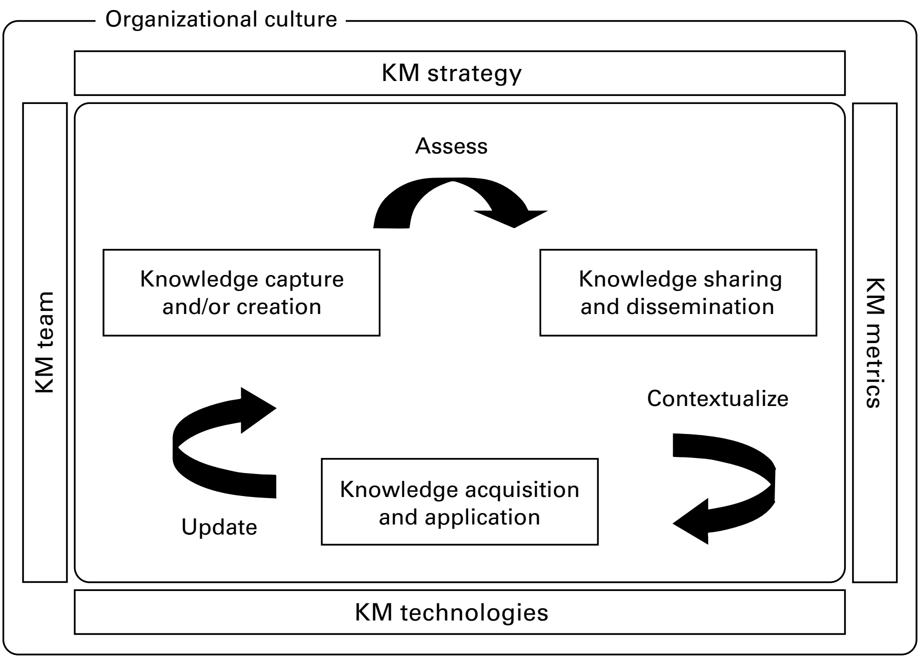


Figure 12.1
The KM team in the integrated KM cycle

and information management, records management, and web and content management. Since 1987, TFPL has worked with organizations in both the 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 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 (http://www.tfpl.com/resources/skills_map.cfm) is based on an extensive international research. The project team contacted over five hundred 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 concept—the philosophy and theory; an awareness of the experience 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 employed to create an environment to create, share, and use knowledge to increase competitive advantage and customer satisfaction (see table 12.1).

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, autonomous, wait to be told, collaborative team player, sees the big picture, makes connections, learns from mistakes, ability

Table 12.1
Excerpt from the TPFL KM skills map

Business awareness/ experience	Management skills	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	Measurement 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

to think and do, with a focus on outcome and an appreciation of information management techniques.

A KM dream team would collectively possess the skills of communication, leadership, expertise in KM methodology/processes/tools, negotiation, and strategic planning. It would also know the organization, remain connected to the top, adopt a systems view, and be an intuitive risk taker.

TFPL has developed a competency framework that allows managers in consultation with the staff who will hold the posts to define knowledge and information management roles and their competencies. The KM Skills Toolkit (http://www.tfpl.com/skills_development/skills_toolkit.cfm) is a diagnostic tool that can help organizations to assess recruitment needs and develop job descriptions and personnel specifications for knowledge and information roles.

Moving up one level, Goad (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 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 "educe" 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, web site, or text—builds on principles of chunking information to enable audiences to understand, remember, and connect. Web styles and monographs on designing web site usability provide concrete content for this KM skill.

While securing information differs from the other six KM skills, it is no less important. Securing information entails developing and implementing practices that ensure 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 e-mail etiquette are an illustration of important knowledge underlying the effective exercise of this KM skill.

Most organizations are still defining their KM roles. 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 Also referred to as KM champions, who are responsible for promoting KM within the organization

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 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, 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 Delivery of KM and information related to training, also called KSO (knowledge support office)

In seeking to recruit relevant professionals for knowledge management 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 describing knowledge management roles. A sample KM job description may look something like the example given here (box 12.1).

KM professionals require a multidisciplinary skill set that consists of such competencies as finding, appraising, and using knowledge, reformulating questions, navigating content, evaluating the relevance of content, filtering out what is not needed, and synthesizing from diverse sources to apply the knowledge (e.g., to make a decision). Last but not least, they must contribute to recording such valuable experiences to organizational memory systems.

Senior Management Roles

One may be familiar with the role of a chief executive officer (CEO), chief operating officer (COO), and the chief financial officer (CFO). There are also chief technology officers (CTO) and chief information officers (CIO), 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)

In 2002, the Chief Human Capital Officers Act was enacted as part of the U.S. Homeland Security Department (see Crumpacker and Crumpacker). This Act required that chief human capital officers (CHCOs) be designated for all twenty-four agencies and offices. The Act states that each CHCO serves as his or her agency's chief policy advisor on all human resources management issues and is charged with selecting, developing, training, and managing a high-quality, productive workforce. The CHCO Act also

Box 12.1

An example: Sample job description: Knowledge and Information Manager (posted on 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

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 web site 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

Box 12.1
(continued)

Role responsibilities:

- Develop, implement, and achieve a knowledge management plan for the organization
- Establish a Health Information Centre 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

established a chief human capital officers council to advise and coordinate the activities of members' agencies on such matters as the modernization of human resources systems, improved quality of human resources information, legislation affecting human resources operations, and organizations.[1]

CHCOs are responsible for the strategic alignment of the workforce (present and future) to the organization's mission. CHCOs are therefore the KM executives who most effectively manage all human capital policies and programs such as retention strategies, knowledge transfer tools and methods, and workforce planning to avoid knowledge gaps and operational breakages.

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 web site, creates virtual workplaces, copyrights information, and creates policies and procedures on how one department communicates information to another (or too many times, there is no communication between departments). 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. 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:

- Maximize the returns on KM investment in knowledge—people, processes, and intellectual capital.
- Exploit intangible assets, for example, know-how, patents, customer relationships.
- Repeat successes and share best practices.
- Improve innovation and the commercialization of ideas.
- 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:

- Promoting the importance of knowledge sharing
- Creating a technical infrastructure to ease that sharing
- Promoting a cultural climate that rewards knowledge sharing behaviors
- Measuring the value to the organization of knowledge and KM practices

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 and Scott 1999). Because of the power associated with expertise, employees may be reluctant to share their knowledge and skill. The old adage that knowledge equals power may prevail as employees with specialized knowledge may elect to use this as a source of 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 and 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 between employees who do not normally work together but would generate value from exchanging information (Earl and 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 a journal dedicated to this new role, called chief learning officer (http://www.clomedia.com/). Like CKOs, most chief learning officers are first-generation incumbents. They typically started their jobs less than three years ago and did so without clearly defined roles, responsibilities, or daily activities. 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 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' mind-sets 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 success factor for being a 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.

Box 12.2

An example: The CLO at Dell

Gale (2003) describes Dell's CLO role, filled by John Coné who retired as Dell's chief learning officer in August 2001. The company never replaced him. The reason was not because the CLO position is a passing concept. It was because Coné believed that his work as the CLO was done. He had been with Dell since 1995 and was given the official title of CLO in 1999, although he says that he really always worked in that capacity. His job was to define the policies and infrastructure that would make Dell a distributed learning organization where employees have access to training whenever and wherever they needed it. Ultimately, that meant making learning such an inherent part of how they did their jobs that it became an unremarkable event in employees' lives, he says. He achieved that goal in part by making training a necessary piece of every new-product release. "We wanted training to be a natural part of the development process," he says. Today, new products at Dell do not move forward unless the necessary training for the product release is in place and deployed. Since Dell comes out with thousands of new products every year, training quickly became a constant in employees' lives.

During his six years at the company, Coné also oversaw the organization's vast e-learning program. His team transformed more than 90 percent of the company's learning content to technology-based formats, putting employees in control of their own learning, twenty-four hours a day, seven days a week. Admittedly, Coné is not sure if he was successful in making learning a permanent part of the culture at Dell. The traditional measures for training success, including the number of hours people are in training, executive involvement, and the percentage of payroll dedicated to learning, show that his efforts are still going strong.

Willis and May (2000) describe the CLO role as:

- A strategic, lead player in today's business organization
- Responsible for making sure learning across an entire system is leveraged, not sacrificed
- Accountable to the whole system and must have broad discretionary power
- Operates 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 CLO's 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:

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.

Culture maintenance Designed to support the marketplace strategy and address deficiencies in skills essential to maintain the new culture developed.

Contemporary initiatives Related to business development, like developing a new marketing plan, account manager development, or promotional process redesign. These require 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 the 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:

Designing information systems Designing, evaluating, or choosing information content, database structures, indexing and knowledge representation, interfaces, networking, and technology.

Managing information systems Maintaining the integrity, quality, currency of the data, updating, modifying, improving the system and operating the system.

Information resources management Managing organizational information resources to support organizational missions and for competitive advantage.

Training Coaching, mentoring, community of practice start-up and lifecycle training support, and feeding back lessons learned and best practices into training content.

Information agencies Acting as information consultants or guides for clients by advising, training, and guiding on information, information sources, information use; acting as an agent on behalf of the client by gathering, evaluating, analyzing, synthesizing, and summarizing information for clients.

Competitive intelligence Gathering and analysing intelligence to inform decision making.

Customer relations for information systems/technology Acting as intermediaries between clients and information system designers, translating client needs into functional specifications, and sales.

Designing and producing information services and products publications Databases, information systems, multimedia products, and stories from storytelling workshops.

Knowledge journalist Gathering organizational stories and coding tacit knowledge.

Organizational information and KM policy analysts Designing access to corporate organizational information and KM policies, quality control, maintaining proprietary information and KM, and mapping corporate intellectual assets.

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 societies covering a single discipline (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, for example, 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, 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 and insurance companies, and the military sector. KM roles include the application of information technology—evaluation, selection, applications design and 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 recent GAO report 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, for example, the Food and Drug Administration.

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.

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. It has become an academic discipline 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 older, more established professions 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 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, 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.

The Knowledge Management Resource Center (http://www.kmresource.com/exp_university.htm) lists a large number of universities that offer knowledge management courses and programs. In general, KM is found in the management, education, and library and information studies departments of universities. Stand-alone special interest courses have evolved into degree programs at the undergraduate and graduate levels. Some sample KM courses and their syllabi can be found on Peter Gray's site (http://mint.mcmaster.ca/mint/OLKM_Syllabi.doc). Quite a few doctoral students are doing their dissertations on KM topics and some of these are listed on the ICASIT web site (http://www.icasit.org/km/academia/list_of_phd_dissertation.pdf).

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://wiki.sla.org/display/SLAKM/) that 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, Knowledge Management Professional Society (http://www.kmpro.org), with wide-ranging chapters and a certification process.
- AOK, Association of Knowledge Work (http://www.kwork.org).
- Knowledge Management Benchmarking Association (http://www.kwork.org/).
- Information and Knowledge Management Society (http://www.ikms.org/).
- Regional KM organizations listed at IT Toolbox's web site (http://it.toolbox.com/wiki/index.php/Knowledge_Management_Societies_&_Associations).

Some sample KM job postings are shown here (adapted from TFPL: http://www.tfpl.com/permanent_recruitment/clients/kmroles.cfm).

The Ethics of KM

Ethics establishes a framework for making decisions based on values and 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 often can 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

Box 12.3
An example: 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 prioritize 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 five years senior experience in a business/financial environment
- Skills: Management skills, good IT skills including maintaining quality databases, Lotus Notes skills; in-depth understanding of the principles of knowledge management
- Personality traits: Good at building, motivating, and leading teams, good communicator; pragmatist

Knowledge Coordinator/Information Specialist

- 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 including the Internet and Lotus Notes. 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 Lotus Notes. 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 experience providing research services in a corporate or industry specific environment

Box 12.3
(continued)

- Skills: Added value research, project management, 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

Knowledge Management Analyst

- Purpose/objectives: To provide information management support to knowledge teams. To undertake analytical research to support business teams.
- Responsibilities: Acting in an advisory/facilitative role to allied knowledge management groups. Designing architectures, processes, and infrastructure for libraries, databases, and intranet. Editing content of library home pages. Conducting analysis and producing reports of KM surveys.
- Education: Degree level qualification in library and information science or a related discipline
- Experience: Two to four years of professional experience in a business environment. Experienced in managing, indexing, and abstracting knowledge.
- Skills: Indexing and classification. Excellent written and oral skills. Good project management skills. Research and analytical skills. Strong IT and database skills including MS Office, Lotus Notes, and the Internet.
- Personality: Good judgment, flexibility, and resourcefulness. Highly analytical. Strongly motivated.

Knowledge Coordinator

- Purpose/objectives: To manage the provision of value added research to sales departments
- Department: Providing added value research information to sales departments within the company
- Responsibilities: Maintaining reference library. Liaising with other departments to assess availability and adequacy of material. Building an industry and issues library to support sales and marketing. Focused on database searching and market/competitor/business issues analysis.
- Education: Degree level qualification in business or marketing or accountancy or information science
- Experience: Two plus years experience in business-to-business research or market analysis. Experience in researching databases.
- Skills: Computer literate with report writing and presentations skills
- Personality: Highly organized, self starter, good communicator

Box 12.3
(continued)

Knowledge Administrator

- Purpose: To manage the acquisition and provision of external business information
- Objectives: To identify and maintain links with corporate sources of business information
- Department: Servicing the business information needs of the entire company in the UK
- Responsibilities: Management of external resources. Serials management. Journal and report circulation. Acquisitions, maintaining records, providing invoicing service, shelving and filing and general office duties. Maintaining links with knowledge administrators in business support departments.
- Education: At least "A" Level standard. Experience: Six months to a year administrative experience.
- Skills: General office or library administration skills, networking and communication skills
- Personality: Initiative, confidence, and sense of humor

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, http://www.iep.utm.edu/e/ethics.htm.) Philosophers today usually divide ethical theories into three general subject areas:

- 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? Meta-ethical 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.
- 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 perform, or the consequences of our behavior on others.
- 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. KM, 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 and 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 and 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., value the demonstration of social responsibility among their employees, promote recycling, donating to local charities, paying 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; 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:

Prevention Using codes of conduct, standard operating practices ,and providing landmarks, fences, and DMZs

Detection Using automated systems to enforce and monitor ethical compliance and to verify appropriate use of company assets

Reporting Where employees able to report unethical behaviors (whistleblowers) without suffering any retaliation

Investigations 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, http://www.kmci.org/). A good illustration is the code of ethics developed for health science librarians (http://www.mlanet.org/about/ethics.html) shown in table 12.2.

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, con-

Table 12.2
Sample code of ethics from 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. 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, 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.

tinual 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?

Note

1. http://www.chcoc.gov/About.aspx.

References

Al-Hawamdeh, S. 2003. *Knowledge management: Cultivating knowledge professionals*. Rollinsford, NH: Chandos Publishing.

Baard, M. 2002. Chief learning officer role taking on new importance, http://searchcio-midmarket.techtarget.com/news/article/0,289142,sid19_gci858958,00.html (accessed June 4, 2010).

Bonner, D. 2000. Enter the chief knowledge officer. *Training & Development* 54 (2):36–40.

Crumpacker, M., and J. Crumpacker 2004. Elevating, integrating, and institutionalizing strategic human capital management in federal agencies through the chief human capital officer. *Review of Public Personnel Administration* 24 (3):234–255.

Davenport, T. H., and L. Prusak. 1997. *Information ecology: Mastering the information and knowledge environment*. New York: Oxford University Press.

Earl, M. J., and I. A. Scott. 1999. Opinion: What is a chief knowledge officer? *Sloan Management Review* 40 (2):29–38.

Gale, S. 2003. For some chief learning officers, one of the goals is job insecurity. *Workforce Management 11*:79–81, http://www.workforce.com/section/11/feature/23/53/77/ (accessed June 4. 2010).

Goad, T. 2002. Problem solving skills for the information age: From concept to practice. JMS Project, Millikin University, http://www.millikin.edu/pkm/pkm_ascue.html (accessed June 4, 2010).

Gordon, J. 2002. *Information literacy and workplace performance*. Westport, Connecticut: Quorum Books.

Groff, T., and T. Jones. 2003. *Introduction to knowledge management*. Boston: Butterworth-Heineman.

McElroy, M. 2002. Ethics, innovation and the open enterprise, http://www.kmmagazine.com/xq/asp/sid.0/articleid.20C04C34-11CE-45AE-8815-CAAB07EE516D/qx/display.htm (accessed June 4, 2010).

Morris, T. 1997. *If Aristotle ran General Motors: The new soul of business*. New York: Henry Holt and Company.

Rogus, J. 1997. Being ethical: Maintaining a perspective of vigilance. *School Business Affairs* 63 (2):58–59.

Rusonow, G. 2003. *Knowledge management and the smarter lawyer*. New York: ALM Publishing.

Skyrme, D. 1997. Do you need a chief knowledge officer? http://www.skyrme.com/insights/27cko.htm (accessed June 4, 2010).

Stewart, T. A. 1998. Is this job really necessary? *Fortune* 137 (1):154–155.

Tapscott, D., and D. Ticoll. 2003. *The naked corporation. How the age of transparency will revolutionize business*. Toronto, Ontario: Viking Canada Press.

Thurow, L. 2003. *Fortune favors the bold: What we must do to build a new and lasting global prosperity*. New York: HarperBusiness.

Thurow, L. 2004. Help wanted: A chief knowledge officer. *Fast Company, 78*, http://www.fastcompany.com/magazine/78/helpwanted.html (accessed June 4, 2010).

Watkins, K. E., and V. J. Marsick. 1993. *Sculpting the learning organization*. San Francisco: Jossey-Bass.

Willis, V., and G. May. 2000. Strategy and the chief learning officer. In *In action: Leading knowledge management and learning*, edited by J. Phillips and D. Bonner. Alexandria, VA: American Society for Training and Development, 55–70.

13 Future Challenges for KM

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. A number of critical challenges must be successfully addressed in order to obtain the maximum value for KM investments—both in terms of budget but also in terms of time and human resources. This chapter explores some issues facing knowledge management such as political issues regarding Internet search engines, the shift to knowledge-based assets, intellectual property, and how to provide incentives for knowledge sharing to successfully incorporate KM into organizations.

Learning Objectives

1. Discuss the politics of information seeking and what this implies for successful knowledge management applications. Be able to outline how this would impact the design of an organizational memory management system.
2. Describe the five major types of information politics models and how knowledge-sharing activities would take place in each of them. Be able to evaluate each model with respect to goodness of fit with KM requirements.
3. Define the paradox of value and explain how this impacts on the design of KM solutions. Describe the ways in which this impact can be minimized.
4. Compare and contrast the different ways incentives can be provided for knowledge sharing.

5. Understand and critically debate where KM stands today, particularly with respect to how well initial expectations of KM have been met.

6. 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.

7. Describe the key areas of research in the field of KM today and make educated guesses about how these new developments will impact KM.

8. List the key challenges KM faces today and in the near future and provide some recommended approaches to best address them.

9. 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.

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 and McElroy 2003; Tannenbaum and Alliger 2000).

The major problems that occur in KM usually result from companies ignoring 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 challenge of selling 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 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 have established a KM program are wasting both their time and money. While technology can support KM, it is not the starting point of a KM program. KM decisions should be based on who/whom (people), what (knowledge), and why (business objectives). 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.

The key critical issues are discussed in this chapter:

• Access issues: What are the political issues factors governing Internet information seeking?

• Organizational issues: What is the political context of the organization and how does this affect KM?

• Accounting issues: What is the impact of a shift from resource-based assets to knowledge-based assets (i.e., from tangible, measurable assets to intangible ones)?

• How do copyright (and "copyleft") and other intellectual property issues impact KM? How can knowledge be shared without losing attribution and without false attribution?

Political Issues Regarding Internet Search Engines

Googlewhacking is a term that has entered our language recently. Googlewhacking refers to the "challenging pursuit of searching the popular Google search engine with a two-word or more search argument that will produce exactly (no less and no more than) one result. That is, only one web page in the world (at least as indexed by Google) will happen to have the combination of words you have entered in the search box" (http://www.googlewhack.com/). Some examples of past Googlewhacks that have been successful include word pairs such as: comparative unicyclist, maladroit wheezer, blithering clops, and demurrable insufficiencies. Both the term and the occupation of Googlewhacking are the inventions of Gary Stock, Chief Innovation Officer, Nexcerpt, Inc. (http://www.googlewhack.com/ and http:/www.unblinking.com).

The raison d'être of this phenomenon lies with the information overload issue: the number of hits that are returned for a given search term is incredible and yet not particularly useful. For example, what results from typing "knowledge management"? It is interesting to compare the results to the concept analysis technique that was presented in chapter 1. For example, Weinberger (1998) used the keywords human, user, change management, knowledge worker, and person and kept a tally of the number of hits returned using those key terms. This can then be compared to the hits obtained when technology-related key terms are used such as processor, RAID, mouse, Internet, repository. The number of hits obtained with KM technology terms far exceeds the number of hits obtained with nontechnology terms. This is partially due to the fact that they are possibly more technology publications, but it illustrates that the "human" is often the last thing considered as organizations change their technology. This is a key reason why many technology initiatives result in failure: neglecting the human element.

To make matters worse, there is common misconception that the commercial search engines perform an objective and exhaustive search of all things digital and that the hits are ranked—that is, the first hit is the most relevant to what you were looking. Nothing, of course, could be further from the truth. Introna and Nissenbaum (2000) argue that search engines raise not merely technical issues but also political ones. Their study of search engines suggests that they systematically exclude (in some cases by design and in some by accident) certain sites and certain types of sites in favor of others, systematically giving prominence to some at the expense of others. Such biases would lead to a narrowing of the web's functioning in society, run counter to the basic architecture of the web, as well as to the values and ideals that have fueled widespread support for its growth and development. It is doubtful that the market mechanism could serve as an acceptable corrective.

There are political as well as technical issues associated with search engines that exlude certain sites systematically in favor of others (by accident or design). Users are largely ignorant of what goes on under the hood and this is compounded by unusually high degree of trust in what the computer says. Lawrence and Giles (1999) conducted a study and found that NONE of the search engines individually indexed more than 16 percent of the total indexable content of the web. Taken together, they index about 42 percent of the available content. Search engines are only partially effective at finding things; a great deal of the web remains hidden. This is not, however, simply due to technological constraints as is popularly believed. The politics of information seeking must be taken into account with organizational knowledge management systems in order to ensure that the best possible (i.e., the most relevant, valid, and up-to-date) content is found, retrieved, and made available to the organization's knowledge workers.

The Politics of Organizational Context and Culture

KM must address not only the information itself, but also the business practices and processes that generate the information. This means that the politics of organizational context and culture must also be taken into consideration. For example, at Dow Chemical, managers believe there should be a common set of financial processes around the world to create common measures of financial performance whereas at IBM, they rely on more traditional measures such as customer satisfaction, time to market, cost evaluation, and so on. The organizational context will thus affect KM implementation, and the evaluation of how successful this implementation was.

Five models of information politics can be used to characterize the politics of the organizational context and culture (Klein 1999; Davenport, Eccles, and Prusak 1992). They are:

- Technocratic utopianism
- Anarchy
- Feudalism
- Monarchy
- Federalism

In technocratic utopianism, a heavily technical approach is taken to information and knowledge management, stressing categorization and the modeling of an organization's full information assets (often in the form of an exhaustive inventory). There is heavy reliance on emerging technologies and content tends to be driven by information systems.. The focus is in detailed corporate data rather than knowledge. The underlying assumption is that technology will resolve all problems with the consequence that little attention paid to content and its use. Data are perceived as a corporate asset.

In the anarchy model, there is an absence of overall information management policy. Individuals are left to their own devices to obtain and manage their own information that is made possible by the introduction of the personal computer. Anarchy models are often seen in early stages of start-ups. They stand at the opposite end of the spectrum from technocratic model because no amalgamation of corporate information is possible (e.g., of revenues, costs, customer order levels, etc.). This model rarely represents a conscious choice but instead tends to evolve into some sort of order with time.

The feudalism model is based on the management of information by individual business units or functions, which define their own information needs and report only limited information to the overall corporation. This is the most commonly encountered model with its emphasis on "the control of information" and "knowledge is power." The "king" decides on content, language, format, distribution list, and the analysis. Key organizational and environmental information often ignored. It is quite difficult to make informed decisions.

In the monarchy, the firm's leaders create the definition of information categories and reporting structures: they may or may not share the information willingly after having collected it. The CEO or someone empowered by the CEO dictates the rules for how information will be managed. This model represents an extreme top-down model that is commonly found in entrepreneurial profiles, small business owner, and micro-managers. This model is appropriate when consensus cannot be reached.

A constitutional monarchy can evolve directly from feudalism or monarchies. There is a document (Magna Carta) that is an information management charter that states the monarch's limitations. This document identifies what information will be collected, rules, processes, platforms, common vocabulary, and so on.

Finally, the federalism model emphasizes an approach to information management based on consensus and negotiation on the organization's key information elements and reporting structures. This is the preferred model for most intellectual capital management applications as it makes extensive use of negotiation to bring potentially competing and noncompeting parties together. People with different interests work out among themselves a collective purpose and a means of achieving it. Federalism requires strong (but not too strong) central leadership and a culture of trust, cooperation, and learning. It is important to understand the value of information itself as well as that of the technology that stores, manipulates, and distributes it. Federalism encourages the use of cooperative information resources to create a shared information vision for genuine leveraging of firm's knowledge assets in the form of data marts not exhaustive data warehouses. As a result, this model is also a very good fit with communities of practice.

It is important to critically assess an organization and to identify the type of political model that is in place so that potential KM barriers can be better anticipated.

Shift to Knowledge-Based Assets

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 13.1).

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. There are also definite costs incurred in managing knowledge assets (Boisot 1998). These are:

- Moving knowledge costs incurred by data processing and data transmission.
- Codification costs due to searching and selections made under uncertainty.
- Abstraction costs arising from generalizing knowledge over wider problem spaces.
- Diffusion costs incurred when communicating with potentially large audiences in ways that can be understood and can lead to effective responses.
- Absorption costs of getting potential recipients of new knowledge to internalize it and familiarize themselves with it.
- Impacting costs of applying internalized knowledge in a variety of concrete situations.

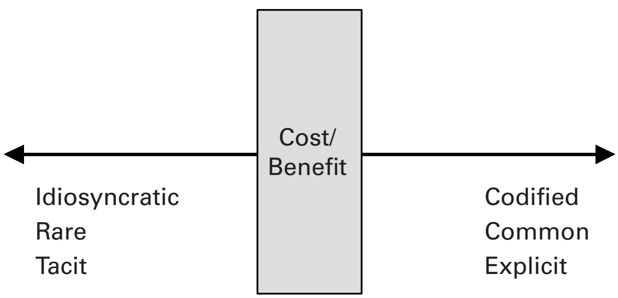


Figure 13.1
The value of a knowledge asset

Classical theories of value focus on resource-based, largely renewable nature's bounty with little concern with the role of information or knowledge. Labor power is put into the equation but is largely unadulterated by knowledge, skills, or expertise. Technical advances were made on behalf of all individuals—not a property of any single individual. Land, labor, and physical factors of production constituted the basis of this traditional approach. However, we need to consider the value of information goods more closely. In the second half of the nineteenth century, value ceased to be regarded as an intrinsic property of the energy inputs required for production. Instead, value became relational and contingent. The focus was still primarily physical goods but with knowledge playing a supporting role. Information goods cannot be inspected prior to purchase. In fact, the value of a knowledge asset is derived from the utility of services it renders over time and the fact that it offers a competitive advantage over those who do not possess it. This lies at the core of the definition of an intellectual asset as discussed in chapter 10.

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 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. An excellent overview of the major measures and techniques used to assess intellectual capital can be found in Sveiby (2001).

In general, most approaches concur that there are three different types of intellectual capital (IC) to be considered:

Human capital The ability of individuals and teams to apply solutions to customer needs, competencies, mind-sets.

Organizational capital The codified knowledge, culture, values, norms.

Customer capital The strength of customer relationships, superior customer-perceived value, and customized solutions.

The intellectual capital model is thus the relationship between human capital, customer capital, and organizational capital that maximizes the organization's potential to create value (see figure 13.2).

Measurement success stories in a number of companies such as Skandia, Dow Chemical, Buckman Labs, the World Bank, and CIBC are outlined in the Knowledge Management of Internal best practices report, available at http://www.bestpracticedatabase.com. A brief summary is provided here.

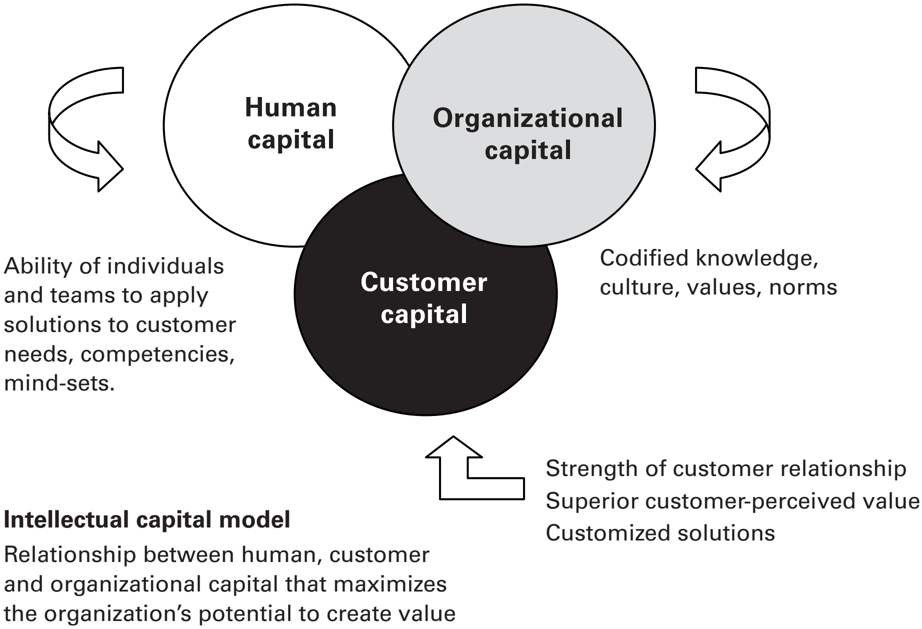


Figure 13.2
The intellectual capital model

In 1993, before the terms *intellectual capital* and *knowledge management* became industry buzzwords, Dow Chemical began to realize that its database of over 29,000 patents represented a gold mine in underutilized intellectual capital. Over time, the company's database had become little more than a dusty, neglected filing cabinet. To combat this neglect, Gordon Petrash was hired to direct Dow's intellectual asset management. Once in office, Petrash took immediate action to identify and index all of Dow's patents. His initial review revealed that less than one half of Dow's patents were being utilized. Understanding the value waiting to be discovered, Petrash worked to develop patent portfolios for each of Dow's business units. All unused patents were indexed and checked for royalty opportunities. This included:

- Projected costs until expiration
- Percentage of annual intellectual asset management costs of R&D budget
- Percentage of competitive samples analyzed that initiate business actions by purpose
- Percentage of business using
- Percentage that business will use . . .

Dow credits Petrash's actions for saving more than $1 million in patent maintenance fees within the first eighteen months. Petrash estimates that in addition to an estimated $50 million in tax savings, Dow increased its annual licensing and patent revenue to $125 million in the year 2000. In effect, Dow expects to reap a benefit of $175 million dollars by better managing its most obvious intellectual assets.

The Skandia Navigator (Edvinsson and Malone 1997) makes use of four types of dimensions:

Financial focus Gross premium income, insurance result

Customer focus Satisfied customer index, customer loyalty, market share

Human focus Number of employees, average age, empowerment index

Process focus Operating expense ratio, premium income/salesperson, net claims ratio

In addition, renewal and development is assessed in terms of training expense, employees, and sales-oriented operations. In all, twenty-one indicators are used to measure IC with nine indicators used to measure efficiency of use of IC.

At Buckman Labs, the following metrics are used:

- Percentage of company effectively engaged with customer (target = 80 percent).
- Percentage of revenues invested in knowledge transfer system.
- Number of college graduates.
- Sales of new products less than five years old as a percentage of total sales.

The World Bank emphasizes the creation of knowledge, public expenditure on education relative to GNP, and public expenditure on education absolute. They also look at the assimilation of knowledge through such metrics as:

- Gross enrollment rate
- Secondary education
- Tertiary education
- Literacy—newspaper readership
- Adult literacy rate
- Mean years of schooling

Finally, at the CIBC, three major dimensions are taken into consideration: human capital consisting of the skills individuals need to meet customer demands, structural capital consisting of the information required to understand specific markets, and customer capital which consists of essential data about the bank's customer base.

Similarly, Sveiby's Intangible Asset Monitor (Sveiby 1997) focuses on external structure, internal structure, and the competences of people. External structure contains customers, suppliers and other "external" stakeholders. One selects the ones that are relevant. In most private companies, this will be the customer and in the public sector organizations will use other stakeholders, such as community members. Many companies have such valuable alliances with their suppliers that they must be included too. Internal departments will have internal "customers" that will form their external structure. Tobin's *q* (Tobin 1998) is a metric that looks at the ratio between the market value stock price multiplied by the outstanding shares and replacement value of physical assets. It serves to quantify the value of knowledge on an objective basis at the global level.

In order to complete the cycle, it is also extremely important to know when to divest knowledge assets. We need to understand why, when, where, and how to formally divest parts of the knowledge base. After having invested so much—how can we throw it away! An opportunity cost analysis should be carried out to identify which knowledge assets are no longer contributing to competitive advantage. Examples of divesting knowledge would include:

- Selling, licensing, donating a patent
- Spinning off or selling a business unit
- Outsourcing a function of the operating process
- Terminating a training program
- Retaining, relocating, or firing individuals with obsolete or ill-fitted skills
- Replacing or upgrading information technology systems
- Terminating partnerships, alliances, and contracts

Figure 13.3 summarizes the different types of intellectual assets and the relative ease with which their value can be extracted.

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, concerns need to be further elucidated. Most practitioners have found that the concerns expressed by knowledge workers revolve around attribution and unwanted attribution.

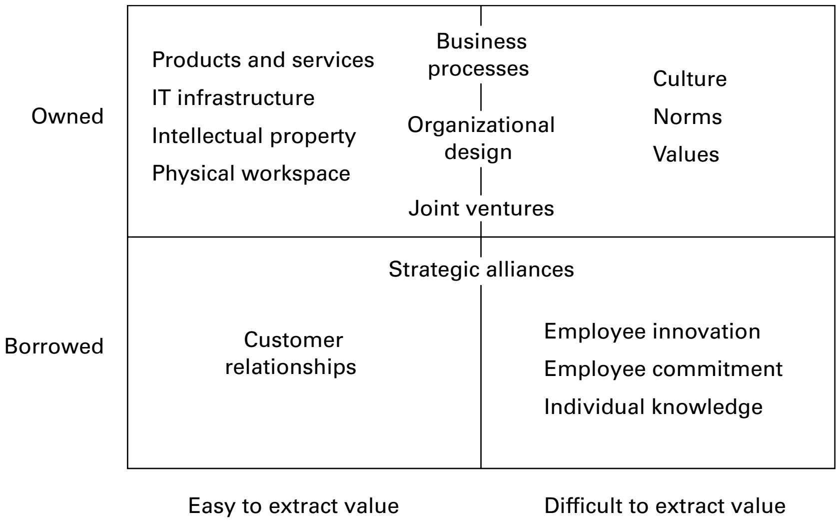


Figure 13.3
The intellectual capital matrix

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 a 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 be 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, such as experienced users, subject matter experts, authors, 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 (see http://search

.creativecommons.org/) 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 (excerpt from http://en.wikipedia.org/wiki/Creative_Commons): There are four major permissions that are contained in creative commons licenses:

- 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.
- 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
- No derivatives (nd), which requires that the work not be modified.
- 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. At a minimum, employees should be allowed to choose their reward from a list of possibilities. At Buckman Labs, this problem was resolved by polling the employees. 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 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:

- 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.
- Moral incentives are said to exist where a particular choice is widely regarded as the right thing to do, 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, approval, or even admiration from her community; a person acting against a moral incentive can expect a sense of guilt, condemnation, or even ostracism from the community.
- 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 her 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. One that provides no or little incentive will suffer from weak morale.

Incentive is very much a double-edged sword. For example, corporate policies with the goal of encouraging productivity —especially of the extreme incentive variant popular during the 1990s—may not have the intended effect. For example, stock options, intended to boost CEO productivity by tying CEO compensation to company performance, have been blamed for many of the falsified earnings reports and public statements in the late 1990s and early 2000s. Throughout the 1990s and 2000s, many corporations have sought to increase individual incentives by increasing the sizes of bonuses (to the point where they exceed salaries, sometimes by a factor as high as ten) for star performers while also laying off large proportions of their workforce, hoping to cultivate fear-factor-related gains. The most extreme version of this is forced ranking, a scheme by which workers are annually ranked and a set proportion (usually between 10 and 15 percent) automatically fired. The results of these programs are mixed, but in extreme cases, usually negative.

While competition among firms often has beneficial results, lowering prices and encouraging competition within firms has almost uniformly negative results. Designed to encourage production, extreme incentive schemes actually create a cutthroat working environment where office politics dominate and actually overshadow the productive goals of the company. An example of this is the now-deceased Enron Corporation. According to Callahan (2004), the environment at that company was so cutthroat (as a result of extreme incentive management) that employees feared leaving their computer terminals, worried that co-workers might steal information for their own purposes.

There are obviously some issues with KM as it is applied in many organizations. 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 yell down" 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 on-going personnel evaluation, 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 over-estimate 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 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.

Stevens (2000) discusses how organizations use a variety of incentives to show that they're serious about sharing knowledge. For example, some have rewards and recognition programs for knowledge sharers; these range from kudos in the company newsletter to substantial pay bonuses. Other companies evaluate employees for raises, advancement, and even extra vacation time partly on how much they participate in knowledge-sharing activities. Government departments are beginning to focus on social or group incentives over individual incentives by rewarding team projects or exemplary success in mentoring or otherwise sharing valuable knowledge. Buckman Labs invites top knowledge sharers to visit the headquarters to personally receive a state-of-the-art laptop as recognition. This incentive was chosen by surveying employees to ascertain what they felt a good reward for being a good knowledge sharer should be. Given that value is in the eye of the beholder, asking employees to suggest rewards they would like to receive is probably the best way to proceed. What is considered a reward may not necessarily be perceived in the same light as it was intended. In a science and technology group, for example, being named "top knowledge aharer" was perceived as being slightly insulting (someone explained it was too much like "employee of the month" at a fast food restaurant). In a multinational consulting company, a $50 bonus was offered for each contribution made to the organization's knowledge base. Again, this was perceived as slightly embarrassing by the members of the organization, yet this type of reward was quite welcome in a similar albeit smaller consulting company located in the same European country. Instead of trying to guess and risk sabotaging the incentive scheme, a representative needs assessment survey of the target group is by the far the preferred option.

Traditional incentives, such as pay bonuses, are not always enough to change behavior. Stevens (2000) surveyed seven organizations about their efforts to encourage knowledge sharing. The following list is adapted from the best practices identified in the survey.

- Hire people who will share to encourage knowledge sharing from the beginning and to catalyze the necessary cultural change. Having current employees participate in the hiring process can do this.
- Develop trust. At Buckman Labs, a code of ethics is formally posted and deals with how to treat fellow employees properly with respect and to recognize and reward all contributions.
- Vary motivations by providing different types of incentives at different levels within the organization in order to better reward executives, department heads, and individuals.
- Show public recognition via plaques, newsletters as well as adding mentions to employees' permanent files.
- Reorganize for sharing to leverage the fact that people naturally share knowledge with others in their own team and/or community of practice. Formalize natural inclinations to group around certain projects, themes, or professional skills.
- Encourage, support, and sustain communities to promote the sharing of expertise, skills, technical knowledge, or even just professional interest in a particular subject matter. Enlarge the network of contacts that each employee has and thus enlarge the scope of knowledge sharing that is possible.
- Develop leaders and role models, as even a small group of KM enthusiasts within a company can be a powerful catalyst for knowledge sharing.

Box 13.1
An example: Siemens Medical Solutions

Gale (2002) 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 e-mails.

Future 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) notes, the reason for this failure was the unrealistic expectation that human organizational behavior could be easily and rapidly changed. Of course, behav-

Table 13.1
Summary of KM cornerstones

1.	Steady and pervasive growth—into almost every business function and geographic location
2.	The holistic perspective of people, processes, and technology—as many organizations still find out to their cost—you cannot simply put in KM technical solutions and leave the realization of business benefits to chance
3.	The knowledge cycle—from creation to identifying, gathering, classifying, storing, accessing, exploiting, and protecting (and many activities in between)
4.	Conducting of information audits and development of knowledge maps
5.	The classification of intellectual capital into customer capital, structural (organizational) capital, and human
6.	The need for KM to demonstrate its value to the organization's bottom line
7.	Communities of practice and the importance of nurturing and not trying to manage or control them
8.	The Internet as an infrastructure for communication, collaboration, and information sharing
9.	The need to root knowledge into its environment and context

ioral 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.

The return on KM investments should not be exclusively perceived as short-term gains but long-term process of people and organizationalimprovements. Unfortunately, people only change their behavior when there is an overwhelmingly compelling argument to do so (not the "leap of faith" on which much of KM was predicated), or where there is simply no alternative. Skyrme (2002), for example, discusses some of the cornerstones of KM as summarized in table 13.1.

Before KM, the way in which people shared knowledge was person-to-person, just in time, and in the context of solving a specific business problem. With the ever-increasing widespread adoption of KM, knowledge management processes such as knowledge creation/capture, knowledge sharing/dissemination and knowledge acquisition/application begin to form part and parcel of the how organizations conduct their core business and how knowledge workers go about conducting their work activities in an efficient and effective manner.

Another way of looking at what lies ahead for KM is to inventory the types of research that are being conducted on KM issues.

KM Research

Some examples of research being conducted in the area of KM include Thomas, Kellogg, and Erickson (2001) who are exploring the role of social and cognitive factors in knowledge codification. The simple picture of knowledge management as getting the right information to the right people at the right time is wrong. Knowledge management is not just a matter of managing information. It is deeply social in nature and must be approached by taking human and social factors into account. As the field of knowledge management develops, and more widespread and varied experience with different approaches to KM is gained, it will become clearer how all the pieces fit together to create a rich picture of social and intellectual capital within organizations. Certainly, looking toward the future of work, as it becomes more centered in virtual relationships and spaces both within and across organizations, creating and maintaining knowledge and its social context will only become more vital.

One of the most important aspects of a knowledge management system is that it becomes what Thomas, Kellogg, and Erickson (2001) termed a "knowledge community": a place within which people discover, use, and manipulate knowledge, and can encounter and interact with others who are doing likewise. They discuss two approaches for supporting knowledge communities, namely social computing and knowledge socialization. A fundamental characteristic of a knowledge community is that it includes conversation and other forms of narrative, for example, stories and/or unguarded discussion among people who know one another, who share professional interests, and who understand the contexts within which their remarks are being made. The authors outline a variety of specific techniques that can contribute to a realistic and effective approach to knowledge management, including supporting new forms of group interaction (e.g., Bohm Dialogue, stories), methods for enhancing creativity (e.g., the use of metaphor), and support for expressive communication. When such techniques are incorporated into knowledge communities, they result in organizational opportunities to build social capital, including trust and cooperation among colleagues.

The notion of a knowledge management environment as a trusted place is an interesting and challenging one for system designers and for organizations. How technically, socially, and organizationally can we balance the need for a safe and trusting place within which so much knowledge creation and social capital building takes place with the organizational imperative to share information more broadly? A greater understanding of how to design socially translucent systems that permit social mechanisms to come into play will help developers of technological systems to negotiate such issues. Similarly, understanding better how to socialize knowledge through techniques such as storytelling and scenarios will offer organizations greater mastery and scope in creating, sharing, and reusing the knowledge that is critical to survival in the twenty-first century.

Others, such as Bouthillier and Shearer (2002) undertook survey research to investigate whether KM is an emerging discipline or just a new label for information management (IM). The authors gathered empirical evidence of how KM is practiced in several types of organizations demonstrating the variety of organizational approaches that are used and the processes that are involved. Based on an exploratory study of KM practices, they presents a typology of methodologies that are employed in various organizations to illustrate what may be considered as the particular nature of KM to show potential differences with IM.

The field of knowledge management is fairly new. This explains why its research base is still under development. Despite the vagueness of KM, its potential overlaps with IM, and its weak theoretical base, KM is practiced in many organizations. Examining empirical evidence is certainly a valid approach for identifying building blocks of theories and concepts to support the development of new scientific fields. Indeed, scientific knowledge is often rooted in practice: culture and society existed before we had anthropology and sociology. The empirical evidence that was gathered for this study shows that KM involves human/soft and technical/hard aspects (Hlupic, Pouloudi, and Rzevski, 2002). KM seems to be made of various organizational practices requiring changes in policies, work routines, and organizational structures. More specifically, these authors found the following general principles:

- Knowledge, in practice, is most often defined as tacit knowledge in spite of the conceptual problems mentioned above. Explicit knowledge was included only in those initiatives where the focus was converting tacit knowledge into explicit knowledge.
- Knowledge management, as it is practiced, really means facilitating the sharing of tacit knowledge. Despite the fact that other processes were part of the KM projects, sharing was the primary emphasis of all case studies.
- There are slight differences in the practices between private and public sector knowledge management. Private sector organizations use KM for internal knowledge sharing targeted in specific areas of the organization. The KM initiatives are most often concerned with managing business and administrative knowledge. Public sector organizations use KM for both internal and external knowledge sharing throughout the organization and the KM initiatives are most often concerned with managing product-related knowledge.

• KM practices could benefit from the skills already held by information professionals. These skills include the identification of knowledge needs, helping to distinguish between information and knowledge to help facilitate a broader and more inclusive KM initiative.

One can claim that the ontological and epistemological aspects of knowledge are still so ill defined and poorly understood that KM cannot be an emergent discipline. And, indeed, although the concepts of tacit and explicit knowledge, knowledge sharing, and knowledge technologies are often used, they are not clearly defined. However, the question remains why do large private and public organizations bother to use unclear terminologies? The reason arises from a lack of consensus or use of standardized terms across organizations rather than a lack of clarity. The IM community cannot continue to claim that it has addressed for years the same issues addressed now by KM experts. Dismissing KM as simply a management fad could be a missed opportunity to understand how knowledge is developed, gained, and used in organizations and ultimately in society. New labels can be misleading but they can also force some reflections. There continues to be a need to examine why there is such an interest for KM in both the academic, business communities, and governments.

Researchers have also begun to study KM technologies. For example, Studt (2003) found that drug discovery is one of a handful of technologies that create value by transforming vast amounts of data into knowledge that is then used to create useful products. in this case drugs for human health. Unfortunately, the creation of that data in the drug area is growing at a faster rate than researchers are being able to manage it. Genomics, proteomics and the biotech industry based on them have turned the traditional, mostly linear flow of information, into a dynamic, iterative loop.

Along with new types of biotech data, however, information capture throughout the development process has also become more critical. Decisions to advance and prioritize targets and potential leads require the integration and capture of whole new types of information using new research technologies.

The use of knowledge management tools is becoming critical to reduce development times and costs and to improve the overall success rate of testing new compounds. Understanding the different components of knowledge management and how they interact in a drug development environment is the first step in implementing a workable system. A knowledge management process consists of the creation, collection, interpretation, storage, and interaction with data. A number of pharmaceutical and biotechnology companies have reported significantly improved R&D productivities with the implementation of knowledge management initiatives.

Bristol-Myers Squibb's SMART-IDEA, for example, incorporates data repositories, data integration technologies, data visualization, and data mining tools, as well as having decision support functionalities. Finally, there are a growing number of doctoral theses that address KM themes.

Some sample KM research topics include:

- What are the exact mechanisms by which knowledge and learning are institutionalized and embedded in the corporate memory?
- How can communities of practice support and enhance professional education?
- When do stories work best and why? Is there a best practice for creating and telling stories?
- What drives employees to share their knowledge with each other or hoard it? What can management do to increase knowledge sharing among employees?
- How can blogs be used in KM research? What types of data can be collected and how can they be analyzed?
- Evaluation of knowledge generation methods within companies, information sharing in multinational companies, reward structures, and commitment in global teams, cultural differences (cross cultural communication problems) within global teams, definitions of knowledge (e.g., cultural relativity of definitions, temporal instability of definitions), effects of organizational identity on definition of core knowledge competences
- Language (genre-specific analyses of stories, argumentation, conversation, computer-mediated) as used in organizations and practical applications or theoretical contributions of strategy development, language coherence, language contingency, organizational rhetoric, impression management, language and organizational identity
- The gap between theory and implementation of knowledge management systems and principles
- Do top-down knowledge management initiatives meet bottom-up organizational learning?
- Business ethics as it relates to the use of IT; methods of effectively assessing ethical quality in business systems and processes
- Evaluating and improving the facilitation of group workshops
- The implementation of strategy (or change programs), and the adaptability of strategy to new pressures
- Search engine use patterns. How do employees interact with intranet search engines?

• Metadata: Hype or help? Does the use of metadata actually improve information finding?

As Schulz & Jobe (2001) point out, empirical research in the corporate knowledge management world is limited. Many opportunities exist for further detailed empirical research.

A Postmodern KM

Weinberger (2001) introduced the term "postmodern KM" to distinguish from traditional KM which he views as having traditionally suffered from the belief that we can discover ultimate truths and organize the world according to rational principles using clever code. The idea was that we should capture and organize bits of knowledge in central databases. The people involved were relevant only as donors to the common ontology or as empty vessels into which knowledge could be poured. Postmodernism holds that the lenses of individual subjectivity and group power dynamics always warp our concept of reality. Therefore, postmodern KM cannot be about management at all because management implies external control of some definable resource. Its goal is simpler yet deeper: leveraging people. Postmodern KM operates within and on the basis of existing behavior patterns, mining conversation streams, and relationships automatically to incorporate structure and context into the information human users already manipulate. It fosters human intelligence and interaction rather than trying to replace them.

Concretely, that means things like automatically parsing e-mail messages and other internal content to draw out useful context and associations (an approach being pursued by Lotus and a bevy of others including Tacit Knowledge Systems, Abridge, EcoCap, Krypteian, and Neomeo); mining discussion content and user feedback on intranets (Newknow); adding workflow directly into e-mail messages (Zaplet); and building on weblogs as a powerful web-native tool for knowledge sharing (Onclave and Slashdot derivatives). In other words, tools to help manage knowledge.

Miller and Morris (1999) discuss the impending transformation of R&D from its historical, product-centric past to its emerging knowledge-centric future. In addition, their focus on discontinuous and fusion innovation promises to lead the way for industry, in general, whose R&D functions typically produce less than one new product innovation per decade and whose new products, when they are produced, tend to fail in under four years. The authors explicit embrace of knowledge management is also welcome, as the value of most companies now tends to rest more on the weight of their intellectual assets than on so-called "hard" assets. The focus is on distributed, enterprise-wide innovation that signals the tearing down of R&D's overly centralized and compartmentalized profile in most firms and offers strong support for the view that innovation should be structured as a distributed, whole-firm social process, not an administrative one.

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) 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:

- Improving access to information and knowledge—covering the availability, accessibility and affordability of information (especially of scientific information in developing countries)
- Promoting knowledge sharing through learning circles and vertical/horizontal coalitions, peer-to-peer technology, communities of practice, infomediaries, help desks, e-learning, and better interaction/mutual learning with target groups (the poor)
- Networking international and regional cooperation—covering networking models, digital solidarity, collaboration tools like portals and common terminology (thesaurus), network effectiveness, strengthening existing structures and resource centers
- Other issues include the development of local content in local languages and dissemination channels besides Internet, capacity building, and quality control/standards
- Avoid 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 does not know exactly what he wants or if output is not straightforwardly measurable.

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 the 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.

• Information seeking, particularly on the World Wide Web, should not always be taken at prima facie—there are political, commercial influences in addition to technical constraints and these will all affect the type and volume of content that can be easily retrieved.

• 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.

• The paradox of the value of an intellectual or knowledge asset is one of the major issues facing KM today. Human, structural, and customer capital will need to be codified to some extent and their sharing promoted actively throughout the organization.

• One of the most important challenges in ensuring success of KM applications is putting 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 must rest on solid theoretical foundations. Current research studies will add to, complete, and complement KM theoretical models.

• 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 acts 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 be guided to offer environments that are more conducive to effective knowledge management.

• KM continues to evolve as a profession. 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. What do we mean when we refer to the politics of information seeking? Why would this be a potential risk for KM?

3. What are the five major types of organizational cultures? Critically evaluate their strengths and weaknesses. How would you analyze or identify these organizational profiles? Where does your organization lie?

4. 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.

5. 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.

6. 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." What are the implications of this on issues of privacy of information?

7. 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 in order to decide the best course of action to take? How and when would you assess progress again?

8. Provide a brief history of the field of KM and describe where you feel it is today and where it is heading.

9. What do you feel are the key priorities to be addressed in order for KM to continue to evolve and become better embedded in critical business processes?

10. 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?

References

Boisot, M. 1998. *Knowledge assets*. Oxford, UK: Oxford University Press.

Bouthillier, F., and K. Shearer. 2002. Understanding knowledge management and information management: An empirical perspective. *Information Research, 8*(1), http://informationr.net/ir/8-1/paper141.html (accessed June 4, 2010).

Callahan, D. 2004. *The cheating culture: Why more Americans are doing wrong to get ahead*. Orlando, FL: Harcourt.

Davenport, T., R. Eccles, and L. Prusak. 1992. Information politics. *Sloan Management Review* 34 (1):53–63.

Denning, S. 2000. *The springboard: How storytelling ignites action in knowledge-era organizations*. Burlington, MA: Butterworth-Heineman.

Edvinsson, L., and M. Malone. 1997. *Intellectual capital: Realizing your company's true value by finding its hidden brainpower*. New York: HarperBusiness.

Firestone, J., and M. McElroy. 2003. *Key issues in the new knowledge management*. Burlington, MA: Butterworth-Heinemann/KMCI Press.

Gale, S. 2002. Knowledge sharing earns bonus points. *Workforce Management* November: 85, http://www.workforce.com/section/02/feature/23/35/70/233574.html (accessed June 4, 2010).

Gartner Group. 1998. Knowledge management. *October 1997/June 1998,* http://gartnergroup.com (accessed).

Hlupic, V., A. Pouloudi, and G. Rzevski. 2002. Towards an integrated approach to knowledge management: “hard,” “soft,” and “‘abstract” issues. *Knowledge and Process Management* 9 (2): 90–102.

Introna, L., and H. Nissenbaum. 2000. Shaping the web: Why the politics of search engines matters. *Information Society* 16:169–185.

Klein, D. 1999. *The strategic management of intellectual capital*. Boston: Butterworth-Heinemann.

Lawrence, S., and C. Giles. 1999. Accessibility of information on the web. *Nature* 400:107–109.

Miller, W., and L. Morris. 1999. *Fourth generation R&D: Managing knowledge, technology and innovation*. New York: Wiley.

Pollard, D. 2003. The future of knowledge management. Discussion paper, http://blogs.salon.com/0002007/images/TheFutureofKnowledgeManagement.doc (accessed June 4, 2010).

Schulz, M., and L. Jobe. 2001. Codification and tacitness as knowledge management strategies: An empirical exploration. *Journal of High Technology Management* 12 (1):139–165.

Skyrme, D. 2002. What’s next for knowledge management? *I*^{3} *Update Entovation International News*, http://www.skyrme.com/updates/u57_f1.htm (accessed June 4, 2010).

Stevens, L. 2000. Incentives for sharing. *Knowledge Management Magazine* October, http://www.kmmag.com/articles/default.asp?ArticleID=778.

Studt, T. 2003. Knowledge management is key to improving drug R&D cycles. *R&D* 45 (4):18.

Sveiby, K. 1997. *The new organizational wealth: Managing and measuring knowledge-based assets*. San Francisco: Berrett-Koehler Publishers.

Sveiby, K. 2001. Methods for measuring intangible assets, http://www.sveiby.com/articles/IntangibleMethods.htm (accessed June 4, 2010).

Tannenbaum, S., and G. Alliger. 2000. *Knowledge management: Clarifying the key issues*. Burlington, MA: IHIRM.

Tobin, D. 1998. *The knowledge-enabled organization: Moving from “training” to “learning” to meet business goals*. New York: AMACON.

Thomas, J., W. Kellogg, and T. Erickson. 2001. The knowledge management puzzle: Human and social factors in knowledge management. *IBM Systems Journal* 40 (4):863–884.

Weinberger, D. 1998. KM and the human element. KMWorld 7 (6). http://www.kmworld.com/Articles/Column/David-Weinberger/KM-26amp3b-the-human-element-9713.aspx. (accessed June 4, 2010).

Weinberger, D. 2001. Postmodern KM: A one-question interview. *Journal of the Hyperlinked Organization* August 15, http://www.intranetjournal.com/articles/200109/ib_09_19_01a.html (accessed June 4, 2010).

14 KM 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 grow your own KM library. Note that these are in addition to the references found in each preceding chapter.[1]

The Classics

Ackerman, M., V. Pipek, and V. Wulf. 2003. *Sharing expertise: Beyond knowledge management*. Cambridge, MA: MIT Press.

Argote, L. 1999. *Organizational learning: Creating, retaining, and transferring knowledge*. Boston: Kluwer Academic.

Beazley, H., J. Boenisch, and D. Hardan. 2002. *Continuity management: Preserving corporate knowledge and productivity when employees leave*. New York: John Wiley.

Brooking, A. 1996. *Intellectual capital: Core assets for the third millennium enterprise*. London: International Thomson Business Press.

Cortada, J., and J. Woods. 1999. *The knowledge management yearbook 1999–2000*. Boston: Butterworth-Heinemann.

Cortada, J. 2000. *Knowledge management yearbook: 2000–2001*. Boston: Butterworth-Heinemann.

Delong, D. 2004. *Lost knowledge: Confronting the threat of an aging workforce*. Oxford, UK: Oxford University Press.

Dixon, N. 2000. *Common knowledge: How companies thrive by sharing what they know*. Boston: Harvard Business School Press.

Figallo, C., and N. Rhine. 2002. *Building the knowledge management network: Best practices, tools, and techniques for putting conversation to work*. New York: John Wiley and Sons.

Firestone, J. 2003. *Enterprise information portals and knowledge management*. Amsterdam, London: KMCI/Butterworth-Heinemann.

Harvard Business Review. 2001. *Harvard Business Review on organizational learning*. Boston: Harvard Business School Press.

Holsapple, C. 2003. *Handbook on knowledge management 1: Knowledge matters*. New York: Springer-Verlag.

Holsapple, C. 2003. *Handbook on knowledge management 2: Knowledge directions*. New York: Springer-Verlag.

Leonard-Barton, D. 1995. *Wellsprings of knowledge: Building and sustaining the sources of innovation*. Boston: Harvard Business School Press.

Liebowitz, J. 1999. *The knowledge management handbook*. Boca Raton, FL: CRC Press.

Morey, D., M. Maybury, and B. Thuraisingham. 2000. *Knowledge management: Classic and contemporary works*. Cambridge: MIT Press.

Nonaka, I., and D. Teece. 2001. *Managing industrial knowledge creation, transfer and utilization*. Thousand Oaks, CA: Sage.

Pfeffer, J., and R. Sutton. 1999. *The knowing-doing gap: How smart companies turn knowledge into action*. Boston: Harvard Business School Press.

Schwartz, D., Ed. 2006. *Encyclopedia of knowledge management*. Hershey, PA: Idea Group Publishing.

Skyrme, D. 1999. *Knowledge networking: Creating the collaborative enterprise*. Boston: Butterworth-Heinemann.

Stewart, T. 2001. *The wealth of knowledge: Intellectual capital and the twenty-first century organization*. 1st ed. New York: Currency.

Von Krogh, G. 2000. *Enabling knowledge creation: How to unlock the mystery of tacit knowledge and release the power of innovation*. New York: Oxford University Press.

Wenger, E., R. McDermott, and W. Snyder. 2002. *Cultivating communities of practice: A guide to managing knowledge*. Boston: Harvard Business School Press.

Wiig, K. 2004. *People-focused knowledge management: How effective decision making leads to corporate success*. Burlington, MA: Butterworth-Heinemann.

KM for Specific Disciplines

Bixler, C. 2002. Knowledge management: A practical solution for emerging global security requirements. *KM World* 11 (5):18–28.

Greer, S. 2008. Engineering practice. A lessons learned knowledge management system for engineers. *Chemical Engineering Magazine* August 14:50–52.

Institute for the Study of Knowledge Management in Education (ISKME). n.d. Available at http://www.iskme.org/.

Liebowitz, J. 2004. Will knowledge management work in the government? *International Journal of Electronic Government* 1 (1):1–7.

Luen, T., and S. Al-Hawamdeh. 2001. Knowledge management in the public sector: Principles and practices in police work. *Journal of Information Science* 27 (5):311–318.

Muscholl, M., and K. Maximini. 2005. Knowledge management in medicine (KMM). *Professional knowledge management. Third Biennial Conference, Revised Selected Papers,* edited by K.-D. Althoff. Berlin: Springer, 316–383.

Parson, M. 2004. *Effective knowledge management for law firms*. Oxford, UK: Oxford University Press.

Shaw, J., C. Subramaniam, G. Tan, and M. Welge. 2001. Knowledge management and data mining for marketing. *Decision Support Systems* 31:127–137.

Soliman, F., and K. Spooner. 2000. Strategies for implementing knowledge management: Role of human resources management. *Journal of Knowledge Management* 4 (4):337–345.

Vasconcelos, J., P. Seixas, P. Lemos, and C. Kimble. 2005. Knowledge management in non-governmental organisations: A partnership for the future. In *Proceedings of the 7th International Conference, Enterprise Information Systems (ICEIS),* Miami, USA, May 24–28, 2005. Available at: http://129.3.20.41/eps/dev/papers/0506/0506002.pdf/

International KM

Alavi, M., and D. Leidner. 1999. Knowledge management systems: Issues, challenges, and benefits. *Communication of the Association forInformation Systems* (1):1–28.

Holden, N. 2002. *Cross-cultural management: A knowledge management perspective*. Boston: Pearson Education.

Inkpen, A., and A. Dinur. 1998. Knowledge management processes and international ventures. *Organization Science* 9 (4):454–468.

Mertens, K., P. Heisig, and J. Vorbeck. 2000. *Knowledge management best practices in Europe*. New York: Springer-Verlag.

O'Riordan, J. 2005. *A review of knowledge management in the Irish civil service*. Ireland: Institute of Public Administration.

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*

Key Conferences

- APQC KM Conferences, http://www.apqc.org/km2008call.
- Conference on Knowledge, Culture and Change in Organizations ,http://m08.cgpublisher.com.
- ECKM—European Conference on Knowledge Management, http://www.academic-conferences.org/eckm.
- ICICKM—International Conference on Intellectual Capital, Knowledge Management and Organizational Learning, http://www.academic-conferences.org/icickm.
- ICKM—International Conference on Knowledge Management, http://www.ickm08.com.
- KM World, http://www.kmworld.com.

• OKLC—Organizational Knowledge and Learning Conference, http://www.feweb.vu.nl/olkc2009/olkc.html.

Key Web Sites

• APQC KM Edge, http://www.kmedge.org.

• The community of practice on communities of practice, CPsquare, http://cpsquare.org/.

• Dave Gurteen, http://www.gurteen.com/.

• Seth Earley's community of practice on knowledge organization, taxonomies and content management, http://thecontentwrangler.ning.com/.

• The eLearning Guild (a CoP for e-learning), http://www.elearningguild.com/.

• ICASIT, http://www.icasit.org/km/.

• Krebs, V. V. Krebs, Knowledge Networks, http://www.orgnet.com/.

• KM for Development, http://www.km4dev.org/.

• The Knowledge Management Resource Centre, http://www.kmresource.com/.

• KM Resources, http://www.skyrme.com/resource/kmres.htm.

• Knowledge Praxis, http://www.media-access.com/resources.html.

• KnowledgeBoard, http://www.knowledgeboard.com/.

• National Library of Health (NLS), http://www.library.nhs.uk/KnowledgeManagement/.

• Organizational Learning and KM Resources, http://carbon.cudenver.edu/~mryder/itc_data/org_learning.html.

• Organizational storytelling resources, http://www.creatingthe21stcentury.org/. and http://www.stephendenning.

• Virtual KM Library, http://www.kmnetwork.com/.

KM Glossaries

• ICASIT, http://www.icasit.org/km/intro/glossary.htm.

• Knowledge Point, http://www.knowledgepoint.com.au/starting_out/glossary.html.

• NLH, http://www.library.nhs.uk/knowledgemanagement/Page.aspx?pagename=GLOSSARY.

KM Case Studies and Examples

KM Case Studies

- Australian Public Service Case Studies, http://www.developmentgateway.com.au/jahia/Jahia/pid/7037.
- Buckman, R. 2004. *Building a knowledge-driven organization*. New York: McGraw Hill.
- Community of practice case studies available from Etienne Wenger, http://www.ewenger.com/pub/index.htm.
- Davenport, T., and G. Probst. 2002. *Knowledge management case book: Siemens best practices*. New York: John Wiley and Sons.
- Harvard Business Online for Educators, http://harvardbusinessonline.hbsp.harvard.edu/b01/en/academic/edu_interactive.jhtml.
- Jennex, M., Ed. 2005. *Case studies in knowledge management*. Hershey, PA: Idea Group.
- The Knowledge Management Advantage, http://www.providersedge.com/kma/km_articles_case_studies.htm.
- Knowledge Management at the World Health Organization (WHO), http://www.who.int/kms/en/.
- Liebowitz, J. 2002. A look at NASA Goddard Space Flight Center's knowledge management initiatives. *IEEE Software* 19 (3):40–42.
- McCormick, J. 2007. Five companies that got KM right. CIO Insight. Available online at: http://www.cioinsight.com/c/a/Case-Studies/5-Big-Companies-That-Got-Knowledge-Management-Right/.
- The National School of Government has case studies on Hewlett-Packard, Buckman Labs, Ford Motor Company, Allen and Overy, and Scandia, http://www.library.nhs.uk/KnowledgeManagement/ViewResource.aspx?resID=286800/.
- Rao, M. 2003. *Leading with knowledge: Knowledge management practices in global infotech*. New York: McGraw Hill.
- Rao, M. 2004. *Knowledge management tools and techniques: Practitioners and experts evaluate KM solutions*. Boston: Elsevier Butterworth-Heinemann.
- Ross, M., and W. Schulte. 2005. Knowledge management in a military enterprise: A pilot case study of the space and warfare systems command. In *Creating the discipline of knowledge management: The latest in university research*, edited by M. Stankosky. London: Elsevier/Butterworth-Heinemann, 157–170.
- Step Two Designs, http://www.steptwo.com.au/category/papers/case-studies.

- U.S. Navy, http://www.about-goal-setting.com/KM-Library/knowledge-management-case-study-us-navy.html.

KM Examples

- A lessons learned database developed for the U.S. National Firefighters, http://www.firefighternearmiss.com.
- A storytelling site for management and leadership best practices and lessons learned, http://fiftylessons.com.
- The World Bank KM site, http://web.worldbank.org/WBSITE/EXTERNAL/WBI/0,,contentMDK:20939032~menuPK:204788~pagePK:209023~piPK:207535~theSitePK:213799,00.html/.
- The World Bank lessons learned database, http://www4.worldbank.org/afr/ikdb/search.cfm.
- KM for development agencies, http://www.u4.no/themes/km/examples.cfm

KM Wikis

- http://kmwiki.wikispaces.com/.
- http://knowledge-management.wikia.com/wiki/Knowledge_Management_Wiki.
- http://it.toolbox.com/wiki/index.php/CommunityTopic?a=Knowledge+Management.

KM Blogs

- Librarian perspective, http://urlgreyhot.com/personal/taxonomy/term/159.
- 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://blog.jackvinson.com/archives/2005/11/30/pollard_on_pkm.html.
- KM tutorial videos highlighted in the Talking KM Blog, http://talkingkm.blogspot.com/2007/08/video-tutorials.html.

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

• Leonard, D. (2003). Knowledge management at JPL, http://www.harvardbusinessonline.org.

• KM at the World Bank, http://web.worldbank.org/WBSITE/EXTERNAL/WBI/0,,contentMDK:20212624~menuPK:575902~pagePK:209023~piPK:207535~theSitePK:213799,00.html.

• Stephen Denning talking about storytelling, http://www.stevedenning.com/WatchAVideo.htm

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

• The Brain, http://www.thebrain.com

• Inspiration, http://www.inspiration.com

• Viso, http://office.microsoft.com/en-ca/viso/default/aspx.

Note

1. Please consult the book web site for more updated KM resources.

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 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 U.S. 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.

Artifact 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.

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, to find a standard or accepted way of proceeding with respect to the specific issue.

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 blog. 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, criticize adversely, or express disapproval. If you are censured for something you have done, someone in authority tells 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, responsible for policy on recruitment and retention of workforce, 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 of the CLO 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 outside of our area of expertise. Short-term memory can usually handle only about seven chunks.

Climate The prevailing psychological state (e.g.,"the climate of opinion," "the national mood 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 ore 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 or generate ideas; a group of professionals who try to face common 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 or in 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 context of relationships with the other components 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 the 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 web site 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 processes that are 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. Organizational memory can either assist or inhibit the organization's progress.

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 fall- back 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 librarian, and Internet information specialist.

Data Directly observable or directly verifiable facts.

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.

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.

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.

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.

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.

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 locator 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 organizations' 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.

Fence 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.

Googlewhacking Searching the popular Google search engine with a two-word or more search argument that will produce exactly (no less and no more than) one result.

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 on one document. Software that enables members of a network work group to communicate and collaborate through e-mail, 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 inducement. In economics, an incentive in anything that provides a motive for a particular course of action that 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 is 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 web sites, this mini-program 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 available to an organization, including the knowledge in people's heads, supported by the organization's collections of information 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 (KSO, knowledge support office) A place where knowledge is gathered and stored and can be accessed and used by other people. It may be a physical place like a library, a "virtual" place like an interactive web site 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 collection, structuring, and disseminating information. That does not mean they do it all themselves. They set the framework and structures, develop the good practice guides, and provide information management expertise. 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 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.

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 Centralized databases in which employees enter information about their jobs and from which other employees seek answers. Often rely on groupware technologies, which facilitate the exchange of organizational information but 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 often built upon 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 Formerly 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 they hang around on the edge of the important stuff, 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 postmortem 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 Rensis 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 a desired goal when growth and progress toward that goal has 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 A model is a 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 When 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, 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 his or her 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 "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.

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.

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.

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 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 objects 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. 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 sets 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 manage anxieties but seldom produce 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 he or she is 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 work flows, 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; “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 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 enable 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 basis of accountability, 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 the 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. It is 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 e-mail, phone, fax, and other communication methods; a cluster of organizations united by a series of electronic linkages.

Weak incentive A weak incentive is an incentive that is does not encourage maximization of an objective, because it is ambiguous or lends itself to "satisficing" instead of optimizing.

Wiki *Wiki wiki* is a Hawaiian term meaning "quick" or "super fast," and wiki became a term for a web site 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 web site.

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.

Index

*Note***:** *t* refers to a table and *f* refers to a figure