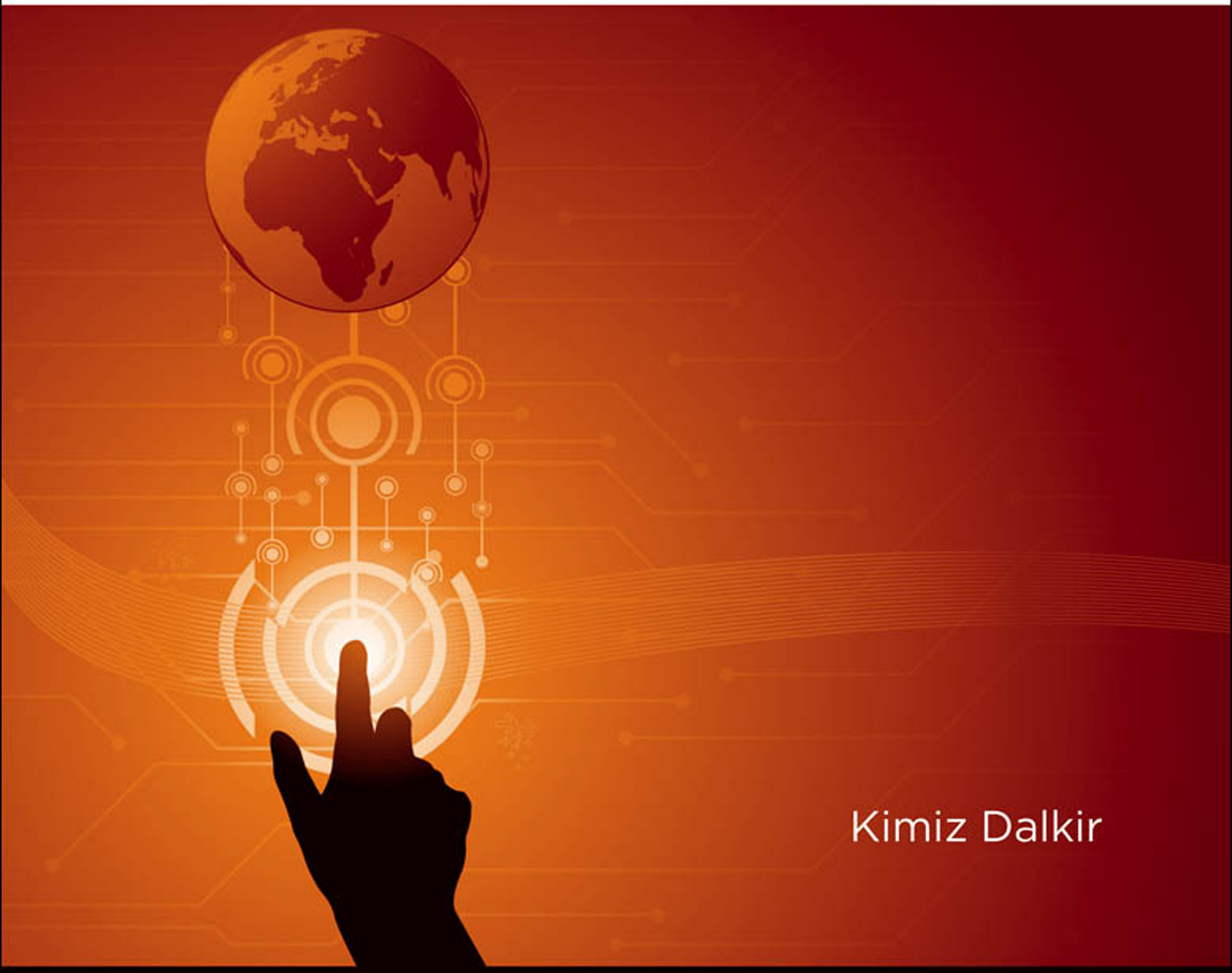
Knowledge Management in Theory and Practice

Fourth Edition



Kimiz Dalkir

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1 Introduction to Knowledge Management

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

This chapter outlines the history of knowledge management (KM) concepts, noting that much of KM existed before the actual term came into popular use. The lack of consensus over a definition of KM is addressed, and the concept analysis technique is described as a means of clarifying the conceptual confusion that 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.

Learning Objectives

1. Use a framework and a clear language for KM concepts.
2. Define key KM 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 KM and identify key milestones.
4. Describe major objectives for KM applications.
5. Discuss the key benefits—the value created by KM—to individuals, groups, and organizations.

Introduction

Knowledge is an intellectual asset that has several unique characteristics:

- Using knowledge does not consume it.
- Sharing knowledge does not result in losing it.
- Much of an organization's valuable knowledge walks out the door at the end of the day.

The industrial age, when we made things, has made way for the knowledge age, when organizational success depends on what it collectively knows, how efficiently it uses what it knows, and how quickly it acquires and uses new knowledge (Davenport & Prusak, 1998). The most valuable benefits from KM arise from sharing knowledge with current fellow employees and with future (often unknown) employees. Sharing knowledge with current fellow employees ensures it moves around the organization so everyone can benefit from best practices (adopt newer, better ways of doing things) and lessons learned (avoid repeating things that failed).

KM, through knowledge use and reuse, has two major goals: improving organizational efficiency and increasing the organizational capacity to innovate.

KM creates value through 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. To succeed in today's challenging organizational environment, companies need to learn from their past errors and not reinvent the wheel repeatedly. Organizational knowledge is not intended to replace individual knowledge but to complement it by making it stronger, more coherent, and more broadly applied.

KM is 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, Toyama, & Konno, 2000; Pasternack & Viscio, 1998; Pfeffer & Sutton, 1999; Ruggles & Holtshouse, 1999).

Intellectual capital management, in contrast, focuses on 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." Although some of these assets are more visible (e.g., patents, intellectual property), the majority consists of know-how, know-why, experience, and expertise that resides within the head of one or a few employees (Klein, 1998; Stewart, 1997). Intellectual capital management is characterized by curated content, or content that is filtered and judged, and only the best is inventoried (the top three best practices, for example).

A good definition of KM should incorporate both the capturing and storing of knowledge perspective, together with the valuing of intellectual assets. An example definition is the following:

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

When asked, most executives often state that their greatest asset is the knowledge held by their employees. "When employees walk out the door, they take valuable organizational knowledge with them" (Lesser & Prusak, 2001, p. 1). Managers also invariably add that they have no idea how to manage this knowledge! Identifying the knowledge that is of value and also at risk of being lost to the organization through retirement, turnover, and competition is essential. 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 KM efforts have been largely concerned with capturing, codifying, and sharing the knowledge held by people in organizations. Although there is a lack of consensus over what constitutes a good definition of KM, agreement is widespread as to the goals of an organization that undertakes KM. Nickols (2000) summarizes "the basic aim of knowledge management [as being] to leverage knowledge to the organization's advantage." Some of management's motives are obvious: preventing the loss of skilled people through turnover, avoiding reinventing the wheel, making organization-wide innovations in processes and products, managing risk, and adjusting to the accelerating rate of knowledge creation.

What Is Knowledge Management?

An informal survey I conducted identified over a hundred published definitions of KM, and of these, at least seventy-two were quite good in that they were distinct yet fairly complete definitions! Girard and Girard (2015) compiled a comprehensive list of more than a hundred KM definitions.[1] The large number indicates that KM is a multidisciplinary field of study that covers a lot of ground, and 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. Each distinct perspective on KM leads to a different extrapolation and a different definition. Some examples include the following:

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

> 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 expertise and, when used appropriately, increased effectiveness. (Wiig, 1993, p. 1)

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

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

Multidisciplinary Nature of KM

The 2018 International Standards Organization (ISO) 30401 KM standard (ISO, 2018) discusses the relationship of KM with adjacent disciplines:

- Information management
- Data management
- Business intelligence
- Customer relationship management
- Learning, organizational development and training
- Organizational learning
- Human resource management
- Innovation management
- Risk management
- Quality management

The term *discipline* is perhaps not the most accurate because this list represents adjacent processes. KM is also highly multidisciplinary because it draws on such fields as cognitive science, information and library science, organizational science, linguistics and computational linguistics, communication, media and journalism, anthropology,

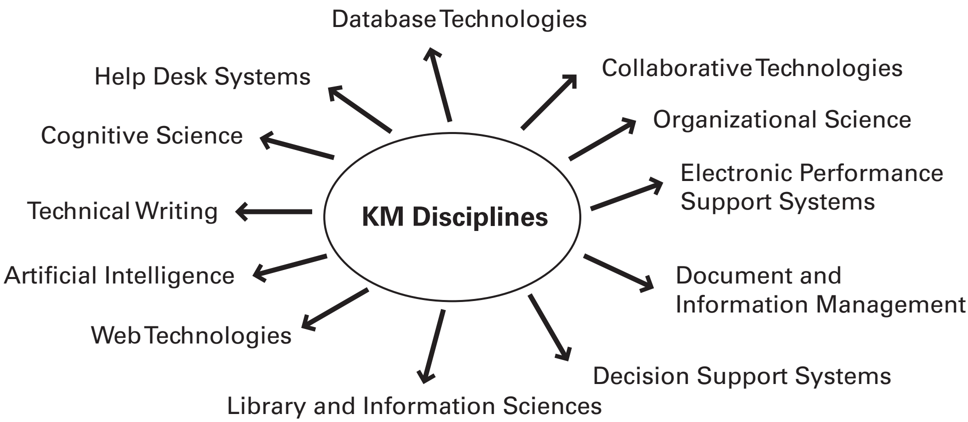

Figure 1.1
Multidisciplinary nature of KM

sociology, and education. This list is by no means exhaustive, but it shows the extremely varied roots KM grew out of and continues to be based on 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 because almost anyone can find a familiar foundation on which to base an understanding and even practice of KM. Those with a background in journalism, for example, can quickly adapt their skill set to the capture of knowledge from experts and reformulate this knowledge as organizational stories to be stored in corporate memory. Someone coming from a more technical database background can easily extrapolate his or her skill set to design and implement knowledge repositories that will serve as the corporate memory for that organization. On the other hand, what makes KM distinct is that it manages knowledge, which differs from tangible information resources.

Knowledge is a more subjective way of knowing, typically based on experiential or individual values, perceptions, and experience. Popular examples to distinguish data from information from knowledge include the following:

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 can download the listings.

Information Content that represents analyzed data; for example, I can't leave before five, so I will go to the seven o'clock 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, when 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 his opinion will tell me whether it's worth seeing!

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 text or drawings. Explicit knowledge represents content captured in a 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 simplistic dichotomy. The property of tacitness is a property of the knower: what is easily articulated by one person may be difficult to externalize by another. The same content may be explicit for one person and tacit for another. Further, highly skilled, experienced, and expert individuals may find it harder to articulate their know-how. Novices, in contrast, are more apt to easily verbalize what they are attempting to do because they are typically following a procedure manual, or how-to process. Table 1.1 summarizes some of the major properties of tacit and explicit knowledge.

The more tacit knowledge is, the more valuable it tends to be. Paradoxically, the more difficult it is to articulate a concept, such as an organizational story, the more valuable that knowledge may be. This is often witnessed when people refer 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

Table 1.1
Properties of tacit and explicit knowledge

Tacit knowledge	Explicit knowledge
Ability to adapt, to deal with new and exceptional situations	Ability to disseminate, reproduce, access, and reapply throughout the organization
Expertise, know-how, know-why, and care-why	Ability to teach and to train
Ability to collaborate, share a vision, transmit a culture	Ability to organize and systematize; translate a vision into a mission statement and 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

understand and subsequently make use of knowledge. Another perspective is that explicit knowledge often represents the resulting product, whereas tacit knowledge is the know-how, or all the processes required to produce the 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 did in order to do the work. (Feynman, 1966, p. 699)

A popular misconception is that KM renders what is tacit into more explicit or tangible forms, then stores, or archives, these forms somewhere, usually accessed via an intranet or knowledge portal. The "build it and they will come" expectation typifies this approach: Organizations take an exhaustive inventory of tangible knowledge (e.g., documents, digital records) and make it accessible to all employees. Senior management is then mystified as to why employees are not using this wonderful new resource. In reality, KM is a broader exercise and includes leveraging the value of the organizational knowledge and know-how that accumulates over time. This 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 improving knowledge sharing may benefit specific individuals, groups, and the organization. Successful knowledge-sharing examples are gathered and documented as lessons learned and best practices, and these then form the kernel of organizational stories.

Several other attributes constitute a set of what KM should be about. The concept analysis technique identifies what these attributes are.

Concept Analysis Technique

Concept analysis is an established technique used in the social sciences to derive a formula that in turn can be used to generate definitions and descriptive phrases for highly complex terms. The lack of a consensus on KM-related terms indicates that these concepts merit the concept analysis approach. A great deal of conceptual complexity derives from the meaning of a word such as *knowledge* being necessarily subjective and its interpretation being value laden.

The concept analysis approach rests on obtaining consensus around three major dimensions of a given concept (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

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

This approach can provide clear criteria to enable sorting into categories such as knowledge versus information, document management versus KM, and tangible versus intangible assets. Concept analysis is a technique used to visually map out conceptual information to define a word (Novak, 1990, 1991). This is a technique derived from the fields of philosophy and science education (Bareholz & Tamir, 1992; Lawson, 1994), and it is typically used in clearly defining complex, value-laden terms such as *democracy* or *religion*. It is a graphical approach to help develop a rich, in-depth understanding of a concept.

In defining KM the objective is for participants to agree on a list of key attributes that are both necessary and sufficient for an acceptable definition. This is completed by a list of examples and nonexamples, with justifications as to why each item was included on the example or nonexample list.

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

Ruggles and Holtshouse (1999) list key attributes of KM:

- Generating new knowledge
- Accessing valuable knowledge from outside sources
- Using accessible knowledge in decision making
- Embedding knowledge in processes, products, 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, or the impact of KM

Key KM attributes that recur in several exercises of concept analysis include the following:

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

It is highly recommended that organizations undertake the concept analysis exercise to clarify understanding of what KM means in each organization's context. The best way to do this is to work as a group to achieve a shared understanding and a clearer conceptualization of the KM concept. Each participant can take a turn to contribute an example of what KM is and another example of what KM is not. The entire group can then discuss this example-nonexample pair to identify one (or several) key KM attributes. Once the group feels they have covered as much ground as they are likely to, summarize the key attributes in a KM concept formula; for example,

> 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 . . .

This working, or operational, definition, derived through concept analysis, renders explicit the various perceptions people in a company have of KM and brings them together into a coherent framework.

History of KM

Although the phrase *knowledge management* entered popular usage in the late 1980s with KM conferences, books, and journal articles, KM has been around for ages—librarians, philosophers, teachers, and writers have always used KM techniques. For example, knowledge sharing is part of town meetings, workshops, seminars, and mentoring sessions. The primary method for transferring knowledge consisted of people interacting.

The noted writer H. G. Wells (1938), although never using the actual term *knowledge management*, describes his vision of a "World Brain" that would allow the intellectual organization of the sum of our collective knowledge. The World Brain would represent "a universal organisation and clarification of knowledge and ideas" (Wells, 1938, p. xvi). Wells 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, used to generate value to users, the users' community, and their organization.

What Wells envisaged for the entire world can easily be applied within an organization by an intranet. What is new in KM is that we are now able to simulate rich, interactive, face-to-face knowledge encounters virtually using 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 can extend the depth and breadth, or reach, of knowledge capture, sharing, and dissemination, as we had not been able to do before, and we find ourselves one step closer to Wells's (1938) "perpetual digest . . . and a system of publication and distribution" (pp. 70–71) "to an intellectual unification . . . of human memory" (pp. 86–87).

Drucker (1964) coined the term *knowledge worker* in the early 1960s. Nonaka and Takeuchi (1995) were among the first to study how knowledge is produced, used, and diffused within organizations and how this contributed to the diffusion of innovation. Figure 1.3 shows a high-level summary of key milestones in the history of KM.

Another perspective is provided in figure 1.4, where KM is seen through the lens of the evolving workplace. The evolution of KM has paralleled a shift from a retail model based on a catalog (e.g., Henry Ford's famous quote that you can have a car in any color

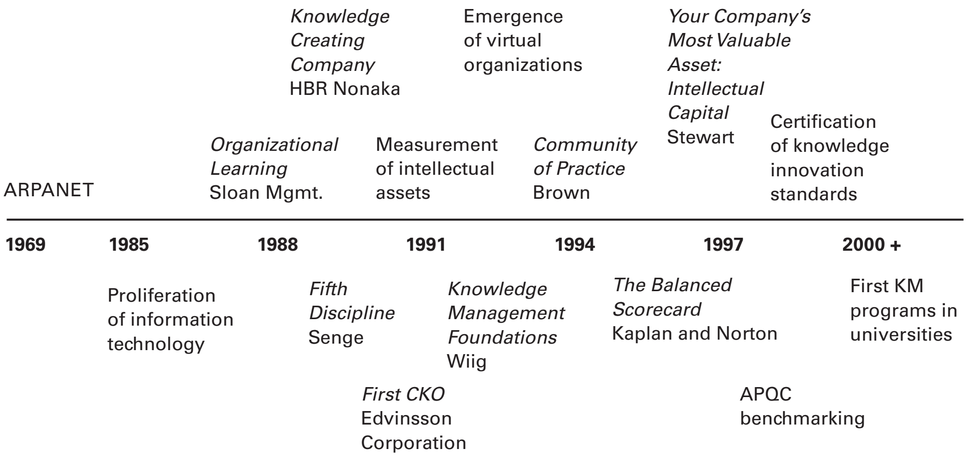

Figure 1.3
A summary time line of KM

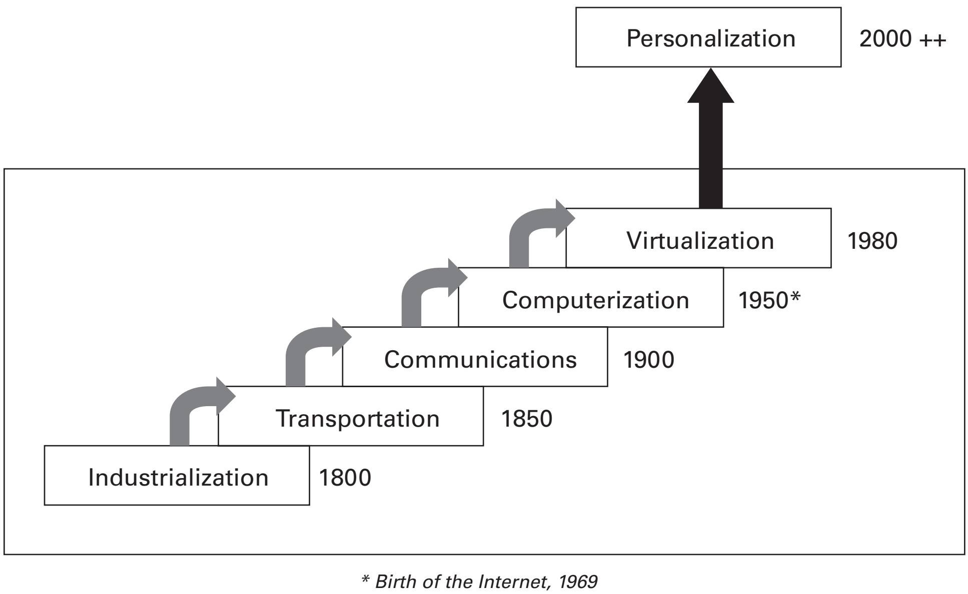

Figure 1.4
Developmental phases in KM history

you like—if it is black) to an auction model (as exemplified by eBay) to a personalization model where real-time matching of user needs and services occurs in a win-win exchange model.

Table 1.2 summarizes some key developments in KM education, research, and practice.

KM has continued to evolve, and the focus has shifted from asking What is it? and Why should we be concerned about it? to How do we do it? The focus of KM research, practice, and even education has turned to how to implement KM to meet challenges such as maintaining knowledge continuity in the face of turnover, improving

Table 1.2
KM milestones

Year	Entity	Event
1980	DEC, CMU*	XCON application
1986	Wiig	Coins KM concept at United Nations
1989	Consulting firms	Start internal KM projects
1991	Nonaka and Takeuchi	Harvard Business Review article
1993	Wiig	Publishes first KM book
1994	KM Network	Holds first KM conference
1998	Davenport and Prusak	Publish *Working Knowledge*
Mid-1990s	Consulting firms	Start offering KM services
Late 1990s	Key vertical industries	Implement KM and start seeing benefits
2000–2003	Academia Social media	KM courses/programs in universities with KM texts (e.g., Harvard Business School course Knowledge-Based Strategy) Era of social media begins with crowd-sourced content and knowledge sharing on a faster and more global scale
	Professional and academic certification	KM degrees offered by universities and by professional institutions such as the Knowledge Management Consortium International (http://www.kmci.org/) and PhD students completing KM dissertations
2016	US presidential election	Post-truth era explodes with fake news created and disseminated online
2018	ISO 30401 KM standard introduced	See https://www.iso.org/standard/68683.html
2020	COVID-19 pandemic	Fake news related to the pandemic created and disseminated

*DEC (Digital Equipment Corporation) and Carnegie Mellon University (CMU) created XCON, an expert system.

efficiencies through remembering and learning from the past, and leveraging KM networking practices to promote creativity and innovation.

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

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

This work continued, and in 2018 the ISO 30401 KM standard was introduced. The purpose of this standard is

> to support organizations to develop a management system that effectively promotes and enables value-creation through knowledge. Knowledge management is a discipline focused on ways that organizations create and use knowledge. Knowledge management has no single accepted definition and no global standards predate this management system standard. There are many well-known barriers to successful knowledge management which still need to be overcome, many confusions with other disciplines such as information management, and many common misconceptions about how to do knowledge management, for example, the view that simply buying a technology system will be enough for knowledge management to add value. (ISO, 2018, p. 5)

Collison, Corney, and Eng (2019) provide a practical overview on how organizations can make use of the standard to improve their KM practices and not be tempted to simply check off some compliance boxes. An overview of the auditing process is needed not only to prepare for the standard's requirements but also as a way of assessing and improving a company's KM performance. The application of this standard is discussed in more detail in chapter 9.

Organizations are now more than ever attuned to effective and comprehensive KM approaches. The KM standard, whose adoption is voluntary, contributes to a wider understanding and demystification of what has often been a cloudy conceptual understanding of KM. This cloudiness has in turn led to a hit-or-miss implementation of key KM processes, tools, and culture. The existence of a standard that directly addresses KM legitimizes KM practice. The evolution toward standardization and even professionalism of KM is greatly advanced by this new standard. The message is clear: KM is an important and integral part of good business practice. It has the potential to generate great value and therefore needs to be addressed in a more formal manner.

The most recent KM phase, that of social media, began early in the first decade of the 2000s with crowd-sourced content creation on Wikipedia (in 2001), social sharing on Facebook (2003), multimedia sharing on YouTube (2005), cloud storage on DropBox (2007), and mobile knowledge sharing on smartphones such as the Apple iPhone (2007). This was followed by the increasing capacity to analyze large volumes of data using such techniques as data mining. Artificial intelligence provided complementary capabilities to KM, notably in knowledge discovery through pattern recognition. In addition, it became possible to visualize data better and create more processed content in general, which led to big data analytics and a renewed integration of KM and artificial intelligence approaches. Big data refers to a large set of data that is almost impossible to manage and process using traditional business intelligence tools. The term was first used by Roger Mougalas from O'Reilly Media in 2005 (Firican, n.d.).

KM conferences, journals, and professional associations have multiplied and shown longevity. The annual KM World conference celebrated 25 years in 2021 (https://www.kmworld.com/Conference/2021). The APQC (American Productivity and Quality Center) annual conference started out in 1995 (https://www.apqc.org/events/annual-knowledge-management-conference). Other major conferences include the ICKM (International Council on Knowledge Management, http://www.ickm.net/) and ECKM (European Conference on Knowledge Management, https://www.academic-conferences.org/conferences/eckm/).

Why Is KM Important Today?

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

- *Globalization of business*: Organizations today are more global—multisite, multilingual, and multicultural—in nature.

- *Leaner organizations*: We are doing more and we are doing it faster, but we also need to work smarter—at an increased pace and workload—as knowledge workers.
- *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.
- *Technological advances*: We are more connected—information technology advances have made connectivity ubiquitous and also radically changed expectations. We are expected to be on at all times, and the response turnaround time is now measured in minutes, not weeks.
- *Fake news, alternative facts, and misinformation*: We have seen a proliferation of online fake news beginning with (but not limited to) the US presidential election in 2016. Fake news and misinformation have, unfortunately, infiltrated other sectors such as health and public safety, as seen during the COVID-19 pandemic. KM is well positioned to help detect and even prevent the sharing of false and dangerous content.

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

We are now in the third generation of KM, content management, as shown in figure 1.5. In the first generation, the emphasis was on containers of knowledge or information technologies to resolve the dilemma exemplified by the much-quoted phrase "If only we knew what we know" (O'Dell & Grayson, 1998). A great many intranets and internal KM systems were implemented during the first KM generation. This was the generation devoted to finding all the information previously buried in the organization and encapsulating commonly produced by-products as reusable best practices and lessons learned.

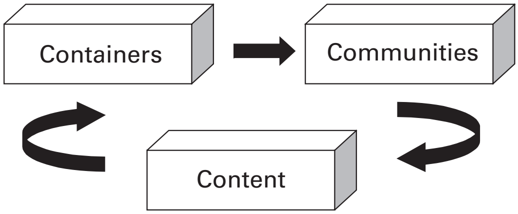

Figure 1.5
Summary of the three major components of KM

Reeling from information overload, the second generation swung to the opposite end of the spectrum, to focus on people, which could be phrased as “If only we knew who knows about” the subject at hand. There was growing awareness of the importance of human and cultural dimensions of KM 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. 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 apparent that a bottom-up or grassroots adoption of KM led to much greater success and that there were many grassroots movements—which later were dubbed communities of practice. Communities of practice are good to study in order to better understand knowledge sharing, or the movement of knowledge throughout the organization, and how to spark not only reuse of knowledge for greater efficiency but also its 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 this content exists, can easily access it, and can apply it. 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 used to benefit the individual, the community of practice, or the organization, then KM has failed. Bright ideas, thought of as light bulbs, are not enough—they must be plugged in, and this can be possible only if people know what there is to be known, can find it when they need, can understand it, and—perhaps most important—are convinced that this knowledge should be put to work. A slogan for this phase might be something like “taxonomy before technology” (Koenig, 2002, p. 3).

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

KM at Three Levels (and Beyond)

KM is needed at a minimum at three levels: for individual employees, for groups, and for the organization itself. Further, KM can be extended to the interorganizational and societal levels (as discussed in chapter 14). For KM to succeed, it must 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. Getting the balance right is important—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 providing sufficient interaction between knowledge workers to generate synergy may not be enough. The KM technology must be supportive, and management must commit itself to putting into place the appropriate rewards and incentives for KM activities. Finally, participants need to develop KM skills to participate effectively. These KM skills and competencies are quite diverse and varied, given the multidisciplinary nature of the field. But one link often neglected is that between KM skills and information professionals' skills. KM has resulted in the emergence of new roles and responsibilities, and a great many of these can benefit from a healthy foundation of not only information technology but also information science. KM professionals have a crucial role to play in all KM processes, which are described in more detail in chapter 2.

Note

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

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2 Knowledge Management Processes

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

This chapter describes the major processes involved in KM: capturing, creating, codifying, sharing, accessing, applying, and reusing knowledge within and between organizations. It presents major KM processes from Bukowitz and Williams (2000), Carlile and Rebentisch (2003), Evans, Dalkir, and Bidian (2015), McElroy (2003), Meyer and Zack (1996), Wiig (1993), and Xu et al. (2010). A comprehensive review of KM process frameworks by Heisig (2009) is included. A synthesis of these approaches is then developed as a framework for following the path information takes to become a valuable knowledge asset for a given organization. This chapter concludes with a discussion of the strategic and practical implications of managing knowledge throughout the KM life cycle.

Learning Objectives

1. Describe how valuable individual, group, and organizational knowledge is captured, created, codified, shared, accessed, applied, and reused throughout the KM cycle.
2. Compare and contrast major KM processes: Do some processes share a label with another process? Are some distinct processes?
3. Define the major KM processes and provide concrete examples of how each addresses efficiency goals through reuse. What are some examples of how they address transformational goals through innovation?

4. Identify the major challenges and benefits of each KM process.
5. Describe the additional challenges posed by global or distributed KM processes.

Introduction

As with a generally accepted definition of KM, consensus is lacking for terms to describe the major steps in the KM cycle. Table 2.1 summarizes the major terms found in the KM literature. However, on closer inspection, the terms overlap in the steps involved in a KM cycle. Heisig (2009) comprehensively compared 160 KM frameworks. He found that diverse terms are used, although common underlying categories for KM processes exist, such as share, create, use, store, identify, and acquire. The frameworks discussed in this chapter meet the following criteria:

- They have been implemented and validated in real-world settings.
- They are comprehensive regarding steps found in the KM literature.
- They include detailed descriptions of the KM processes involved in each of the steps.

KM cycle approaches from Meyer and Zack (1996), Bukowitz and Williams (2000), McElroy (1999, 2003), Wiig (1993), Carlile and Rebentisch (2003), Evans, Dalkir, and Bidian (2015), and Xu et al. (2010) are described in greater detail in this chapter. They were selected as the most relevant, and each one builds on the previous models by contributing one or more additional components. The chapter concludes with a summary and aggregation of all key components in the KM cycle

Table 2.1
Key KM processes

Wiig (1993)	McElroy (1999)	Bukowitz & Williams (2000)	Meyer & Zack (1996)	Carlile & Rebentisch (2003)	Evans, Dalkir, & Bidian (2015)	Xu et al. (2010)
Build	Formulate claim	Get	Acquire	Create/ acquire	Identify/ create	Generate ideas
Hold	Evaluate	Use	Refine	Store	Store	Preserve
Pool	Integrate	Learn	Store/retrieve	Retrieve	Share	Evaluate
Use	Learn	Contribute	Distribute	Assess	Use	Select ideas
	Improve	Assess	Present	Transform	Learn	Develop
		Build/sustain		Use	Improve	Learn, repeat
		Divest		Reuse		

Major Approaches to the KM Cycle

Meyer and Zack

The Meyer and Zack (1996) KM cycle is derived from work on the design and development of information products. Information products are, broadly, any information sold to internal or external customers such as databases, news synopses, and customer profiles. This approach provides several useful analogies, such as the notion of a product platform (the knowledge repository) and of an information process platform (the knowledge refinery), to emphasize that value-added processes are required to leverage the knowledge of an organization. The KM cycle consists primarily of creating a higher-value-added knowledge product at each stage of knowledge processing. For example, a basic database may represent an example of knowledge that has been created. Value can then be added by extracting trends from this data. The original information has been repackaged to now provide trend analyses useful for organizational decision making.

In Meyer and Zack's approach, the KM processes comprise the technologies, facilities, and processes for manufacturing products and services. 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 accumulated for products under design or currently sold. 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. Whereas a document management system stores, manipulates, and retrieves documents as integral wholes, KM can easily identify, extract, and manage several different knowledge items (sometimes referred to as knowledge objects) within a document.

The knowledge repository often forms the first kernel of an organizational or corporate memory. A sample repository for a railway administration organization is shown in figure 2.1. Figures 2.2 and 2.3 summarize the major stages in the Meyer and Zack cycle.

Refinement is the major contribution of this cycle. This may be physical (e.g., migrating from one medium to another) or logical (restructuring, relabeling, indexing, and integrating). Refining also refers to cleaning up (e.g., sanitizing content so as to ensure complete anonymity of sources and key players involved) or standardizing (e.g., conforming to templates of a best practice or lesson learned as used within a particular organization). The repository and the refinery together enable the management of

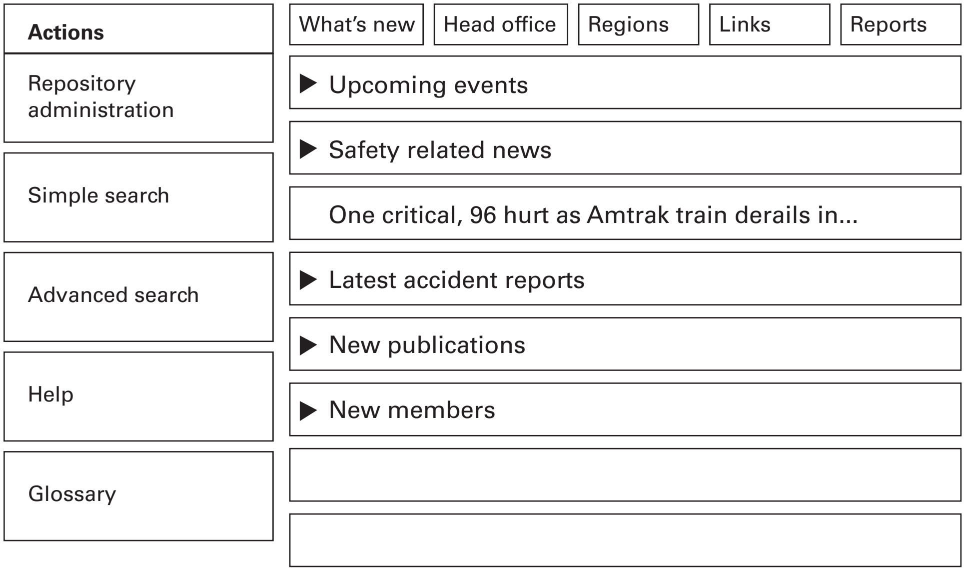

Figure 2.1
Sample screen for a repository

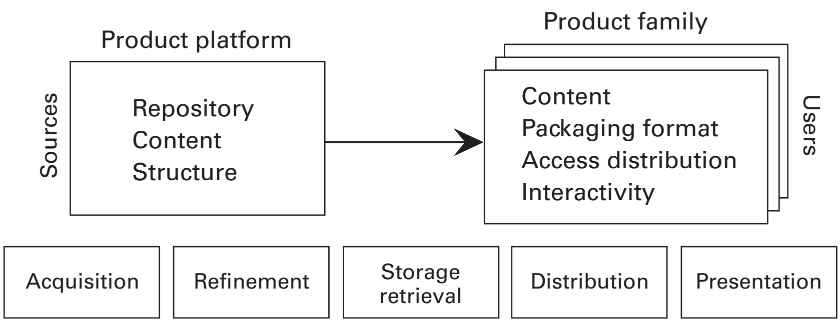

Figure 2.2
High-level view of the Meyer and Zack information cycle

valuable knowledge of a firm. Although not explicitly described in the Meyer and Zack cycle, management includes having to continually renew the repository and the refinery 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 greater depth of an analysis, an updated report, greater integration, more sophisticated cross-linking, or greater standardization of content.

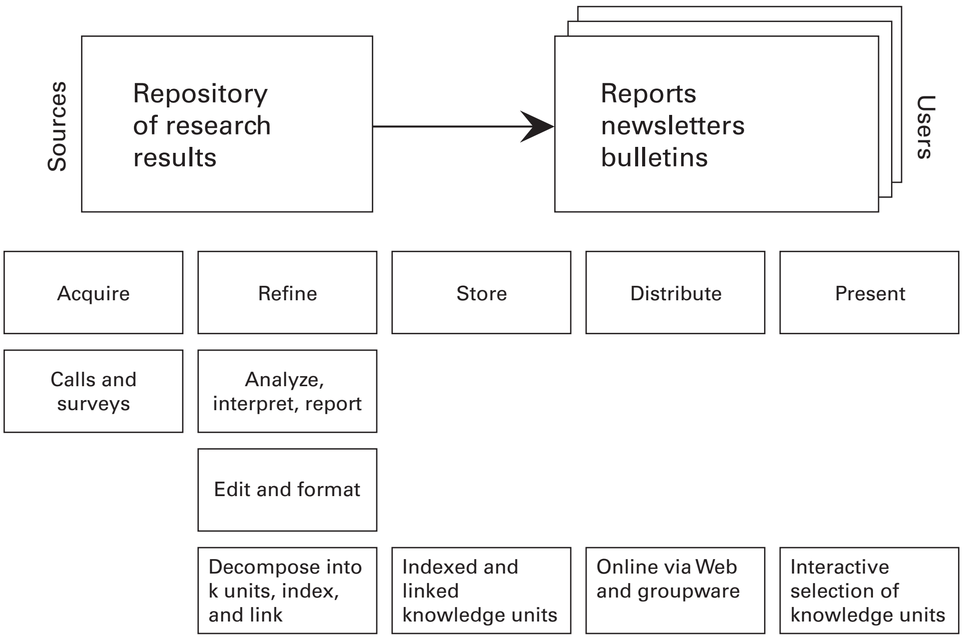

Figure 2.3
Detailed view of the Meyer and Zack information cycle

Bukowitz and Williams

Bukowitz and Williams's (2000) KM process framework is shown in figure 2.4.

The first stage, get, consists of seeking out information needed to make decisions, solve problems, or innovate. This involves knowing where knowledge resources exist and can be accessed. KM diverges from information management in that getting of content encompasses not only traditional explicit content (e.g., a physical or electronic document) but also tacit knowledge. The next stage, use, deals with how to combine information in new and interesting ways to foster organizational innovation. Bukowitz and Williams discuss several techniques to promote serendipity and outside-the-box thinking, or enhancing creativity. Although promoting fluid flow of knowledge is a worthwhile pursuit, knowledge is used for much more than innovation. This emphasis on innovation is a strong feature of this KM cycle.

The learn stage refers to the formal process of learning from experiences and creating an organizational memory so that organizational learning becomes possible—from both successes (best practices) and failures (lessons learned). Time must be taken to reflect on experience and consider its possible value elsewhere. Learning is essential after the getting and using of content—otherwise, the content is simply warehoused

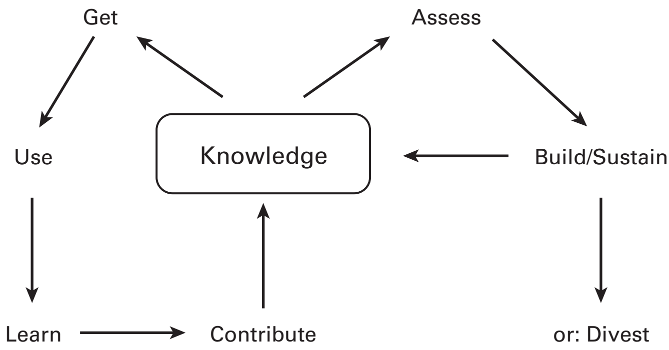

Figure 2.4
The Bukowitz and Williams KM cycle

somewhere and does not make a difference in how things are done within the organization.

In the contribute stage of the KM cycle, employees 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. This caveat applies to the misconception that KM makes public all that resides within the heads of individuals. This is not the objective of KM and, besides, is impossible.

Next, the assess stage deals more with the group and organizational level. Assessment refers to the evaluation of knowledge. An assessment framework has criteria to identify valuable knowledge. The build and sustain step refers to resources that must be allocated to the growth and maintenance of knowledge. The final step is divest. The organization should not hold on to assets—physical or intellectual—if they are no longer creating value. Organizations need to decide whether resources required to maintain an asset would be better spent elsewhere. This often involves converting rather than getting rid of knowledge—for example, by redeploying the knowledge elsewhere, within or outside 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 it. In contrast to the Meyer and Zack cycle, it incorporates both tacit and explicit KM.

McElroy

The high-level processes of the McElroy KM cycle are shown in figure 2.5.

McElroy (1999, 2003) emphasizes that organizational knowledge is held both subjectively in the minds of individuals and groups and objectively in explicit forms.

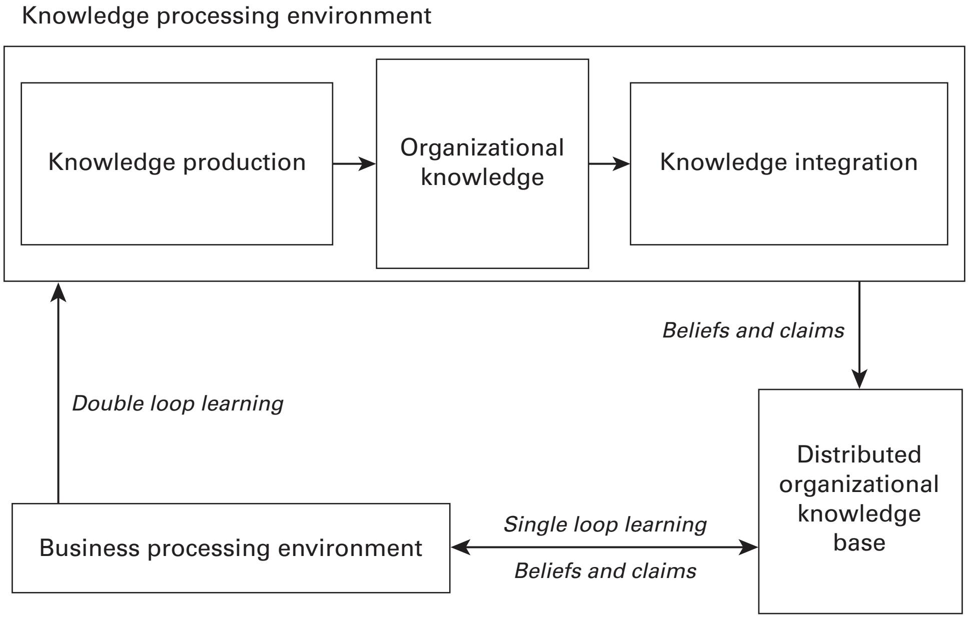

Figure 2.5
High-level processes in the McElroy KM cycle

Subjective and objective knowledge together comprise the distributed knowledge base of the company. Knowledge use in organizations results in outcomes that either match or do not match expectations or outcomes. Matches reinforce existing knowledge, leading to its reuse, whereas mismatches lead to adjustments in business processes and behavior via single-loop learning (Argyris & Schon, 1978). Successive failures from mismatches will lead to doubt and, ultimately, rejection of existing knowledge, which will in turn trigger knowledge processing to produce and integrate new knowledge, this time via double-loop learning, a form of organizational learning explained in more detail in chapter 11 (Argyris & Schon, 1978).

Formulation of a problem claim attempts to learn and state the specific nature of a detected knowledge gap. Knowledge claim formulation follows as a response to validated problem claims via information acquisition and individual and group learning. New knowledge claims are tested and evaluated. Knowledge claims that survive evaluation will be integrated as new organizational knowledge or as falsified or undecided knowledge claims. The record of all such outcomes becomes part of the distributed organizational knowledge base via knowledge integration. Once integrated, the outcomes are used in business processes. 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.

Given the proliferation of fake news, beginning in the 2010s, especially misinformation that is rapidly and widely shared across social media platforms, this knowledge processing cycle is particularly relevant, not only to KM cycles but in general (Dalkir & Katz, 2020). Treating all knowledge claims as just that, claims, is an excellent approach to misinformation. A claim may not be true, may no longer be true, or may not be valid in a given context. Evaluation of knowledge claims is an important step in processing knowledge, especially before we proceed to subsequent steps of storing and preserving this content. The Scottish justice system is a good model: it offers three instead of two possible verdicts: guilty, not guilty, and not proven. The not-proven outcome is a great fit with subjective knowledge. An unproven claim can be further nuanced as "not proved in context x, y, or z but has been proved in context a and b," for example. This also is in keeping with the current preference to use *proven practice* in lieu of *best practice*.

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 processes. Individual and group learning represents the first step in organizational learning. Figure 2.7 shows some of the components of this stage of the knowledge cycle.

In knowledge integration, an organization introduces new knowledge claims to its operating environment and retires old ones. This process includes all knowledge

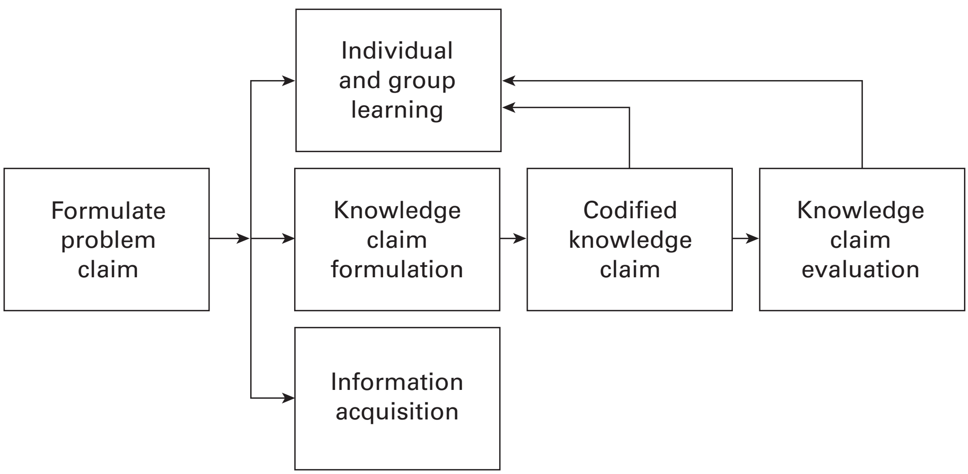

Figure 2.6
Knowledge production processes in the McElroy KM cycle

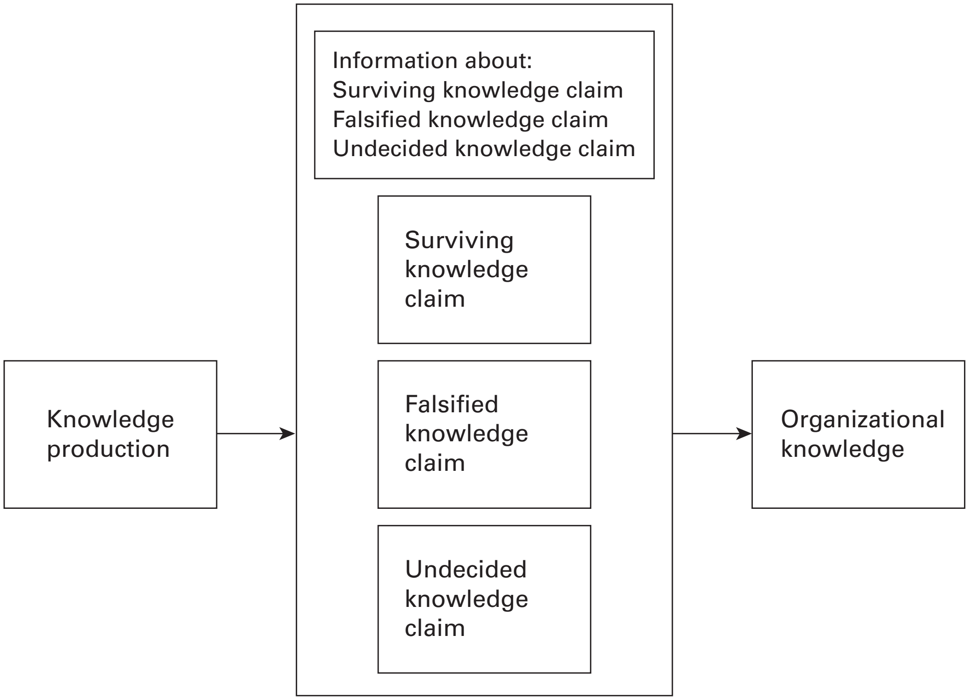

Figure 2.7
Knowledge claim evaluation processes in the McElroy KM cycle

transmission, such as teaching, sharing, and other social activities, that communicates either an understanding of previously produced organizational knowledge to knowledge workers or an integration of newly minted knowledge (figure 2.8).

One of the strengths of the McElroy cycle is the clear description of how a knowledge claim is evaluated and how a conscious decision is made as to whether it will be integrated into the organizational memory.

Wiig

Wiig's (1993) KM cycle addresses how knowledge is built and used by individuals or by organizations. This cycle has four major steps, as shown in figure 2.9: building, holding, pooling, and applying knowledge.

Although the steps in figure 2.9 are shown as independent and sequential, this is a simplification because some steps may be performed in parallel. Cycling back to repeat steps but with a different emphasis or level of detail is also possible. We can build knowledge by gaining it from personal experience, formal education or training, peers,

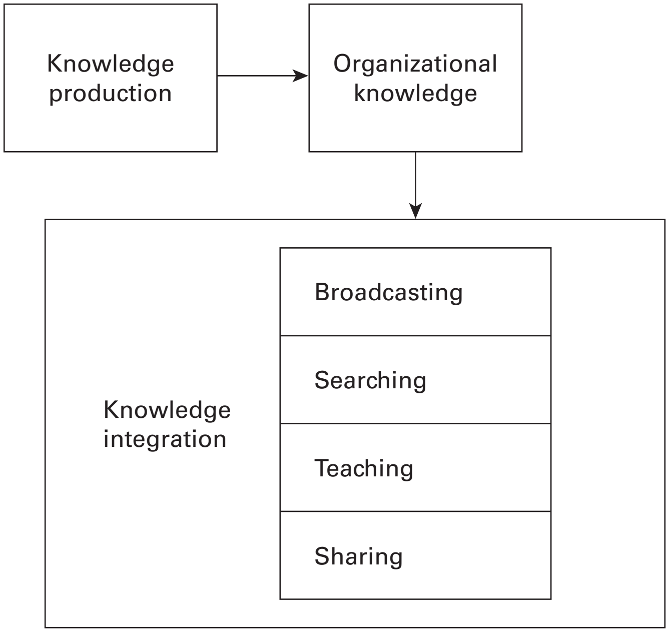

Figure 2.8
Knowledge integration processes in the McElroy KM cycle

and intelligence from all sources. We can then hold knowledge either within our heads or in tangible forms such as books or databases. Knowledge can then be pooled and used in various ways, depending on the context and the purpose.

Building knowledge is achieved in many ways: from market research, focus groups, surveys, competitive intelligence, and data mining applications. Building knowledge consists of five major activities: obtain, analyze, reconstruct or synthesize, codify and model, and organize knowledge. Knowledge creation may occur through research and development projects, innovations by individuals to improve how they perform their tasks, experimentation, reasoning with existing knowledge, and hires of new people. Knowledge creation may also occur by 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 activities such as listening to interview transcripts and identifying themes, abstracting concepts to form hypotheses or models, and identifying patterns through trend analysis. In knowledge synthesis or reconstruction, analyzed material is generalized into broader principles. Codifying and modeling knowledge

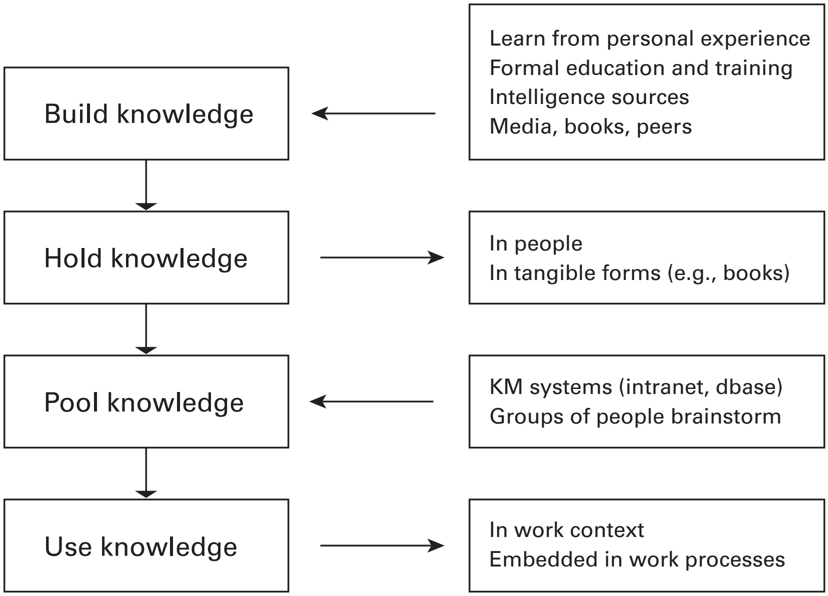

Figure 2.9
The Wiig KM cycle

addresses how we represent knowledge in our minds (mental models). Finally, knowledge is organized for specific uses and according to an established organizational framework (e.g., standards, categories). Some examples are a help desk service or a list of FAQs (frequently asked questions) on the company intranet. This organizing typically uses knowledge ontology (conceptual model) and taxonomy (classification rules).

Holding knowledge consists of remembering knowledge, accumulating knowledge in repositories, embedding knowledge in repositories, and archiving knowledge. Remembering knowledge means that an individual has retained that item of knowledge (knowledge has been internalized, understood by a given individual). Accumulating knowledge in a repository means creating a computer-resident knowledge base and encoding knowledge so that it can be stored in organizational memory. Knowledge is then embedded in the repository by ensuring it is part of business procedures (e.g., workflows). In addition, knowledge must be archived, and outdated content systematically retired.

Knowledge pooling consists of coordinating knowledge, assembling knowledge, and accessing and retrieving the knowledge. Coordination of knowledge requires forming collaborative teams to create a "who knows what" network. Once knowledge sources are identified, they are assembled into background references to make subsequent access and retrieval easier. Focus groups are often used to arrive at a consensus as to how to

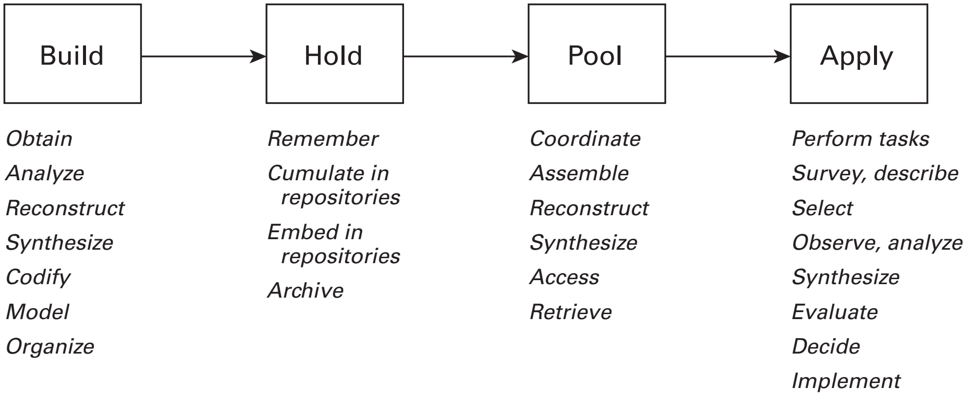

Figure 2.10
Summary of the key Wiig KM cycle activities

do this. Access and retrieval relates to consultation with knowledgeable people about difficult problems, obtaining a second opinion from an expert, or discussing a difficult case with a peer.

Finally, there are too many potential ways to apply the knowledge to list exhaustively. Some examples are problem-solving, identifying the best person to consult, conducting a risk-benefit analysis, and prioritizing alternatives. 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 generates value for individuals, groups, and the organizational itself.

Carlile and Rebentisch

Carlile and Rebentisch (2003) studied how knowledge became integrated in complex technologies and products, especially the path-dependent nature of knowledge acquisition. Knowledge can move from one person to another or from one organizational group to another. New knowledge is often created through the integration of knowledge gained when, for example, solving a problem or developing a new product. The high-level cycle therefore consists of three major stages: transformation (or acquisition), storage, and retrieval, as shown in figure 2.11.

Storage consists of adding new knowledge to existing knowledge. Transformation is emphasized over acquisition because most reuse of knowledge does not consist of as-is reuse: knowledge tends to be changed, at least updated, before it is reused. Once knowledge has been deemed useful, the transformation stage begins. This may involve

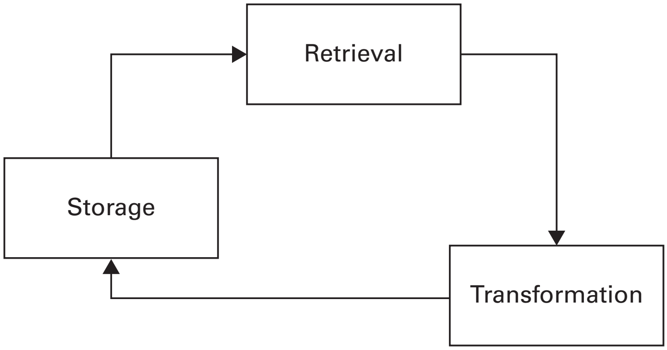

Figure 2.11
The three major stages of the Carlile and Rebentisch KM cycle

documenting previously undocumented knowledge, refining it, adding new metadata, and updating the knowledge.

However, things often change between the time knowledge is stored and the time it is retrieved for reuse. The organization has changed, the employees have changed, and the environment has changed (e.g., new technologies, new laws, or new challenges). The usefulness of the stored knowledge may have decreased significantly. The knowledge is potentially less valuable and less useful and may even be detrimental to use if, for example, it is incorrect or outdated. Therefore, documenting the context of any given knowledge in the cycle is critical. The more metadata (description of the content) we can capture, the greater the likelihood of being able to reuse this knowledge (box 2.1).

Evans, Dalkir, and Bidian

The Evans, Dalkir, and Bidian (2015) KM cycle (KMC) is a holistic view of KM processes that has seven phases: identify, store, share, use, learn, improve, and create (figure 2.12). The major contributions of this cycle are (1) a clear distinction between identifying existing knowledge (typically in explicit form) and creating new knowledge and (2) the addition of double-loop learning (Argyris & Schon, 1978, 1996) to show the learning and improving that occurs as knowledge moves through the process cycle.

A catalyst, such as a knowledge need or request, is required to mobilize the KM processes. The first step is to identify the knowledge: does it exist or need to be created? For example, a document may summarize the key points, or you may need to sit down with the design team to elicit the key points of their innovation. Next, knowledge is stored and then shared both within the organization and, as appropriate, outside the organization (e.g., throughout a professional network). Once shared, knowledge can be

Box 2.1

A Vignette: The Importance of Metadata in Knowledge Processes

A car insurance organization that administers automobile insurance plans reimburses members in the event of injury or death resulting from a traffic accident. Those involved in a traffic accident are referred to this organization, and they receive benefits through it. When a KM team began working with the organization on a KM strategy, the team noticed that a small group of employees worked with only a certain set of files, the orange files. Intrigued, the KM team asked what was special or different about this group and the files it handled. The explanation was that these employees were the only ones who could handle accidents that had happened so long ago that earlier, different legislation applied. They remembered what was and was not covered under previous legislative periods, which determined what benefits a person was entitled to. The KM team immediately decided to prioritize this group. They began documenting metadata, or the laws and provisions that were in effect at different times. Only in this way could the valuable knowledge be acquired (documented), preserved (stored as metadata), and retrieved for future use, even after the senior employees retired.

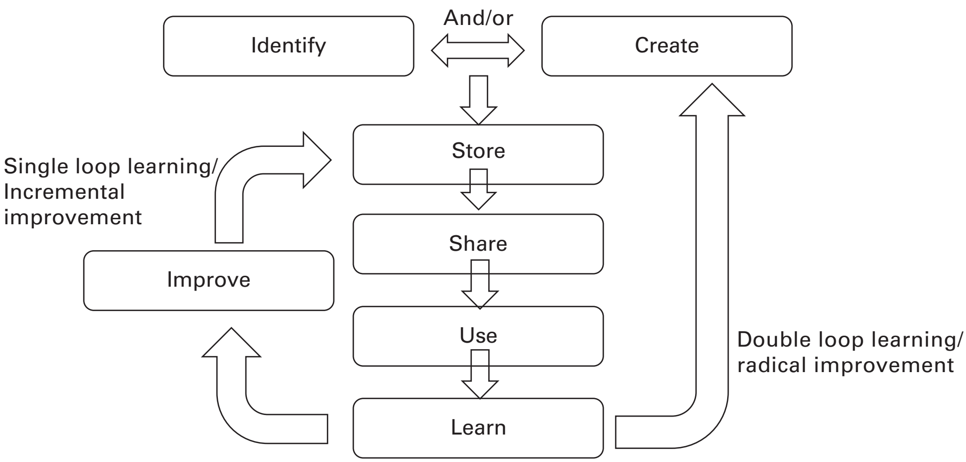

Figure 2.12

The seven KM processes in the Evans, Dalkir, and Bidian KMC used to solve problems, make decisions, improve on products and services, innovate, and so on. The next step, learn, is often overlooked in KM. The improve and learn steps document metadata to update, refine, and as needed, correct existing knowledge, add to it, and extend it. The learning is single loop, meaning improvements are incremental, or double loop, which entails a much more holistic review of the knowledge that not just improves the knowledge (its efficiency) but recasts it (its effectiveness). Improvements are then fed back into the KM process cycle.

The most significant contribution of the Evans, Dalkir, and Bidian KMC is that the silos of organizational learning and KM are brought together. Ironically, the KM landscape remains highly divided, with intellectual capital, knowledge or community networks, and organizational learning being distinct subdisciplines and having their own journals, conferences, and key researchers. KM need not be voted as the more high-level or generic term. The more successfully KM and organizational learning are integrated, the more successful the organization will be in managing its valuable knowledge assets, in learning, and in continuously improving.

Evans, Dalkir, and Bidian (2015) also point to several technologies as being particularly relevant and useful for each KM process. For example, workflow mining and analysis identify and create knowledge, automated classification (taxonomy) tools store knowledge, expertise locator systems share knowledge, knowledge networks use knowledge, visualization analytics aid learning, and lessons learned databases improve on the knowledge. With the advent of new technologies, additional tools can be mapped on to the major KM processes. Agarwal and Islam (2014), for example, mapped tools and technologies to the phases of the KM cycle. They studied the tools used in KM implementation in libraries, but the tools are applicable to any KM cycle. Mapping is discussed further in the next section, and the tools themselves are discussed in greater detail in chapter 8.

Integration of Evans, Dalkir, and Bidian KMC with Innovation Cycle

Processing knowledge to derive value through increased efficiency has always had the most focus in KM. This focus is understandable because most organizations need to learn to walk before they can run a KM marathon. However, as KM continues to mature and become more integrated in good business processes, it is important to also consider the second major goal of KM: namely, to go beyond single-loop, incremental changes to improve existing processes and toward double-loop learning, which can trigger radical innovation and transformational change in the organization.

Just as it made sense to integrate the organizational learning processes with the Evans, Dalkir, and Bidian KMC processes discussed in the previous section, it makes sense to integrate the innovation process cycle with the KM life cycle. One example is provided by Xu et al (2010), who discuss how knowledge integration (which they refer to as "internalization") provides the basis for repeated iterations of the knowledge processing steps through innovation. They note that the core activities of knowledge creation and knowledge use are critical ingredients for continuous innovation processes and cycles. In knowledge creation, ideas are generated (often through brainstorming) to address a problem or design a new product or service. These ideas are then assessed and one or more selected for in-depth research and development.

There are almost as many innovation process cycles as there are knowledge process ones, and at both a microlevel and a macrolevel, the two processes have a great deal in common. Innovation cannot succeed without organizational learning, which in turn cannot take place without knowledge processing. The Evans, Dalkir, and Bidian KMC model integrates single-loop learning for incremental innovation and double-loop learning for radical innovation. In addition, the role of both tacit and explicit knowledge is quite prevalent in the processes involved with continuous innovation. Figure 2.13 shows how KM processes can be integrated with innovation processes.

Figure 2.13 is inspired by Xu et al. (2010) and adds the step of saving all ideas generated. Most creative industry organizations adopt this best practice because even ideas discarded after a brainstorming session may prove useful in the future. A database of ideas can preserve valuable knowledge that was created in an organized manner so that

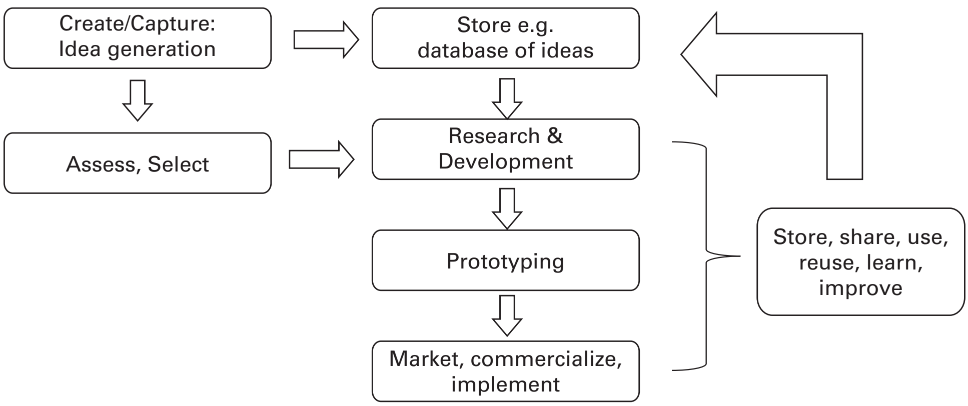

Figure 2.13
KM process cycle integrated with innovation processes

employees can revisit it. The integration of innovation with knowledge processing can be visualized as parallel yet interlocking processes in a cycle where learning occurs at each step, and this knowledge is stored, shared, and used for learning, improvement, and innovation.

An Integrated KM Cycle

Table 2.2 synthesizes the KM cycles discussed in this chapter. The last column summarizes Heisig's (2009) review of KM cycles. Although the authors of the KM cycles use different labels to describe each stage, the labels often refer to the same general type of knowledge processing. Table 2.3 amalgamates the major KM cycle steps that all the approaches have in common. The combined steps have been placed in a logical, chronological order. The additional steps contributed by each of the approaches were then added, providing a comprehensive overview of knowledge processing throughout the organizational life cycle of knowledge. Importantly, although the cycle is presented as a sequential progression of steps, KM processes typically occur in parallel. For example, as shown in the Evans, Dalkir, and Bidian (2015) cycle, codification of tacit knowledge and identification of already documented explicit knowledge occur at the same time.

Regrouping by alternative processing choices thus yields ten major knowledge processing steps:

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

Next, an integrated KM cycle can be distilled from the preceding discussion of major approaches that describe the key processes of 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 or creation, (2) knowledge sharing and dissemination, and (3) knowledge acquisition and application.

Table 2.2
Synthesis of key KM processes

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

In the transition from knowledge capture or creation to knowledge sharing and dissemination, knowledge content is assessed. Knowledge is then made contextual to be understood (acquired) and used (application). This stage then feeds back into the first one to update the knowledge content and to allow single- and double-loop learning to occur. The integrated KM process cycle is outlined in figure 2.14.

Knowledge capture refers to the identification and subsequent codification of existing (usually previously unnoticed) internal knowledge and know-how within the organization or external knowledge from the environment. Knowledge creation is the development of new knowledge and know-how—innovations that did not have

Table 2.3
Synthesis of knowledge processing steps of all approaches

Steps in common	Step added by
1. Knowledge capture	Evans, Dalkir, & Bidian
2. Knowledge creation	Evans, Dalkir, & Bidian
3. Knowledge contribution	Bukowitz & Williams
4. Knowledge filtering and selection	Bukowitz & Williams
5. Idea creation and capture	Xu et al.
6. Knowledge codification	
7. Knowledge refinement	Bukowitz & Williams; Carlile & Rebentisch; Meyer & Zack;
8. Preserve ideas	Xu et al.
9. Knowledge sharing	
10. Knowledge access	
11. Knowledge learning	Bukowitz & Williams; Evans, Dalkir, & Bidian
12. Improve	
13. Innovate	Xu et al.
14. Knowledge application	
15. Knowledge evaluation	Bukowitz & Williams; McElroy
16. Knowledge reuse	
17. Knowledge reuse or divestment	Bukowitz & Williams

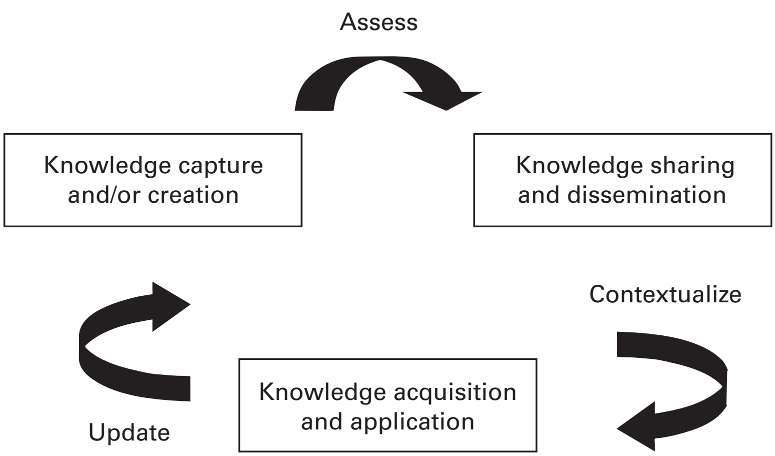

Figure 2.14
An integrated KM cycle

Box 2.2

A Vignette: A Typical Day in the Life of Knowledge in an Organization

A major international consulting organization wanted to document lessons learned from its major projects, making a first step toward becoming a learning organization. A scan of what similar companies were doing led them to implement an after-action review, a project postmortem. The review was a new procedure, and it was initially piloted with a group of experienced consultants. Project managers experienced with project postmortems were subsequently asked to become resource people for those willing to try it out. The role of knowledge journalist was created so as to have a neutral, objective person, one who had not been a member of the original project team, who could facilitate the postmortem and capture the key learning outcomes from the project. Finally, the postmortem became an additional step to be completed by all project managers before they could officially declare that a project had been completed.

Knowledge Processing Steps

1. *Knowledge capture, creation, or contribution*: A 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 or selection*: During the review meeting, a facilitator helps project team members reach a consensus on the criteria for selecting which lessons learned will be documented and why.
3. *Knowledge codification*: A knowledge journalist documents the review using a template (governing, e.g., format, length, and classification tags for future retrieval).
4. *Knowledge refinement*: The KM team then revises the original text of the lessons learned to, for example, remove information that identifies the project or the people involved, and adds abstraction so that the lessons to be learned are generalized to more than one specific context.
5. *Knowledge sharing*: The lessons learned are publicized and made available to others (organization-wide or to targeted groups).
6. *Knowledge access*: The lessons learned are stored in a database with metadata, or tags, adequate to enable easy access and retrieval (e.g., tagging by the type of lesson, such as "poor team communication"; by date; or by type of project).
7. *Knowledge learning*: Some of the lessons learned are incorporated into an employee orientation session and others into a training course on project management.
8. *Knowledge application*: A project manager embarking on a new project for the organization calls up the lessons learned from similar projects in the lessons learned database. At best, the same mistakes will not be repeated. (This is not to say that, human creativity being what it is, new ones will not arise!)

Box 2.2 (continued)

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 tags added to this documented lesson.
10. *Knowledge reuse or 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 owing to changes in the organization, changes in the business environment, or both (e.g., technology issues with an older version of software that are moot now there is a newer version).

a previous existence within the company. After knowledge is captured and inventoried, the next critical step is an assessment against selection criteria that closely follow organizational goals. Is this content valid? Is it new and better—in other words, is it of sufficient value to the organization such that it should be added to the store of intellectual capital? The next step of contextualizing this knowledge involves maintaining a link between the knowledge and those knowledgeable about the content: the author or originator of the idea, subject matter experts, and those who have significant experience in making use of this content. The KM cycle is then reiterated as users understand and decide to make use of content. The users will validate its usefulness and signal when it becomes out of date or when situations are encountered where this knowledge is not applicable. Users 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 of iteration, resulting in individual, group, and organizational learning. An example of how the KM cycle can be applied is provided in box 2.2.

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3 Knowledge Management Models

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

A robust theoretical foundation is required as the basis of any successful KM. The major KM activities described in the KM cycle in chapter 2 need a conceptual framework to operate within, otherwise the activities will not be coordinated and will not produce the expected KM benefits. Several KM models described in this chapter offer distinct perspectives on the key conceptual elements that form the infrastructure of KM.

Learning Objectives

1. Understand the key tenets of the major KM theoretical models in use today.
2. Link the KM models to key KM concepts and the major phases of the KM cycle.
3. List the strengths and weaknesses of each KM model.

Introduction

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

A KM model or framework situates and explains the key KM concepts and processes, and it guides the measurements needed to monitor progress. Types of KM models include the classic models, models of knowledge sharing and collaboration, KM strategy, and intellectual capital models. An example of each is described. This is a survey, not an exhaustive list, of KM models to show how they can be used to explain, describe, and better predict how to manage knowledge.

The Classics: Pioneering KM Models

Von Krogh, Roos, and Kleine Model of Organizational Epistemology

The 1995 Von Krogh and Roos KM model is an organizational epistemology KM model. 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 organization thus picks up information from its environment and processes it in a logical way.

The connectionist approach, in contrast, is more holistic than reductionist. Information is not only taken in from the environment but also generated internally. Familiarity and practice lead to learning. Individuals form nodes in a loosely connected organizational system, and knowledge is an emergent phenomenon that stems from the social interactions of these individuals. In this perspective, knowledge resides in the minds of individuals and also in the connections among these individuals. The representation of this network is a collective mind.

Von Krogh and Roos adopt the connectionist approach because knowledge is seen to reside both in the individuals of an organization and at the social level, in the relations among the individuals. Unlike the cognitive perspective, where knowledge is viewed as an abstract entity, connectionism maintains that there cannot be knowledge without a knower. This fits nicely with the concept of tacit knowledge, which is difficult to abstract out of someone and make 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 outlined four factors—individual mindsets, communication, the organizational structure, and the relationship between the knowledge workers—that could either help or impede management of organizational knowledge. For example, if individuals do not perceive knowledge to be a crucial competence of their organization, that organization will have trouble developing knowledge-based competencies. If there is no legitimate language to express new knowledge in the individual, then contributions will fail. If the organizational structure does not facilitate innovation, KM will fail. If individual members do not have mutual trust and respect and are not willing to share their experiences with their colleagues, then social, collective knowledge will not be generated within that organization. Finally, if those contributing knowledge are not highly valued and acknowledged by top management, they will lose their motivation to innovate and develop new knowledge for the firm. This approach was further refined by Von Krogh, Ichijo, and Nonaka (2000) to propose a model of knowledge enabling, or an "overall set of organizational activities that positively affect knowledge creation" (p. 4).

The connectionist approach is well suited to KM because the linkage between knowledge and those who use the knowledge is viewed as an unbreakable bond.

Nonaka and Takeuchi Knowledge Spiral Model

Nonaka and Takeuchi (1995) studied how Japanese companies achieved creativity and innovation. They found that organizational innovation often stemmed from highly subjective insights that can best be described by 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 to create knowledge and produce innovation.

Nonaka and Takeuchi assert that a key reason for successful innovation of Japanese enterprises is a more tacit-driven approach to KM. They argue that Western culture considers knower and known as separate entities (hearkening back to the cognitive approach, which places greater importance on communicating and storing explicit knowledge). They view knowledge, in contrast, as principally group knowledge, which is easily converted and mobilized (from tacit to explicit, along the epistemological dimension) and easily transferred and shared (from the individual to the group to the organization, in the ontological dimension). Nonaka and Takeuchi underline a sort of integration of the two approaches as necessary to build knowledge-creating organizations.

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 on years of experience to come up with a process innovation that saves the company millions of dollars. In each of these scenarios, an individual's personal, private knowledge (predominately tacit) 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 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. Organizational knowledge creation, therefore, should be understood as organizationally amplifying the knowledge created by individuals and crystallizing it as a part of the knowledge network of the organization (Nonaka & Takeuchi, 1995, p. 59).

Knowledge creation consists of a social process between individuals in which knowledge transformation is not simply a unidirectional process but is interactive and spiral (Nonaka & Takeuchi, 1995, pp. 62–63). 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

In socialization (tacit-to-tacit), knowledge is conveyed in face-to-face, natural, and typically social interactions. This involves arriving at a common understanding through sharing mental models, brainstorming to come up with new ideas, apprenticeship, or mentoring interactions, and so on. Socialization is one of the ways to exchange knowledge because it is what we do instinctively when we gather at the coffee machine or engage in impromptu corridor meetings. Because knowledge remains tacit, however, it is rarely captured, noted, or written down anywhere. It remains in the minds of the original participants.

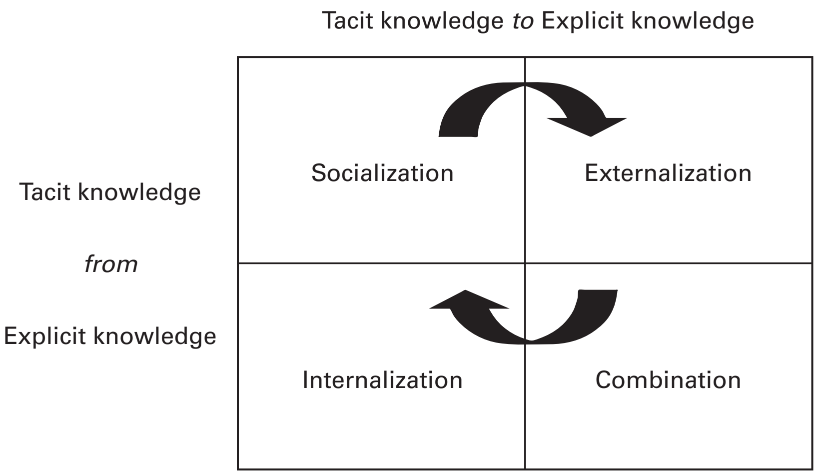

Figure 3.1
The Nonaka and Takeuchi model of knowledge conversion

Davenport and Prusak (1998) point out that

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

In externalization (tacit-to-explicit), tacit knowledge is visible and is converted to explicit knowledge. In this mode, individuals articulate their knowledge and know-how and, in some cases, the know-why and the care-why. Tacit knowledge can be written down, taped, drawn, or made tangible. An intermediary is often needed at this stage because it is difficult to transform one type of knowledge into another. A knowledge journalist is someone who can interview knowledgeable individuals to extract, model, and synthesize the knowledge in a different way (e.g., format, length, level of detail) to increase its scope (so that a wider audience can understand and apply this content now).

The next stage of knowledge conversion is combination (explicit-to-explicit), in which discrete pieces of explicit knowledge are recombined into a new form. Examples are a synthesis in 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.

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 strongly linked to learning by doing. Internalization converts or integrates shared and individual experiences and knowledge into individual mental models. Once new knowledge has been internalized, it is then used by employees, who broaden, extend, and reframe it within each one's existing tacit knowledge bases. They understand, learn, and buy into the new knowledge, and this is manifested as an observable change—that is, they now do their jobs and tasks differently.

Knowledge goes through the conversion processes of socialization, externalization, and combination, but it should not stall at any one of these stages. When knowledge is internalized, it becomes a valuable asset—to the individual, to the person's community of practice, and to the organization. The entire conversion process has to begin all over again for organizational knowledge creation to take place, starting a new spiral of knowledge creation (Nonaka & Takeuchi, 1995, p. 69), as illustrated in figure 3.2.

The Nonaka and Takeuchi model has proved 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; however, it does not address the larger issue

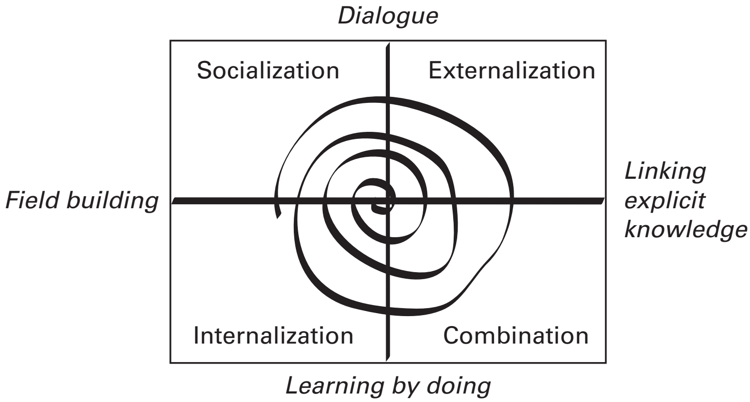

Figure 3.2
The Nonaka and Takeuchi knowledge spiral

of the decision making that leverages both these forms of knowledge. Nonaka and Takeuchi updated and extended their original model in 2019, and this is discussed later in this chapter.

Choo Sense-Making KM Model

Choo (1998) described a model of KM that stresses sense making (largely based on Weick, 2001), knowledge creation (based on Nonaka & Takeuchi, 1995), and decision making (based on the bounded rationality of Simon, 1957; and others). The Choo KM model centers 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 the information. Weick (2001) proposes a theory of sense making to describe the transformation of chaos into sensible, orderly processes in an organization through the shared interpretation of individuals. Individuals construct their own representation of reality by comparing current with past events.

Knowledge creating transforms personal knowledge between individuals through dialogue, discourse, sharing, and storytelling. The result feeds the decision-making process with innovative strategies that extend the organization's capability to make

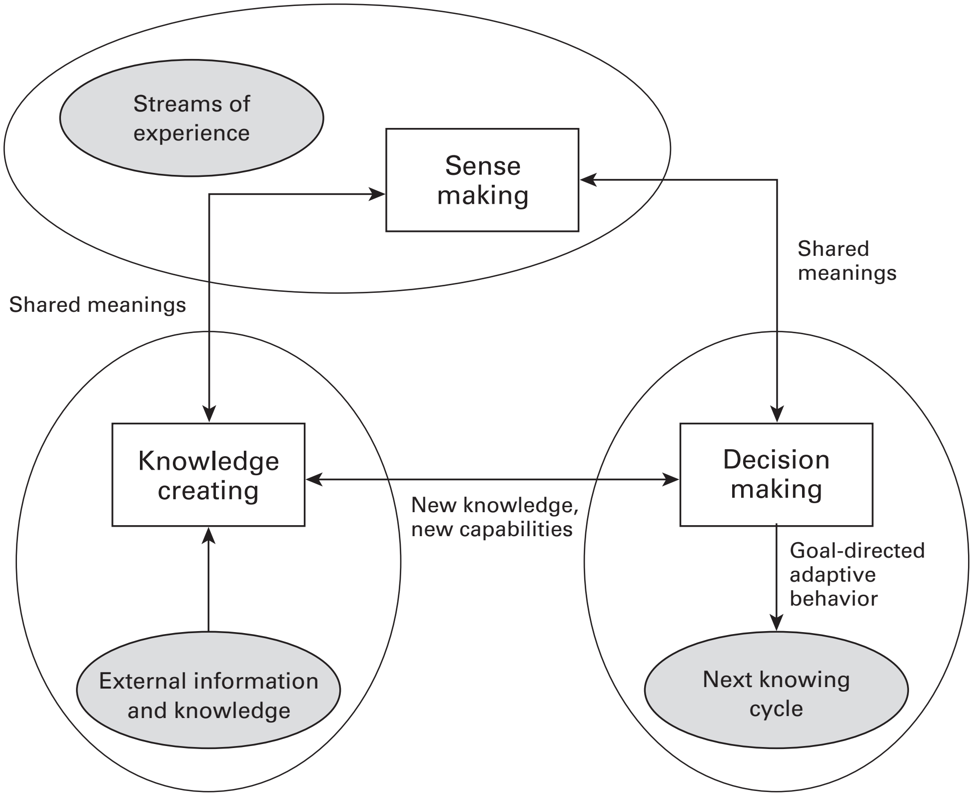

Figure 3.3
Overview of Choo's KM model

informed, rational decisions. Choo (1998) draws on the Nonaka and Takeuchi (1995) model for a theoretical basis of knowledge creation.

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

The garbage can model of organizational decision making was developed for "ambiguous behaviors"—that is, explanations or interpretations of behaviors that appear to contradict classical theory. "The theoretical breakthrough of the garbage can model is that it disconnects problems, solutions, and decision makers from each other, unlike traditional decision theory. Specific decisions do not follow an orderly process from problem to solution but are outcomes of several relatively independent streams of events within the organization" (Daft, 1982, p. 139).

Simon (1957) identifies the principle of bounded rationality as a constraint for organizational decision making:

> The capacity of the human mind for formulating and for solving complex problems is very small compared with the size of the problems whose solution is required for objectively rational behavior in the real world—or even for a reasonable approximation to such objective rationality. (p. 198)

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 factors such as the following:

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

Bounded rationality is characterized by individuals' use of limited information analysis, evaluation, and processing, shortcuts and rules of thumb (sometimes called heuristics), and "satisficing" (blend of *satisfying* and *sufficing*) behavior, which means it may not be fully optimized but is good enough. The 80/20 rule (e.g., Clemson, 1984) is an example of satisficing behavior—for example, when a brainstorming session may not have fully exhausted all the possibilities but has managed to capture roughly 80 percent of them. Continuing 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.

Wiig Model for Building and Using Knowledge

Wiig (1993) emphasizes that knowledge must be organized to be useful and valuable. It should be organized according to what the knowledge will be used for. We organize our knowledge in the form of a semantic network (think of a net made up of strings and knots). We can pick up the net using any one of the knots, and each knot (node) will offer a different perspective on the overall knowledge. Knowledge organized in a semantic network can be accessed and retrieved using multiple entry paths by users, each needing the knowledge for different purposes.

These knowledge networks should be complete, connected, and congruent and identify different perspectives and purposes. Completeness refers to how much relevant knowledge is available from a given source. Sources may be human minds or knowledge bases (i.e., tacit or explicit knowledge). Do we have all the knowledge (or at least 80 percent of it)? Connected means that ideally every node should be connected to every other node. The number of disconnected nodes should be minimized. The more connected a knowledge base is (the greater the number of interconnections in the semantic network), the more coherent the content and the greater its value. A semantic network of knowledge is congruent when all the facts, concepts, perspectives, values, judgments, and associative and relational links among the knowledge objects are consistent. There should be no logical inconsistencies, no internal conflicts, and no misunderstandings. Perspective and purpose refer to being able to know something from a particular point of view or for a specific purpose. We organize much of our knowledge using the dual dimensions of perspective and purpose (e.g., just-in-time knowledge retrieval, or just enough or on-demand knowledge). Semantic networks are useful ways of representing different perspectives on the same knowledge content. Figures 3.4–3.8 show examples of different perspectives on the same knowledge object (a car) using semantic networks.

Wiig's KM model goes on to define levels of internalization of knowledge, which is a further refinement of Nonaka and Takeuchi's fourth quadrant of internalization.

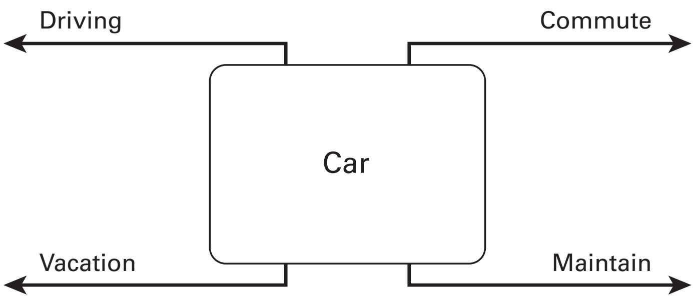

Figure 3.4
Example of a semantic network

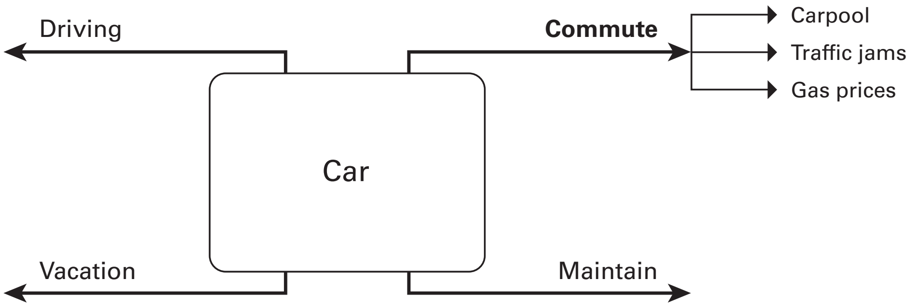

Figure 3.5
Example of a semantic network—commute view

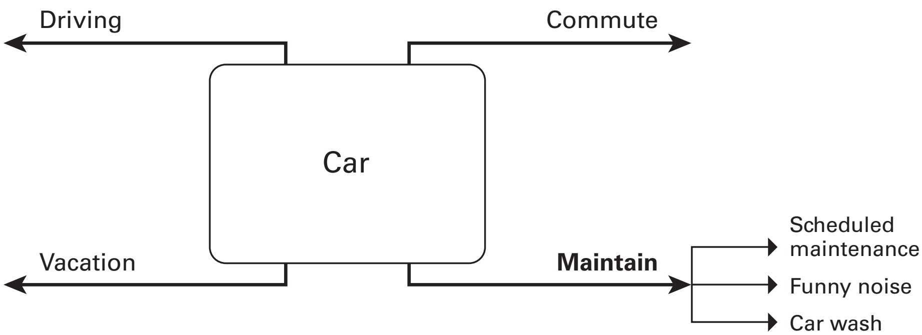

Figure 3.6
Example of a semantic network—maintain view

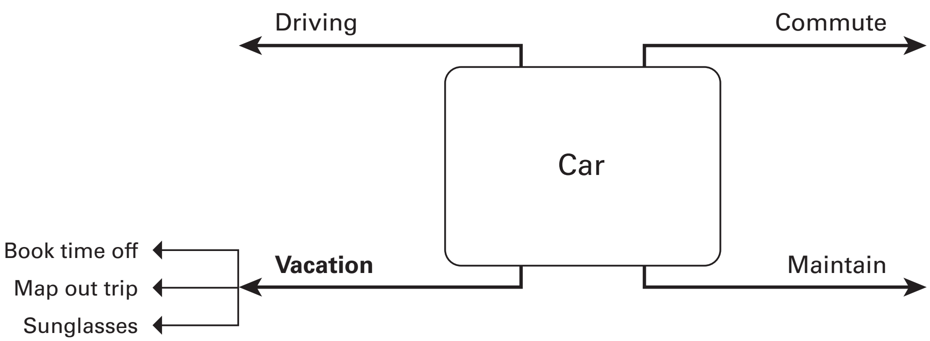

Figure 3.7
Example of a semantic network—vacation view

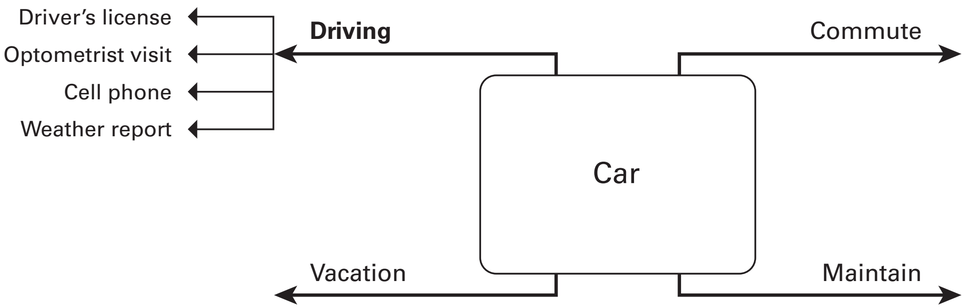

Figure 3.8
Example of a semantic network—driving view

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 it if given external knowledge bases such as documents and people to help
4	Expert	Knows the knowledge, holds it 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

Table 3.1 briefly defines each of these levels. In general, there is a continuum of internalization, starting with the lowest level, the novice who "does not know that he does not know"—that is, who doesn't have even an awareness that the knowledge exists—to the mastery level, at which there is a deep understanding not just of the know-what but also 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 such as a published book. Shared expertise is proprietary knowledge assets that are exclusively held by knowledge workers and shared in their work or embedded in technology. This form of knowledge is usually communicated via specialized languages and representations. Although Wiig does not use the term *shared expertise*, in the Wiig model this knowledge form would be common in communities of practice, informal networks of like-minded professionals who interact and share knowledge to improve the practice of their profession. Finally, personal knowledge is the least accessible but most complete form of knowledge. Personal knowledge is typically more tacit than explicit and used unconsciously in work, play, and daily life.

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

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 as summarized in table 3.2. Wiig's hierarchy of knowledge forms is shown in figure 3.9.

The major strength of the Wiig model is that despite having been formulated in 1993, the organized approach to categorizing the type of knowledge to be managed remains a powerful theoretical model of KM. The Wiig KM model is perhaps the most pragmatic of the models in existence today and can easily be integrated into any of the other approaches. This model enables practitioners to adopt a more detailed or refined approach to managing knowledge on the basis of its type but going beyond the simple tacit-explicit dichotomy.

Boisot I-Space KM Model

The Boisot (1998) KM model proposes the following two key points:

1. The easier it is to structure and convert data into information, the easier it is to diffuse.
2. The less that data require a shared context for diffusion, the easier is the diffusion.

These two points underpin a simple conceptual framework, the information space (I-space) KM model. Data is structured and understood through 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

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 okay	Check for past failures
Personal	The right color, texture	Company has a good track record	Hunch that the analyst has it wrong	What is the recent trend?

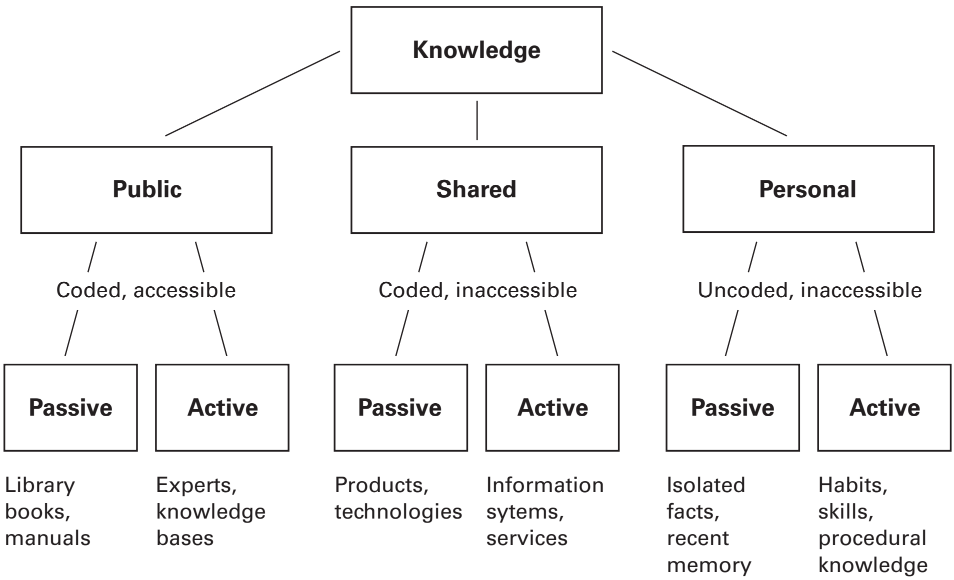

Figure 3.9
Wiig hierarchy of knowledge forms

contextual content. Boisot's KM model does address the tacit form of knowledge by noting that the loss of context due to codification may result in the loss of valuable content. This content needs a shared context for its interpretation, and that implies face-to-face interaction and spatial proximity—which is analogous to socialization in the Nonaka and Takeuchi (1995) model. Figure 3.10 shows the three dimensions of the I-space model: codified–uncodified, abstract–concrete, and diffused–undiffused.

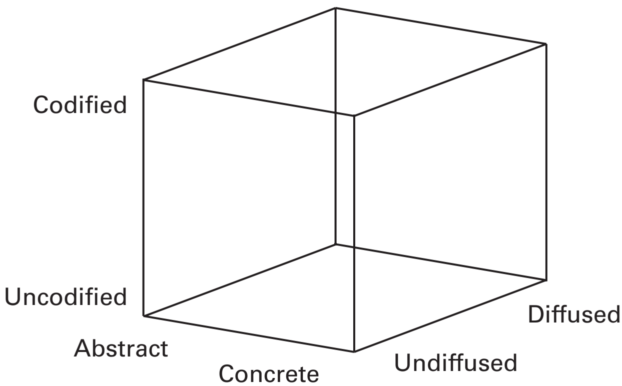

Figure 3.10
The Boisot I-space KM model

Scanning, problem-solving, coding, abstracting, diffusing, absorbing, and impacting all contribute to learning. When they take place in that sequence—and to some extent they must—they make up the six phases of a social learning cycle, as shown in table 3.3.

The Boisot model links content management, information management, and KM in an effective way. In an approximate sense, codification links to categorization and classification; abstraction links to knowledge creation through analysis and understanding; and diffusion links to information access and transfer.

Complex Adaptive System Models of KM

The KM model of intelligent complex adaptive systems (ICAS; e.g., Beer, 1981; Bennet & Bennet, 2004) views the organization as a living entity (figure 3.11).

Complex adaptive systems can self-organize through these emergent phenomena. No overall authority is directing how each independent agent should be acting. An overall pattern of complex behavior arises because of their interactions.

Beer's (1981) viable system model has been applied to many complex situations, including the modeling of an entire nation (implemented by President Salvador Allende in Chile in 1972).

> As part of his plan for socialism in the early 1970s, Salvador Allende created Project Cybersyn. The Chilean president's idea was to offer bureaucrats unprecedented insight into the country's economy. Managers would feed information from factories and fields into a central database. In an operations room bureaucrats could see if production was rising in the metals sector but falling on farms, or what was happening to wages in mining. They would quickly be able to analyse the impact of a tweak to regulations or production quotas. ("Enter Third-Wave Economics," 2021)

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 rapid when the data is well codified and abstract and slow and random when the data is uncodified and context specific
2	Problem-solving	• Giving structure and coherence to such insights—that is, codifying them; • Insights 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 is technically less problematic than for uncodified and context-specific content • Only a sharing of context by sender and receiver can speed up the diffusion of uncodified data • The probability of a shared context is inversely achieving proportional to population size
5	Absorbing	• Applying the new codified insights to different situations in learning by doing or learning by using • Over time, such codified insights come to acquire a penumbra of uncodified knowledge, which guides their application in particular circumstances
6	Impacting	• The embedding of abstract knowledge in concrete practices • The embedding can take place in artifacts, in technical or organizational rules, or in behavioral practices • Absorption and impact often work in tandem

Source: Adapted from Boisot (1998).

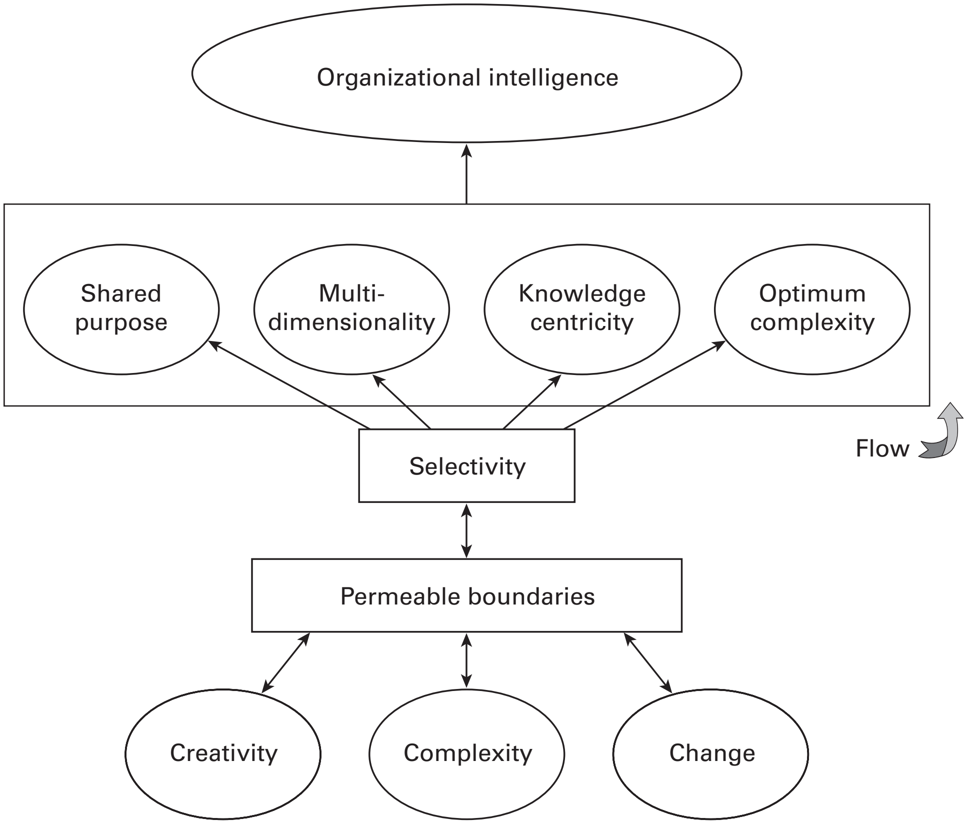

Figure 3.11
Overview of ICAS KM model

Bennet and Bennet (2004) also describe a complex adaptive system approach to KM, but the conceptual roots are somewhat different from the Beer (1981, 1989) viable system model. Bennet and Bennet strongly believe that traditional bureaucracies using a matrix organization or others using a flat structure cannot provide the cohesiveness, complexity, and selective pressures that ensure the survival of an organization. They propose a different model, in which the organization is a system in a symbiotic relationship with its environment, or "turning the living system metaphor into reality" (Bennet & Bennet, (2004, p. 25). The ICAS model is composed of living subsystems that combine, interact, and coevolve to provide the capabilities of an advanced, technologically intelligent, and sociologically adaptive enterprise. Complex adaptive systems are organizations composed of a large number of self-organizing components, each of which seeks to maximize its own specific goals but also operates according to the rules and context of relationships with the other components and the external world.

The key processes in the ICAS KM model are understanding, creating new ideas, solving problems, making decisions, and taking actions to achieve desired results. Because only people 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. 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 also requires eight emergent characteristics, according to this model: organizational intelligence, shared purpose, selectivity, optimum complexity, permeable boundaries, knowledge centricity, flow, and multidimensionality (figure 3.11). These emergent properties endow the organization with the internal capability to deal with unanticipated environments yet to be encountered. Organizational intelligence is the capacity of the firm to innovate, acquire knowledge, and apply that knowledge to relevant situations. This is very similar to Choo's sense-making model's approach. Unity and a shared purpose represent the ability of the organization to integrate and mobilize its resources through a continuous, two-way communication with its large number of relatively independent subsystems. Optimum complexity represents the right balance between internal complexity (i.e., number of different relevant organizational states) to deal with the external environment without losing sight of the overall goal and the notion of a one-firm firm, or common identity.

Selectivity consists of filtering incoming information from the outside world. Knowledge centricity refers to the aggregation of relevant information from self-organization, collaboration, and strategic alignment. Flow enables knowledge centricity and facilitates the connections and the continuity needed to maintain unity and give coherence to organizational intelligence. Permeable boundaries are essential if ideas are to be exchanged and built on. Finally, multidimensionality represents the organizational flexibility that ensures knowledge workers have the competencies, perspectives, and cognitive ability to address issues and solve problems.

Knowledge-Sharing KM Models

McAdams and McCreedy KM Model

McAdams and McCreedy (1999) emphasize organizational knowledge creation through social exchange processes (figure 3.12). Because knowledge is created through social

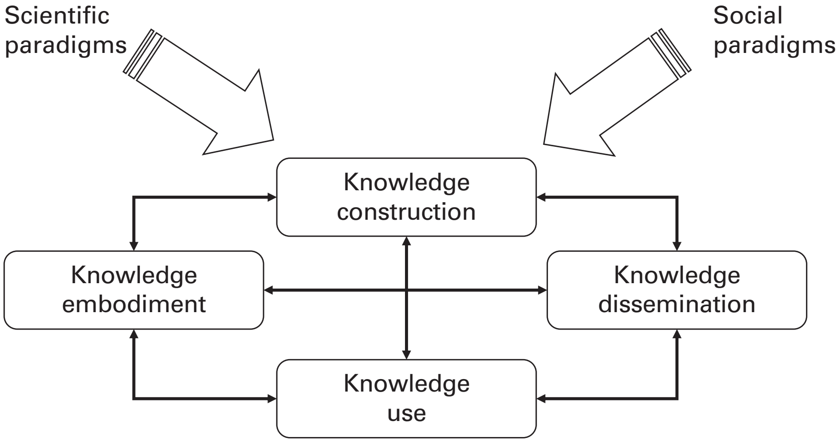

Figure 3.12
The McAdams and McCreedy model

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

Wang and Noe Knowledge-Sharing Model

Wang and Noe (2009) identify several environmental factors, individual characteristics, motivational factors, perceptions, and knowledge-sharing behaviors in their model (figure 3.13). Environmental factors are the organizational culture, interpersonal and team characteristics, and collective cultural characteristics. Organizational culture consists of "long-standing organizational values and practices" (p. 117) that either support or hinder knowledge sharing. These include the perceived costs of knowledge sharing, the availability of technologies such as intranets, emphasis on individual competition over cooperation, emphasis on innovation over efficiency, and the existence of role models among senior management. Knowledge sharing may be facilitated if organizational structures are less hierarchical, if they have open workspaces that offer job rotation opportunities, or if they have a significant number of informal meetings in addition to formal ones.

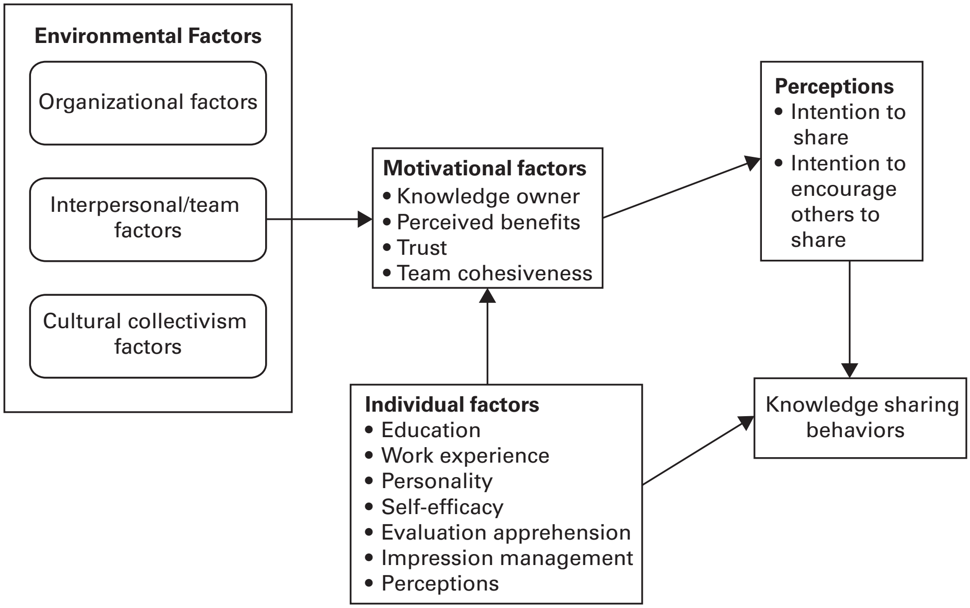

Figure 3.13
The Wang and Noe knowledge-sharing model

Trust is an important mediator of knowledge sharing that has been studied extensively by many researchers (e.g., Evans, Wensley, & Frissen, 2015). People tend to share their knowledge more when they perceive other team members to be honest, fair, and principled (i.e., to have integrity). Affect-based (how you feel about another person) and cognition-based (objective assessment of another person's credibility, expertise, authority, and so on) trust tends to be more important than benevolence-based trust (belief that a person wants to help others, do the right thing, behave as a good citizen, and so on). Finally, individual characteristics that influence knowledge sharing include education, work experience, personality, self-efficacy, evaluation apprehension, impression management, and perceptions (e.g., knowledge as power). Individuals who are open to new ideas, are curious, have a high level of comfort with using collaborative technologies, and have higher levels of education and greater seniority are more likely to share their expertise. Newer employees tend to use technologies to share knowledge more often than more senior workers. Individuals with high levels of evaluation apprehension fear that if they share their knowledge, it may be critiqued or negatively evaluated, and they will therefore be hesitant to share.

KM Strategy Models

Hansen, Nohria, and Tierney Model

Hansen, Nohria, and Tierney (1999) proposed one of the first KM strategy models in 1999: codification versus personalization. Codification relies heavily on information technologies to document and make accessible explicit knowledge. Personalization focuses on face-to-face knowledge sharing of tacit knowledge. These two very different strategies were first identified for different types of consulting services, but they apply to all types of organizations when looking at a KM strategy. Each has strengths and drawbacks. Codification can contribute to operational efficiencies and standardization because knowledge can be more easily reused. Knowledge is accessible more quickly and to a wider group of users. Personalization, in contrast, requires more time because users are not simply retrieving content from a system but engaging in a conversation with another individual. These conversations typically lead to deeper understanding and can also trigger epiphanies, insights, and innovations. Instead of investing in repositories, personalization strategies invest in building networks such as expertise locator systems.

Stankosky and Baldanza KM Pillars Model

The multidisciplinary KM model by Stankosky and Baldanza (2001) rests on the four pillars of leadership, organization, technology, and learning, as shown in figure 3.14. Leadership consists of organizational strategies, mission, and goals. The KM strategy must always be aligned with the overall business strategy of the company. This ensures that KM brings value, that employees buy in to KM, and that senior management supports KM implementation. The organization pillar refers to the change needed to integrate KM, typically a change in organizational culture. This may include recognizing the expertise of employees more, ensuring information and knowledge is disseminated and shared throughout the organization, and starting to embed KM processes into organizational processes. Technology refers to KM tools to document, store, share, and preserve knowledge. As noted in chapter 2, there are tools that are relevant and can be used for each major KM process at the individual, group, and organizational levels. The final pillar, learning, refers to using KM and KM tools to improve (e.g., to be more efficient, to make fewer errors, to produce better quality products, to innovate more). It comprises both individual and organizational learning, and it ensures the organization has a learning culture.

Intellectual Capital Models

Van den Berg (2003) notes that intellectual capital models all grew out of methods of measuring intangible assets. Intellectual capital management, or "strategies used

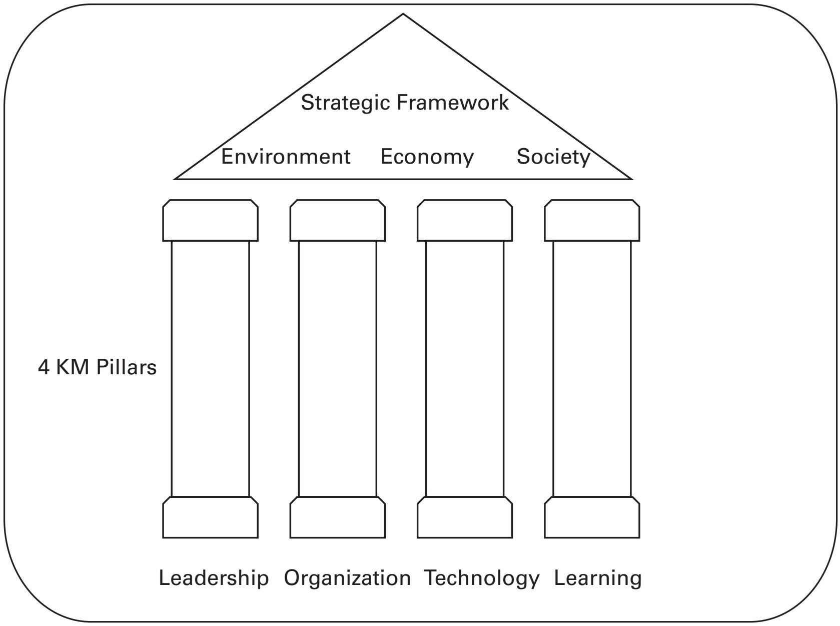

Figure 3.14
Stankosky and Baldanza's KM pillars model

by organizations to develop, maintain, and exploit knowledge for innovation, constitute an important topic in the field of business strategy" (p. 7). Once the existence of knowledge assets became firmly established, it became necessary to be able to measure their value. Traditional methods of valuing organizational assets were no longer adequate and misrepresented the true value of the company in question. Several financial and nonfinancial measures were developed to value intangible assets along with the more traditional, tangible ones. A well-known intellectual capital model is the Skandia IC Navigator (Edvinsson & Malone, 1997), shown in figure 3.15. Intellectual capital explains the difference between book value (the sum of all measurable, tangible assets of a company) and market value (what the market values the company at). The total market value is the sum of its financial capital plus its intellectual capital.

This model created a taxonomy of organizational assets that is still widely used today. Intellectual capital is categorized as human capital, structural capital, and organizational capital. Human capital is primarily composed of human knowledge, expertise, and experience. Structural capital is everything that remains behind when employees leave for the day: physical inventory, patents, and so on. Organizational capital is further subdivided into innovation capital and process capital. One of the strengths of this model is that

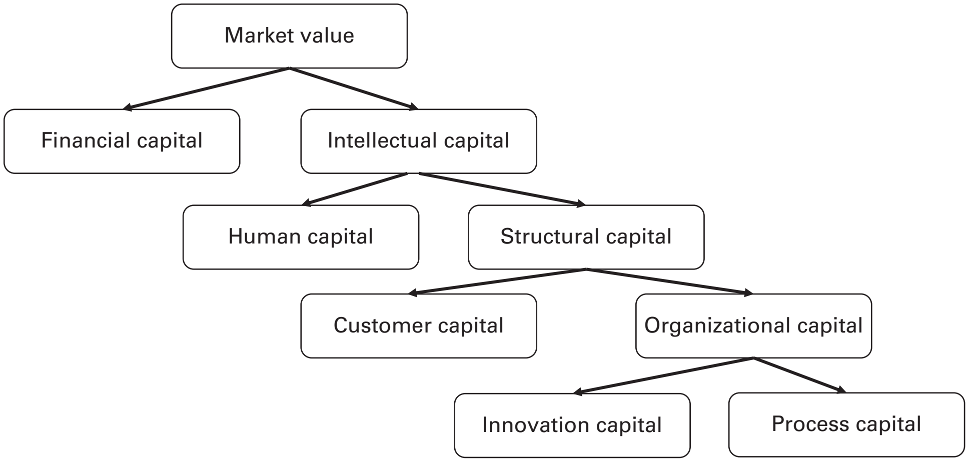

Figure 3.15
The Skandia IC Navigator model

it explicitly notes the important roles played by the organization: its structure and its processes. Since the inception of the model, there have been many extensions to it (e.g., social capital, creativity capital, cultural capital, and educational capital).

The Phronesis Model

Nonaka and Takeuchi (2016) revisited their work from 1995 (*The Knowledge Creating Company*) and expanded their SECI (socialization, externalization, combination, and internalization) spiral model. The emphasis is on higher-order tacit knowledge or wisdom and continuous innovation. This new model rests on three premises:

1. Although most decision makers continue to rely on explicit knowledge, human and social ecosystems are complex and cannot be understood, let alone well managed, without considering tacit knowledge: “dependence on explicit knowledge prevents companies from coping with change” (p. 4).
2. Companies continue to seek short-term gains at the expense of long-term gains: “creating the future must extend beyond the narrow interest of the company” (p. 5).
3. Leadership and knowledge governance is perhaps the most important facet of KM that needs to be addressed today: “what a novel, dynamic, and unstable world needs are ‘wise’ leaders who can act as thinking agents of change” (p. 5).

Nonaka and Takeuchi (2019) use *phronesis* to refer to wisdom. Aristotle used this term to denote

> "practical wisdom" that has been derived from learning and evidence of practical things. Phronesis leads to breakthrough thinking and creativity and enables the individual to discern and make good judgements about what is the right thing to do in a situation. (OxfordReview, n.d.)

The new SECI model thus aims to create not only wise companies but also wise leaders.

In revisiting their SECI KM model, Nonaka and Takeuchi's central message remains the same in that knowledge creation generates innovation. There is a greater emphasis on KM being unable to generate value unless knowledge is applied or put into action. Polanyi (1966), who is best known for introducing the concept of tacit knowledge, has always held that we accumulate tacit knowledge about our world so that we can better understand our environment, which in turn aids survival. Further, knowledge creation and application processes operate not only between a given individual and the environment but also at multiple levels: with other individuals; within project teams, groups, or communities; and collectively within the organization and in collaboration with other organizations.

In the new SECI spiral model, the four major components (socialization, externalization, combination, and internalization) and the knowledge spiral remain. The challenge is to close the gap between theory and practice. Knowledge creation, although requiring a significant amount of effort, can never be sufficient without knowledge application or knowledge practice. In the revised model, the knowledge spiral encompasses not only tacit and explicit knowledge but also the three levels (individual, team, and organization) situated in the organizational environment, which all evolve over time (see figure 3.16). Knowledge creation and application of both tacit and explicit knowledge occur within each spiral cycle and with each cycle, and the scope of the processes increases: from individual to group, to organization, to interorganizational, and finally, to the external environment. The new model visually depicts the important interactions that occur in one-to-one interactions between individuals and in many-many interactions within teams, between teams, within the organization, between organizations, and with the larger environment or society at large.

The upward spiral increases in scope with every iteration or level. Each cycle can be associated with a different unit of change, as shown in table 3.4. Phronesis, experiential knowledge accumulated over time, drives the knowledge spiral up through the individual level to the societal level. One of the aims of the new SECI spiral model is to complete the original SECI model and also avoid becoming stuck in any one phase. The original SECI emphasized knowledge creation, whereas the new SECI spiral model emphasizes both knowledge creation and knowledge practice. This makes possible incremental improvements when it is not possible to make the leap to second-order learning or more radical innovations and improvements. The expanded model ensures

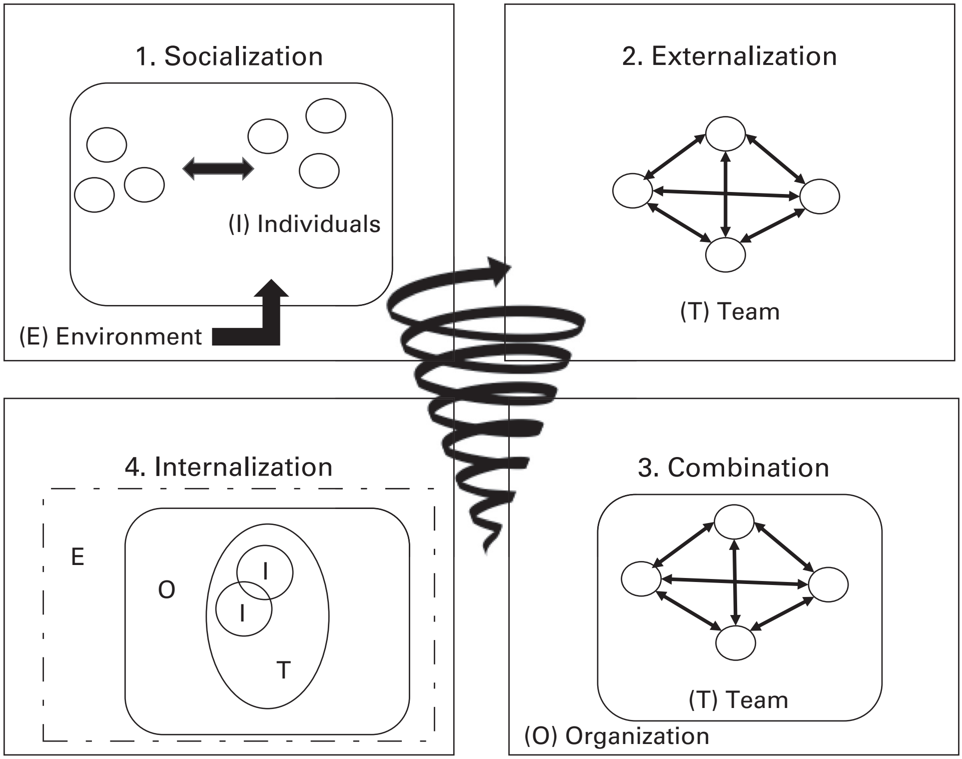

Figure 3.16
New SECI spiral model

Table 3.4
New SECI spiral model

Spiral level	Unit of change
1	Individual
2	Teams, groups, communities
3	Organization
4	Interorganization
5	Society

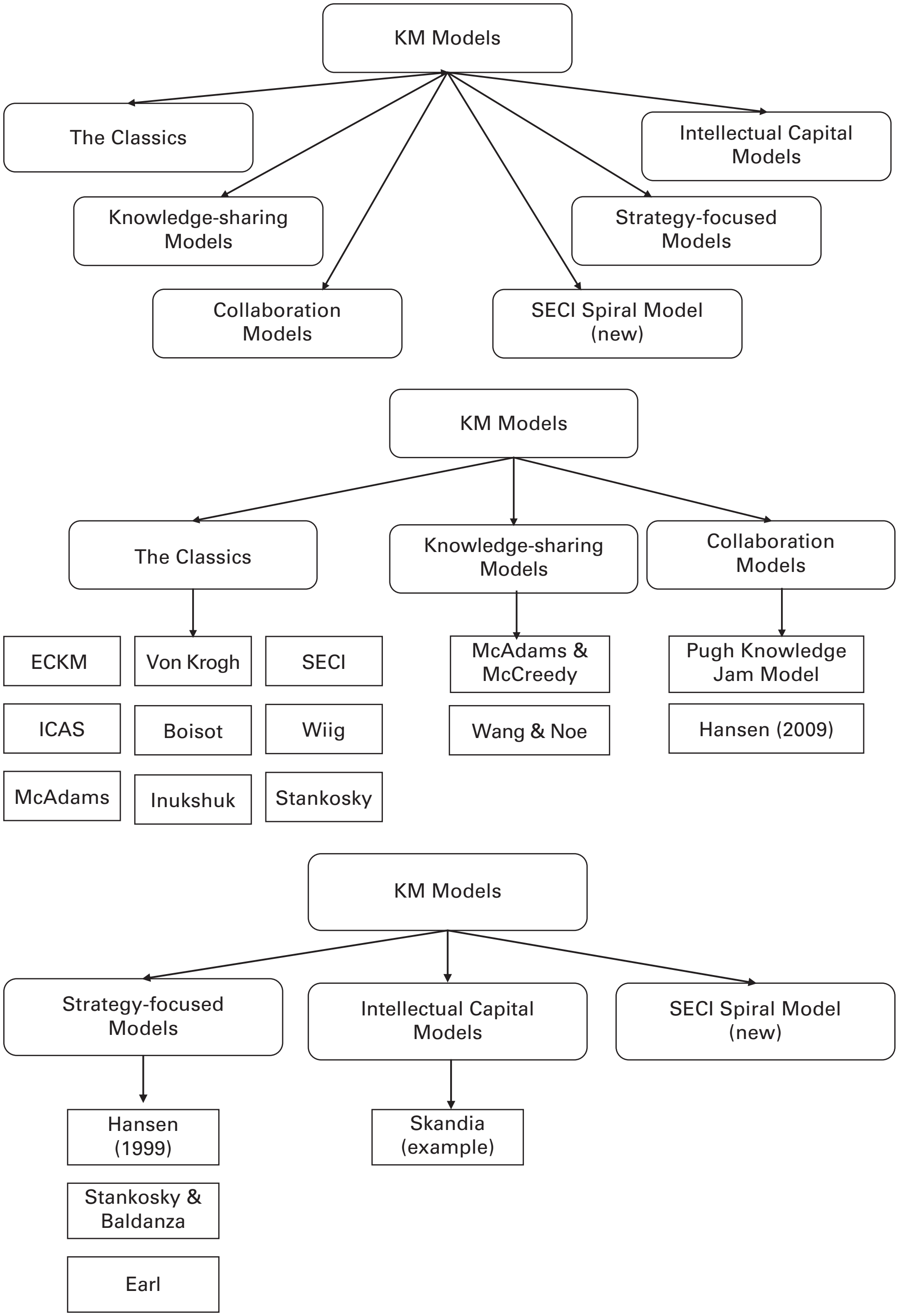

Figure 3.17
Summary of KM models

that knowledge creation and knowledge practice is facilitated at every level and sustained over time as the spiral cycles repeat.

A lack of phronesis results in becoming stuck at the first SECI spiral level, becoming more efficient only through reuse and never thinking outside the box, never asking Should we become more efficient at this task? Should we even be doing this task? Nonaka and Takeuchi denote phronesis as the missing link in ensuring that knowledge is managed well operationally and also transforming an organization to survive and succeed in its environment. In addition, each level integrates tacit and explicit knowledge as well as (ideally) practical wisdom. As each cycle is repeated, knowledge is processed across the four SECI quadrants and then vertically advances. Repeating the cycles and processing knowledge require time to complete, and over time, more knowledge is created and applied, the knowledge base expands over more of the organization, more people are involved in innovation, and the knowledge-creating and knowledge-practicing community becomes larger.

Figure 3.17 shows a high-level summary of the KM models discussed in this chapter.

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4 Knowledge Capture and Codification

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

The major approaches, techniques, and tools used to identify and elicit tacit knowledge, trigger the creation of new knowledge, and subsequently organize this content in a systematic manner (codification) are presented.

Learning Objectives

1. Become familiar with the basic terminology and concepts related to knowledge capture and codification.
2. Describe the major techniques used to identify and elicit tacit knowledge from subject matter experts and the major parameters used to characterize them.
3. Compare and contrast different types of tacit knowledge.
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 KM 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. Often, these two processes occur in parallel.

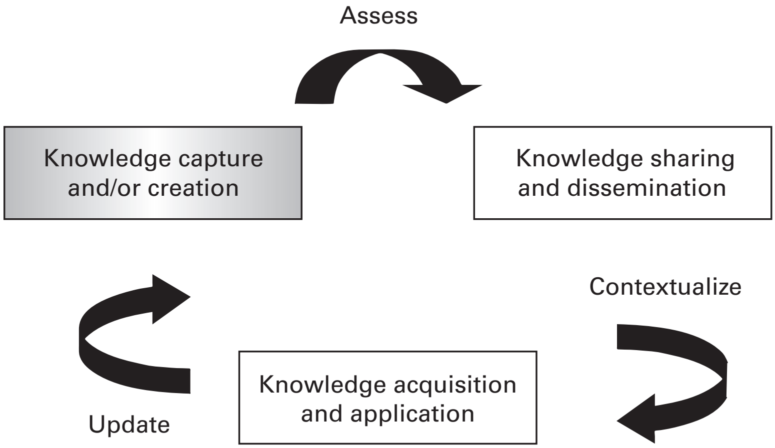

Figure 4.1
An integrated KM cycle

In knowledge capture, a distinction needs to be made between the capture and identification of existing knowledge and the creation of new knowledge. In most organizations, explicit, or already identified and coded, knowledge typically represents only the tip of the iceberg. The interesting area of knowledge that we don't know about remains hidden. 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 (figure 4.2).

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. Knowledge must be captured and codified in such a way that it becomes part of the existing knowledge base of the organization. Knowledge capture may be difficult, particularly in the case of tacit knowledge. The first step, identifying the tacit knowledge and the people who have mastered this knowledge, is already a challenging one. Management of tacit knowledge captures the experience and expertise of the individual in an organization and makes 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.

Once knowledge is explicit it should be organized in a structured document that will enable multipurpose use. A wide variety of techniques capture and codify knowledge, and many have their origins in fields other than KM (e.g., artificial intelligence, sociology, instructional design), which are described here.

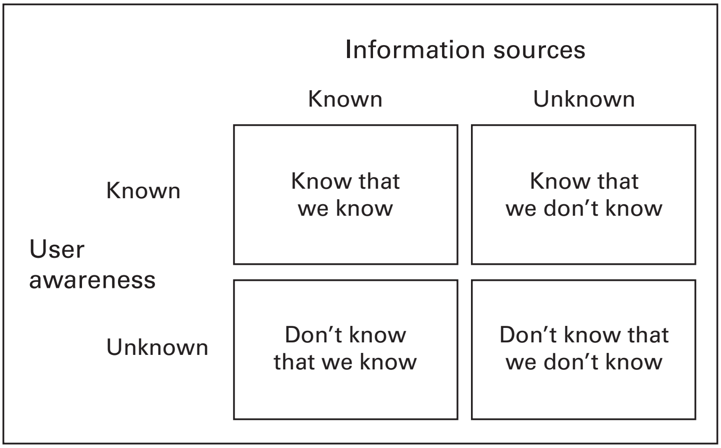

Figure 4.2
The known-unknown matrix (Frappaolo, 2006)

Tacit Knowledge Identification

The first step in tacit KM is to create an inventory of what tacit knowledge exists and where—that is, who has this expertise. The best way is to ask a wide range of people who work (or previously worked) at the organization. You can begin with the senior management, but don't limit yourself to only this group. It is important to talk to the people in the field and equally important to speak to a representative sample of organizational units. One of the best ways of identifying tacit knowledge is to ask who the gurus are in communities of practice (CoPs). A more mathematical approach would be to undertake a social network analysis, and ask participants to answer two questions:

1. Who do you ask for help when you need it? This can be nuanced further to identify forms of specific help.
2. Who asks you for help? On what topics?

A third approach is to look at employee profiles (e.g., LinkedIn or internal profiles) because most will list their expertise there. All three approaches can be complementary. Of course, if the organization has an expertise locator system, a database where you can look up experts by entering a keyword search term, this would save you a bit of time. Examples can be found in many sectors, including academia. Universities typically maintain an expertise database so that journalists can quickly find an expert to interview on a developing news story (e.g., https://usfweb.usf.edu/ucm/media/). Expertise locator systems are discussed in greater detail in chapter 5. An example is provided in box 4.4.

Automated software applications also can be used to identify expertise (McKellar, 2013). These applications analyze content such as emails (subject headings to see who is emailing whom on what subject), publications authored by employees, and presentations (internal and external). This approach is best for creating a starting point, and it is always a good idea to follow up with the individuals to validate and update their expertise profiles. Some companies have implemented formal validation procedures in which the direct supervisor validates the expertise areas of their employees. A 2010 APQC study describes several evolving IBM systems with examples. The original Blue Book was an IBM corporate directory that listed employees' expertise. This was replaced by Blue Groups, which added email distribution lists, CoPs, and online discussion forum content to identify the expertise of employees. The 2022 IBM Practitioner Portal provides one-stop-shop capability to search for IBM content, including automated expertise location. Finally, the current SmallBlue system combines data from internal IBM knowledge repositories with statistical data from users who agreed to opt in. Small Blue then makes inferences about who is an expert in which areas to generate a searchable organization-wide map of expertise and where it is located.[1]

Once you have identified the major types of valuable tacit knowledge and listed experts in the organization, the next step is to identify the specific tacit knowledge that has been internalized by each expert.

The purpose of identifying valuable tacit knowledge is to create not only an inventory but also a plan because this knowledge is the highest-value knowledge that is also most at risk of being lost. Valuable expertise is rare and hard to replace. The inventory of valuable tacit knowledge is the starting point for most KM efforts because this knowledge is high priority for knowledge processing (identify, share, preserve, and reuse).

Different Types of Tacit Knowledge

Collins (2010) expands on Polanyi's (1966) description of tacit knowledge and identifies three distinct types of tacit knowledge:

- Relational tacit knowledge, or knowledge that could be articulated if someone requested it
- Somatic tacit knowledge, sometimes referred to as embodied knowledge, which is part and parcel of our containers, or bodies (e.g., riding a bike)
- Collective tacit knowledge, which refers to common sense or knowledge of how our world works (e.g., knowing how to drive in traffic)

The weakest, or least tacit, type is the relational type because of the potential for it to be rendered tangible or explicit if the knower puts some effort into doing so. The reason this content has remained tacit may be just that it was never sought out or that the person chose to actively not share the knowledge. Somatic tacit knowledge can be partially documented or codified but is best shared through observation, active coaching, and trying it out until perfected. Collective tacit knowledge is the strongest, the most tacit, form because it is societal or organizational rules that have been acquired over a long period: "This is how things are done here." Collective tacit knowledge is shared by all members of a society or employees of an organization. Culture is a good example of this form of tacit knowledge.

Analysis of the type of tacit knowledge, once identified, yields an estimate of how long it would take to convert part or all of it into a more explicit form. In addition, knowing the type informs knowledge managers as to the best methods to use to make this tacit content available to others, whether through dissemination or sharing. If, for example, tacit knowledge is deeply embedded in a given individual, then the best course of action might be to point to the individual in an expertise locator system and have other employees contact and talk to that person directly. If tacit knowledge is collective, then the best approach might be to include some aspects of this content in onboarding activities for new employees.

Asher and Popper (2019) provide a useful framework in their onion model of tacit knowledge. They describe three types of tacit knowledge. The outermost layer of the onion represents hidden practical knowledge. This is the easiest to articulate and make more explicit and tangible. This layer is similar to their concept of relational or easy-to-explain-if-asked tacit knowledge. They note that in this layer, experts can explain this knowledge with little if any effort. The second layer represents reflective tacit knowledge, and it is more abstract and less practical. This layer consists of principles or heuristics used to make inferences and to identify preferences, priorities, and criteria used to make decisions. This knowledge requires more effort from experts because they have to articulate, on the basis of their accumulated personal experience, their judgments, their reasoning, and how they acquired this knowledge. The innermost layer is demonstrated tacit knowledge. As the name implies, this type of knowledge can often be demonstrated only by an expert and not at all easily verbally. Although this sounds like a typology, expert knowledge typically spans all three layers because experts will be able to seamlessly travel through all three types of tacit knowledge and seamlessly integrate them.

The practical application of the onion model is to select the best way to elicit tacit knowledge from each of the three layers. Practical hidden knowledge can be elicited using direct questions such as a survey or interview. Reflective tacit knowledge requires more analysis and is best elicited by asking experts to reflect on some of their experiences and analyze them. Demonstrated tacit knowledge is best understood by observing experts as they perform their work. Elicitation techniques are described in greater detail later in this chapter.

Tacit Knowledge Capture

Organizational learning is a fundamentally social process—something that cannot occur without group interaction. Individuals learn from the collective, and at the same time, the collective learns from the individuals (e.g., Crossan, Lane, & White, 1999). In Crossan, Lane, and White's 4I model (figure 4.3), organizational learning involves a tension between assimilating new learning (exploration) and using what has been learned (exploitation). Individual, group, and organizational levels of learning are linked by the social and psychological processes of intuiting, interpreting, integrating, and institutionalizing (the four I's). Zietsma et al. (2002) modified this slightly to include attending at the stage of intuiting and experimenting during interpreting.

In KM, 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

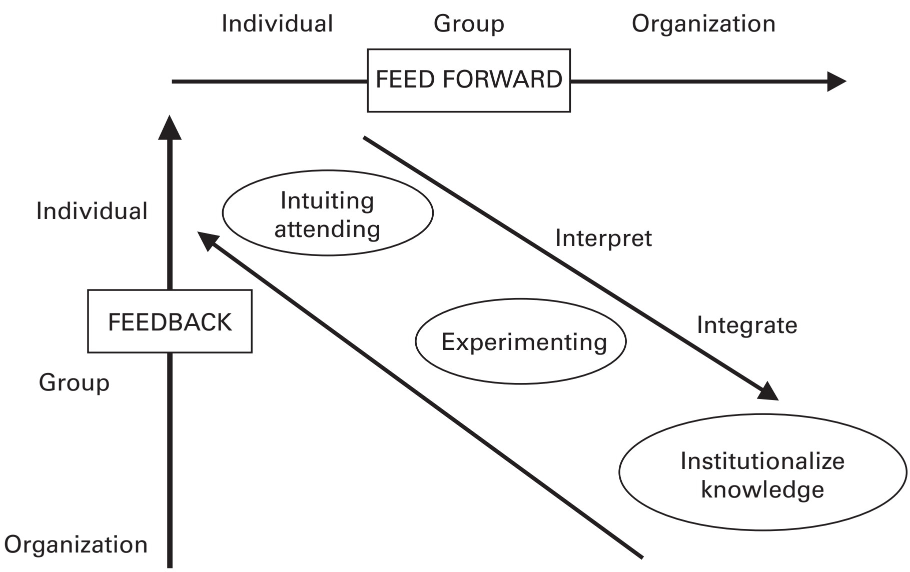

Figure 4.3
The 4I model of organizational learning (Crossan, Lane, & White, 1999)

CoP, or a dedicated individual from the CoP—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 personalized KM. Within the firm, individuals share perceptions and jointly interpret information, events, and experiences (Cohen & Levinthal, 1990), and at some point, knowledge acquisition extends beyond the individuals and is coded into corporate memory (Inkpen, 1995; Nonaka & Takeuchi, 1995; Spender, 1996). Unless knowledge is embedded into corporate memory, the firm cannot leverage the knowledge held by individual members of the organization. Organizational knowledge acquisition is the "amplification and articulation of individual knowledge at the firm level so that it is internalized into the firm's knowledge base" (Malhotra, 2000, p. 334).

Knowledge elicitation tends to refer to one part of the knowledge acquisition process—namely, capturing knowledge that is tacit or in the heads of experts, usually through some form of question-and-answer or interview method.

Tacit Knowledge Capture at the Individual and Group Levels

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 similar role in the design and development of conventional software systems (McGraw & Harrison-Briggs, 1989, pp. 8–9). The ways we can tackle tacit knowledge range from simple graphical representations to sophisticated mathematical formulations.

Parsaye (1988) outlined three approaches to knowledge acquisition from individuals and groups: learning by interviewing experts, learning by being told, and learning by observation. In many cases, a combination of these is required to capture tacit knowledge.

Interviewing experts Tacit knowledge is also elicited from subject matter experts in instructional, or pedagogical, design. Course developers interview subject matter experts to design courses that will help nonexperts learn the material. Interviewing experts is at the core of qualitative research methods (Savin-Baden & Major, 2013; Taylor & Bogdan, 1984). Participants knowledgeable about a subject area are interviewed and the results are then organized to identify key themes and findings. Two of the more popular means are structured interviewing and stories.

Structured interviewing In many organizations, structured interviewing is done through exit interviews with knowledgeable staff near retirement age. A structured interview is one that is prepared beforehand. The questions to ask are then adhered to strictly when interviewing. These sessions yield specific data that is often declarative in nature in response to focused questions. In contrast, most knowledge elicitation interviews are semistructured. In semistructured interviewing, participants are told ahead of time the purpose of the interview and how it will be conducted. The questions are usually provided to them ahead of time. This allows them to prepare and think of examples and stories to illustrate what they will explain. The list of interview questions guides the interview, but the questions are less strictly adhered to than in structured interviews. For example, they can be asked out of sequence, and the interviewer can modify them as needed during the interviews. Ideally, the interviews should take place in participants' offices. Their office is their comfort zone, and they will have easy access to their resources during the interviews (Edwards & Holland, 2013).

Two types of questions are used in interviewing: open and closed. Open questions are broad and place few constraints on the expert. Open questions are not followed by choices because they are designed to encourage free response (Oppenheim, 1966). Open 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 are the following:

- 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 [a certain aspect] 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 is something like, "Which symptom led you to conclude that . . . ?" A strong closed question is one that can be answered only by yes or no.

The structured interviewing process is primarily a people-focused one, and thus reflective listening facilitates the interactions. The techniques of reflective listening are paraphrasing, clarifying, summarizing, and reflecting feelings. Reflective listening helps when the words used have multiple meanings and when interviewers hold very different mental models from interviewees or have differing personal characteristics such as background, attitude, training, and level of comfort with current position in the organization. These factors may influence how an expert communicates his or her knowledge.

Paraphrasing restates the perceived meaning of the speaker's message but in your own words. The goal is to check the accuracy of understanding the message (e.g., "What I believe you said was . . ."). Clarifying lets experts know that their message was not immediately understandable. These responses encourage the expert to elaborate or clarify the original message so that the interviewer gets a better idea of the intended message. Always focus on the message and not on the experts' ability to communicate, and encourage them to elaborate or explain by using open questions wherever possible (e.g., "Could you please explain or provide an example?"). 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 (e.g., "So to summarize your key points . . ."). Finally, reflecting feelings mirrors the speaker's feelings that seem to have been communicated. The focus is on emotions, attitudes, and reactions, not on the content itself. The purpose is to clear the air of some emotional reaction or negative impact of the message (e.g., "I sense that you are uncomfortable with . . .").

Cooke (1994) reviews several techniques to help experts transform their tacit knowledge into explicit knowledge. These include accounts of case studies (e.g., describe the worst case you ever had to deal with, and now describe a routine case—what are the major differences between the two?), descriptions of key milestones in careers, simulations, and role-playing. An archeological or historical approach is to identify a key past event and ask a series of Why? questions: Why did you do this? Why did you select this tool? Why did you decide this and not that? Finally, at times, group interviews (much like focus groups) may be required—for example, with a team that worked on a given project. In addition, because expertise is so subjective and contextual, it may be a good idea, time permitting, to seek out a second expert to obtain a second opinion or perspective. The Delphi method can be used to conduct group knowledge elicitation and arrive at a group consensus. In the Delphi method, experts are brought in to review results, and each participant is viewed as an expert. Whyte and Classen (2012) used this approach to achieve group consensus on how to classify elicited organizational stories.

The easiest place to begin in a structured interview is often with a survey of the roles, responsibilities, and tasks employees are responsible for, and follow that with a listing of their resources, references, contacts, other supporting content, and the people they interact with to do their work (Leavitt & Trees, 2013). Another good question is what major lessons they learned throughout their career. Bognar, Littig, and Menz (2009) recommend developing a flexible list of thematic guidelines or topics to address rather than specific questions to be answered for these initial interviews. This initial round of interviews with an expert could take time, but it is time well spent because the knowledge elicited will help identify the context and the key parameters of the expert's profession, break the ice, establish rapport with the interviewer, and even establish a certain language, or jargon, of the expert's domain. The more the interviewer and interviewee have a common ground (terminology, understanding of key concepts) and the more similar they are in their backgrounds (education, training, and experience), the more effective knowledge elicitation will be (Bognar, Littig, & Menz, 2009).

The next round of interviews establishes the scope of the knowledge to be elicited and codified—the breadth and depth of knowledge. This may require more than one interview because the full landscape must be at least outlined. Subsequent interview questions will be developed on the basis of the scoping interviews. Scoping consists partly of identifying other documents to be procured and studied and other people to be interviewed. For an example, see box 4.1.

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

To test whether enough content has been captured, switch roles: the interviewer takes on the role of a novice practitioner and verbally or physically goes through the key tasks that have been discussed. The interviewee validates the content until both are satisfied that the knowledge has been understood and captured in as complete and valid a manner as possible. We can also borrow the notion of data saturation from qualitative research to determine whether we have conducted enough interviews (Bowen, 2008). Data saturation refers to the point at which significantly different, new knowledge is no longer elicited in each interview. The best test of how easy or difficult it will be

Box 4.1

A Vignette: Excerpts of an Expert Interview

Interviewee 37 (name coded to protect anonymity) works in a large government department and has been responsible for the implementation of KM for the last five years. His area of expertise lies in project management—he has over twenty years' experience managing large-scale (over $10 million) infrastructure projects that 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, although each PM had the necessary training and skills, there was often little time to overlap with the incumbent PM to rapidly get up to speed on the specifics of the project. The purpose of the structured knowledge elicitation interviews with senior PMs was to identify the tools and techniques they had used, to ensure solid continuity in the project management. Some PMs were scrupulous and disciplined and kept detailed records (primarily on paper), whereas others found ways of embedding the knowledge about the project within the project itself (primarily with digital annotations). The departmental KM team had recently introduced facilitators to carry out project debriefs and KM journalists to convert paper narratives into digital annotations, and they were in the process of setting up videotaping sessions to accommodate those PMs who were more comfortable with verbal rather than textual communications.

An excerpt of the interview with PM #37 follows:

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

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

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

A: The stuff you can't write down! I mean everyone spouts the same stuff—budget overrun, risk assessment figures off, and on and on and on. . . . the real stuff—we all know it in our gut but no way 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 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?

Box 4.1 (continued)

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

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

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

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

A: Those oddballs—listen some people have too much free time on their hands—this isn't the place for paparazzi—we are serious folks, and we don't need a bunch of 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. . . . (*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!!!

to share, disseminate, and have someone else understand and use this knowledge is to test it out with a representative recipient (Leavitt & Trees, 2013) and then revise, as needed, with the expert.

Interviews are widely used to elicit knowledge because they tend to be more effective than methods such as observations (following employees around as they work) and questionnaires (paper or electronic), which often require follow-up interviews to properly interpret responses (Bognar, Littig, & Menz, 2009). Some problems with using interviews are identifying who the experts are, gaining access to experts (who usually do not have a lot of spare time), validating highly subjective and contextual knowledge, ensuring the interviewer has the interviewing skills required, having the expert and the interviewer perceive a difference in status between them, and getting the expert to competently articulate his or her expertise (explain, provide examples, define, answer questions, and be motivated to participate in the interview). Technology-mediated interviews also have challenges. Although a telephone or video interview (e.g., via Zoom) may put the expert more at ease, especially if answering sensitive questions, most studies show that face-to-face interviews provide the widest bandwidth and lead to more effective knowledge elicitation (Bognar, Littig, & Menz, 2009). In-person interviews allow the interviewer (and expert) to pick up on nonverbal cues, and the degree of interaction is much more natural, giving the impression of engaging in a conversation with a person rather than providing answers to a list of questions.

In addition, interviews can be conducted sequentially with individuals or held in group settings. The latter are quite effective if the group represents a cohesive team who worked together or if members are all part of a given profession or community. Another possibility is to conduct individual interviews and aggregate the results. Then a subset of the participants can be convened to discuss any discrepancies and to validate the content that was elicited. This is a variation on the Delphi method, which is used to achieve consensus. For example, interview responses from each participant could provided to the other participants, who are asked to comment, confirm, refute, or elaborate on the content. These can then be sent back to the original interviewees to obtain their comments. Alternatively, all the interview responses can be aggregated and summarized. This summary can then be presented to a group of experts in a facilitated group interview session for validation. In either of these scenarios, consent of the participants would be needed, or the content would have to be thoroughly anonymized. Box 4.2 has an example of this type of interviewing at the group level.

Stories Stories are another excellent vehicle for capturing and then subsequently coding tacit knowledge. An organizational story is a detailed narrative of management

Box 4.2

Inclusive Tacit Knowledge Elicitation: The Chignecto Isthmus Project

Researchers (Needham, Beazley, & Papuga, 2020) carried out interviews with local people to gather tacit knowledge about the habitats and movements of wildlife species in a specific area. The participants were people who had lived there for at least ten years and were subsistence harvesters, owners of woodlots, farmers, naturalists, and recreational users of the land. The interviews focused on how these people spent their time on the land, whether it was for their livelihood or purely recreational. Participants had tacit knowledge gained through long-term observations of the land and the wildlife inhabiting it. Interviewers asked questions on their personal, experiential knowledge of hunting, trapping, farming, forestry, and wildlife rehabilitation and recreational activities such as fishing and hiking. Because they had been living in this area for most of their lives, participants also had knowledge of changes over time.

Although scientific data and models reveal wildlife movements, they do not explain the underlying factors that contribute to movement patterns. Existing models have to rely on the quality of the data, and they typically use optimization methods, which do not take into account the specificities of local contexts. The complex socio-ecological system of wildlife requires local knowledge of the region to explain why wildlife moves the way it does and identify factors that directly affect movements such as in areas of high roadkill. Tacit knowledge that only local inhabitants can provide enhances the data and provides the explanatory context for observed movement patterns and changes over time. Only those who have lived there all their lives can talk about the impact certain forestry practices had or poaching activities or even interactions between different species of wildlife.

The semistructured interviews were conducted in person at participants' farms, cabins, and so on. Interviews lasted from one to two hours. The initial stages of interviews were used to break the ice and establish rapport. Questions consisted of asking them where they lived, how they came to be here, and what sorts of activities they take part in. The second stage consisted of the key tacit knowledge components:

- What wildlife species were there.
- How their population was distributed.
- What their movements were (e.g., seasonal movements).
- What were their habitats.
- What conservation efforts had been made.
- Where were the roadkill hotspots.
- What were existing threats to wildlife and what mitigation measures could be taken to address them.

During the final interview stage, participants and interviewers situated spatial data on maps that had been created by participants and interviewers. Paper maps were used to physically elicit and capture participants' tacit spatial knowledge because it was easy for them to

Box 4.2 (continued)

draw directly on the maps. They situated where wildlife was and where it was absent, key landmarks, and all significant markers. The maps were then digitized and aggregated thematically. The digital maps thus codified the tacit landscape-based and experience-based knowledge of participants. The consolidated map captured a composite landscape and represented participants' combined knowledge.

The researchers then facilitated a group interview with a subset, the experts among the participants. They validated the tacit knowledge that was captured and resolved conflicts that arose as they worked in smaller groups. They then combined their work into a collective map of their tacit knowledge. During this interview, the researchers documented the level of consensus, the level of confidence, and the rationale provided by participants (which are all also forms of tacit knowledge). The facilitated workshop was continued until all participants reached a consensus. This is an excellent example of how individual and group knowledge elicitation interviews can be combined.

The resulting map can now be used to analyze the patterns of wildlife movement, such as bear and moose, to better understand threats to them from highways or a rise in sea level due to climate change. The captured tacit knowledge will be of great value in designing conservation methods for this region because decisions will be based on valuable collective tacit knowledge.

> The use of local tacit knowledge and participatory mapping represents a rich contribution towards a unique and robust dataset for conservation planning, research and decision making. . . . The engagement of knowledgeable community members was effective for eliciting and incorporating social and ecological knowledge. (Needham, Beazley, & Papuga, 2020, pp. 24–25)

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 is 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 that remains in the conscious memory longer and creates more memory traces than information without a context. Stories can greatly increase organizational learning and communicate common values and rule sets.

Stories naturally emerge during semistructured interviews, or they will with prompting. Most experts call on examples to illustrate their points. If they don't, then the interviewer can ask questions, such as "Do you remember a project where this happened?" Other useful prompts include asking experts to recall examples of successes or project achievements that they are particularly proud of. Next, experts could be asked to describe particularly challenging events. These questions are loosely based on the critical incident technique developed by Flanagan (1954). As the name implies, participants recall significant events and then describe both positive and negative aspects of what happened.

However, several conditions must be in place before storytelling can create value in an organization. Sole and Wilson (1999) argue that, although 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 or prompt a change in behavior, communicate the organizational culture, and create a sense of belonging. To achieve these organizational objectives, knowledge-sharing stories need to be authentic, believable, and compelling. Stories need to evoke a 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 on. In other words, organizational stories should have an impact: they should prevent mistakes from being repeated or promote organizational learning and adoption of best practices stemming from the collective organizational memory.

Denning (2001) describes the power of a springboard story, or knowledge captured in a brief story that creates a strong impact. He outlines key elements required to use stories to encapsulate valuable knowledge:

- The story should be relatively brief and just detailed enough so the audience can understand it.
- The story must be intelligible to the 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.

Fables like Aesop's (1968) are helpful in tacit knowledge capture. A simple approach is to invite participants to a workshop where they are given several classic fables to read, are asked to recollect some they had heard, and identify the lesson in each. Fables are particularly useful with multicultural groups because fables are ubiquitous but differ from one culture to another. Next, participants are given a fable minus the punch line and 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—and have the reader learn from it. Participants also become sensitized to stories, like fables, needing to be concise. A fable can consolidate multiple viewpoints and recollections of different individuals because it is not dependent on a single story to deliver its message (Snowden, 2001). Finally, the best way to end a fable—the punch line—is to have an ironic ending in which the reader realizes how a happy ending could have come about without the narrative stating it.

Two illustrations of the value of storytelling in the capture of tacit knowledge are in 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 looks at each key task an expert performs and characterizes them in terms of prerequisite knowledge and skills, criticality, consequences of error, frequency, difficulty, interrelationships with other tasks and individuals, and how the task is perceived by the person (routine, dreaded, or looked forward to).

Process tracing and protocol analysis are adapted from psychological techniques and involve 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., Gammack & Young, 1985; McGraw & Seale, 1987). Simulations are especially effective for later stages of knowledge acquisition—to validate, refine, and complete the knowledge capture. Tools may include software programs and props such as models, schematics, and maps.

Learning by being told is simulated teaching, in which the expert teaches the novice (the interviewer). To structure such interactions, a modified form of cognitive task analysis (Crandall et al., 2006) and critical incident techniques (Flanagan, 1954) can be used. Cognitive task analysis identifies the cognitive skills a person needs to carry out a task successfully. Critical incident theory has participants recall and describe a time when they accomplished a task or completed a project that had a significant impact (either positive or negative).

Box 4.3
IBM and Xerox

IBM

Storytelling allows us to uncover knowledge in the context of its use. IBM views stories as a powerful means of knowledge discovery and knowledge transfer. They convey complex messages simply, such as values and other complex tacit company knowledge. Stories exist in all organizations; managed and purposeful storytelling provides a nonintrusive, organic means of producing sustainable cultural change. Storytelling is the most powerful means of sharing tacit knowledge. 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. Failure stories, or lessons learned, help a community 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 is intervention/communication design, in which a story is constructed or enhanced; the final phase is story deployment. Storytelling workshops can elicit the knowledge and cultural values of an organization as well as 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 of 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. Perhaps most importantly, it achieves buy-in from participants.

Captured anecdotes 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 or skill profiling).

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

Xerox

Of course, creating rich environments where people can share is not enough. Also required are good ideas, leadership, and motivated people. Jack Whalen, a sociologist, spent some time in a Xerox customer service call center outside Dallas studying how people used Eureka, Xerox's knowledge repository. But employees were not using it. Management

Box 4.3 (continued)

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 Carlos, an eight-year veteran who earned more than nine hundred points. Carlos really knew his stuff and everyone else knew this too. Carlos never used the software.

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

Experts are asked to start off with a routine task or problem that they have to frequently deal with, one that could be performed with their eyes closed. The interviewer then asks why this is so simple and straightforward and notes the key attributes listed by the experts. Next, experts are asked to concoct the perfect storm: the most difficult challenge they have faced in their career. They can be encouraged to combine elements of more than one critical incident in their experience to make this example as extreme as possible. The same probing question is then repeated: what makes this example so complex and difficult? The attributes of the two scenarios are then compared by the experts. The last question asks the experts to list a few examples of normal projects and again go through their key features. In this way, the interviewer elicits stories and also gains an understanding of the key factors involved in the experts' decision making and judgment.

Learning by observation There are at least two types of discernible expertise: skill- or motor-based (e.g., operating a piece of machinery or riding a bike) and cognitive expertise (e.g., making a medical diagnosis). Expertise is a demonstration of the application of knowledge. Learning by observation 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, always accommodate the expert or interviewee—many are uncomfortable if they know they are being recorded. The happy medium is to bring along recording equipment but give experts the choice of handling the controls—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.

Video-based knowledge elicitation Van Braak et al. (2018), among others, describe the potential of video interviewing in eliciting valuable tacit knowledge. They note that mainstream qualitative research tools such as surveys and interviews are effective but can provide only a limited number of stimuli to prompt experts to articulate their expertise. Many experts find that photos or other visual materials can add depth to their explanations. Van Braak et al. outline a specific use of video to record an expert while he or she is performing a task as a way of focusing on reflection rather than recall. Human memory has well-known limitations, such as unreliability and memory editing. Reflective knowledge elicitation asks experts to make sense of their past behavior. The interviewer collaborates with the expert to construct the meaning of elicited tacit knowledge as soon as it is articulated by the expert. Of course, this method is not feasible in all contexts because it is labor intensive and may not apply to expertise that is less visible.

More broadly, however, video interviews hold promise for tacit knowledge elicitation. Everyone is now equipped with the means of photographing and videotaping themselves and putting this content out as a TED talk or on YouTube. Sampath (2018) refers to Burja's "The YouTube Revolution in Knowledge Transfer," in which Burja contends that the advantages of capturing tacit knowledge that others can then watch and emulate are increasing in popularity over time. It is possible to observe real experts and learn how they do what they do. Watching someone is very different from listening to someone explain what they do. A recording has the added benefit of being paused, rewatched, and annotated, which helps transfer the tacit knowledge.

Other methods of tacit knowledge capture Other techniques—including road maps, learning histories, peer assists, knowledge and innovation jams, and exit interviews (part of knowledge continuity management discussed in chapter 12)—also capture tacit knowledge from individuals and groups.

Road maps are facilitated problem-solving meetings that are scheduled and convened and that follow an agenda. The objective is to solve day-to-day problems in a public forum, which often leads to guidelines and even standards for continuous process improvement within the company. Recording these sessions makes them useful for internal benchmarking, or monitoring progress against goals over time (comparing snapshots with an initial baseline) or comparing the performance of one unit with another's within the same company.

Learning histories (Roth and Kleiner, 2000) are useful for capturing tacit knowledge within group settings (table 4.1). They represent a retrospective history of significant events in the organization's recent past, as described by people who took part in them, and are often referred to as project postmortems, postproject reviews, or after-action reviews (described in greater detail in chapter 11). Organizational history is often researched through a series of initial individual interviews where participants are asked to remember and reflect on the event, followed by a facilitated workshop with all participants to capture that group's memory (McIntyre et al., 2015).

Peer assists can be defined as

> face-to-face or virtual gatherings that bring colleagues together to share knowledge, best practices, or lessons learned on a particular topic. In a peer assist, an individual or group presents an issue or challenge that they are facing in their work to another group with experience in that issue. By sharing their thoughts and suggestions, the experienced group and the hosts engage in participatory learning. Peer assists are customizable depending on the topic, location, and available time. Regardless of the subject matter, it is important to clearly define the session's objectives to ensure that they can be met within the designated timeframe. (USAID, n.d.)

Peer assists are peer-to-peer learning that elicits and shares tacit knowledge in organizations. Yahya and Goh (2002) describe how the oil company BP made use of peer assists to leverage the company's KM and HR departments to promote organizational learning. Employees found that they could often get help and insights from people who were not part of their team. This is sometimes referred to as thinking outside the box, and there was an additional benefit in that participants developed connections with one another. Peer assist meetings should be structured to ensure that effective knowledge creation and capture takes place. Typical meetings have six phases:

1. The team presents the background and the problem to solve.
2. Participants are asked to consider the problem so that they understand it well.

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, and so on.
Part 2: Description	Chronological commentary, conclusions, and the questions that were asked and the responses; quotes representing key responses to questions should appear as separate right-hand-side column and be aligned with the content the quote refers to.
Part 3: Summary	Brief summary of quotes, additional questions to provide more clarity to the theme; a standalone section made available to and understandable by nonparticipants.
Part 4: Best practices	Description of 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 the 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 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 lessons learned • Problem statement (what does the lesson learned 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)

3. Participants attempt to solve the problem, often beginning by identifying what additional information is needed.
4. Participants recall whether they faced similar problems.
5. Participants informally present their initial thoughts and outline options, drawing on their collective experience. The team who requested the peer assist should then take the time to thank all the participants for their input.
6. Participants discuss what they learned and plan the next steps to tackle the problem.

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

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

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

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

These knowledge transfer processes are built into succession planning, onboarding, and even routine evaluations if an organization is to become a true learning environment. Leonard, Swap, and Barton (2014) coined the term "deep smarts" to refer to the collective experiential tacit knowledge of an organization. They note that the knowledge most important to an organization is the practical accumulated know-how gained directly from experience and, at the same time, aligned with organizational goals. They recommend making individual knowledge institutionally available rather than conducting a series of interviews with individual experts. This is more difficult to do and will require resources, especially time, but will provide more benefits in the long term. In other words, every employee continuously contributes his or her experiential learning to an organizational memory system.

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

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 template for a knowledge acquisition session is shown in figure 4.5. It is important to always send back transcripts and summary forms to the people interviewed. This validates and completes 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 qualitatively different from processes at the individual and group levels. Whereas in the latter levels we are primarily concerned

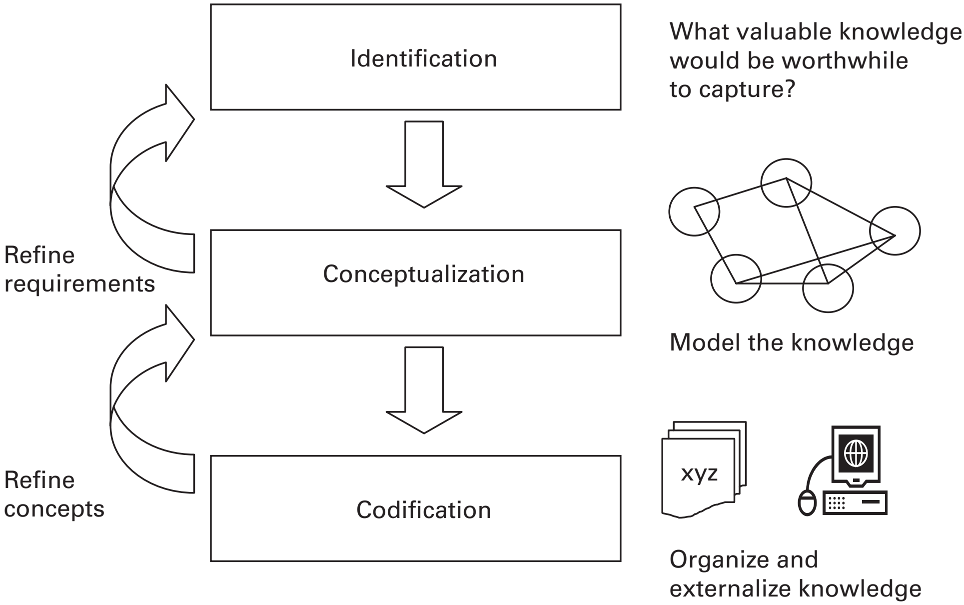

Figure 4.4
Key knowledge acquisition phases

with identifying and coding valuable knowledge, which is mostly tacit, organizational knowledge capture takes place more on a macro level.

The results of organizational knowledge capture will ultimately reside in a knowledge repository, usually a database on an intranet or extranet. The capture of such knowledge has, in large part, already occurred, which means we can proceed directly to its codification.

Sampath (2018) outlines eight ways to capture tacit knowledge in organizations:

1. Organizational culture: establish incentives for knowledge-sharing activities such as meetings, conferences, lunch and learns, and town halls to ensure valuable tacit knowledge is spread more widely throughout the organization.
2. Mentoring: match senior employees with newer employees and use techniques such as job shadowing to instruct them on how things work in the organization.
3. Collaboration: encourage and reward teamwork, support collaboration using technologies such as social media and MS Teams, and bring together people from different units as much as possible to work together but also just to get to know one another.
4. Document: user guides, checklists, manuals, presentations, tutorials, policy, stories, case studies—document whatever can be documented and preserved in such a way that it is easily findable.

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

5. Meetings: meet to integrate best practices when starting a new project and to debrief on what went right and what went wrong during a project and after it is completed.
6. Informal groups: internal forums allow people to get work-related advice; these can be CoPs that also have a social component to help support collective learning and tacit knowledge sharing.
7. Experiential training: on-the-job training, demonstrations, and simulations show how to do something (through observation); workshops and conferences inform employees why this is the way to do it and expose them to different perspectives.
8. Professional and social networks: let employees set up their internal profiles and list their areas of expertise, update their status, share articles, and so on. This can be an internal private LinkedIn platform. Many organizations also use Yammer to set up internal conversation threads.

Malamed (2020) adds the following:

9. Show your work: as described by Bozarth (2014), find ways of making your work visible to others. This can be through recording a narrative as you work (thinking aloud, as described earlier in this chapter).
10. Storytelling: organizational stories are effective to both capture and share tacit knowledge in an organization. Structured interviewing of experts who are about to retire and of organizational experts militates against the loss of valuable tacit knowledge.

Finally, automated methods use data mining, text mining, and similar techniques to uncover patterns in data. Ting et al. (2011) developed an automated system to elicit tacit medical knowledge. The system mines the clinical information in electronic health records and presents the results as a knowledge map. Their results show that the knowledge elicited was more reliable than that obtained by traditional methods such as interviewing. Physicians rated the system very highly owing to the quality of evidence-based decisions that it could support and the accessibility of the knowledge as a visual map.

Others have also used electronic health and medical records to mine the tacit knowledge of medical informatics and make it more available for physicians to share with one another (e.g., Hersh, 2009). These records can be thought of as explicit knowledge containers that contain tacit medical knowledge. Tacit knowledge acquisition is thus completely automated and converted into explicit knowledge using concept mapping to show the logic behind the diagnosis and medical decision making. The advantage of presenting this now codified tacit knowledge graphically is that other physicians, especially more junior ones, can more easily follow the logic flow.

Summary of Tacit Knowledge Elicitation

In summary, the value of tacit knowledge is that it contributes the know-how and the know-why to the explicit knowledge of know-what. Without tacit knowledge, explicit knowledge can remain unleveraged. Tacit knowledge accumulated through years of experience brings the expertise to practically apply explicit knowledge to solve organizational problems, make decisions, take actions and ensure sustainability, survival, and innovation.

Several dimensions can be used to summarize the different approaches to elicit tacit knowledge (e.g., Gavrilova & Andreeva, 2012). These include the following:

- Direct or indirect
- Manual or automated
- Passive or active
- Individual or collective (group)
- Verbal and textual or multimedia

Table 4.2 summarizes the tacit elicitation techniques discussed in this chapter and characterizes them according to these dimensions.

Explicit Knowledge Codification

Knowledge can be shared through personal communication and interaction. We saw this in the first quadrant, socialization, of the Nonaka and Takeuchi KM model (see figure 3.1). This occurs naturally all the time. Although this process is effective, it is rarely cost effective. Interaction is limited to those within hearing or able to have face-to-face contact. Knowledge codification is the next stage of leveraging knowledge. By converting knowledge into a tangible, explicit form such as a document, that knowledge can be communicated much more widely and with less cost. Documents can be disseminated widely over a corporate intranet, and they persist over time, which makes them available for reference when they are needed, by existing and 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 the following:

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

Table 4.2
Summary of tacit knowledge elicitation approaches

Approach	Direct (D) or indirect (I)	Manual (M) or automated (A)	Passive (P) or active (A)	Individual (I) or group (G)	Verbal (V), textual (T), or multimedia (M)
Interviewing	D	M	A	I, G	Mostly V
Storytelling	D	M	A	I, G	T, M
Protocol analysis	I	M	P	I	V, M
Observation	D	M	P	I, G	V, M
Video	I	A	P	I, G	M
Ad hoc session	D	M	A	G	V
Road maps	D	M	A	G	V
Learning histories	D	M	A	G	V
E-learning	I	M	P	I, G	M
Learning from others	I	M	P	I	M
Peer assists	D	M	A	G	V
Knowledge jams	D	M	A	G	V
Knowledge continuity	D	M	A	I	V, M
Critical knowledge transfer	D, I	M, A	A, P	I, G	T, M
Master class	D	M	P	I	T
Data mining	I	A	P	I, G	T, M

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 CoP 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, in terms of both audience and time duration. To understand, maintain, and improve knowledge as part of corporate memory, knowledge must be codified. The codification of explicit knowledge can be achieved through 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 represents 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 knowledge because it captures the context and the complex interrelationships among the different key concepts. Individual views, perceptions, judgments, hypotheses, and beliefs are important to include because they form part of the subjective worldview of the interviewee. The nodes in a map are the key concepts, and the links represent the interrelationships among the concepts. These may be drawn manually, by taping small note pages on a wall or a whiteboard, or using visualization software (ranging from simple brainstorming mapping tools to three-dimensional depictions). Figure 4.6 shows an example of a cognitive map drawn in response to a request to describe 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 in which nodes represent key concepts connected by links representing propositions. These are quite like the semantic networks used by such diverse disciplines as linguistics, education, and knowledge-based systems. The goal of such systems is to better organize explicit knowledge and to store it in corporate memory for long-term retention.

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

1. Task model of the business processes of the organization
2. Agent model of the use of knowledge by executors, both human and artificial, to carry out 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

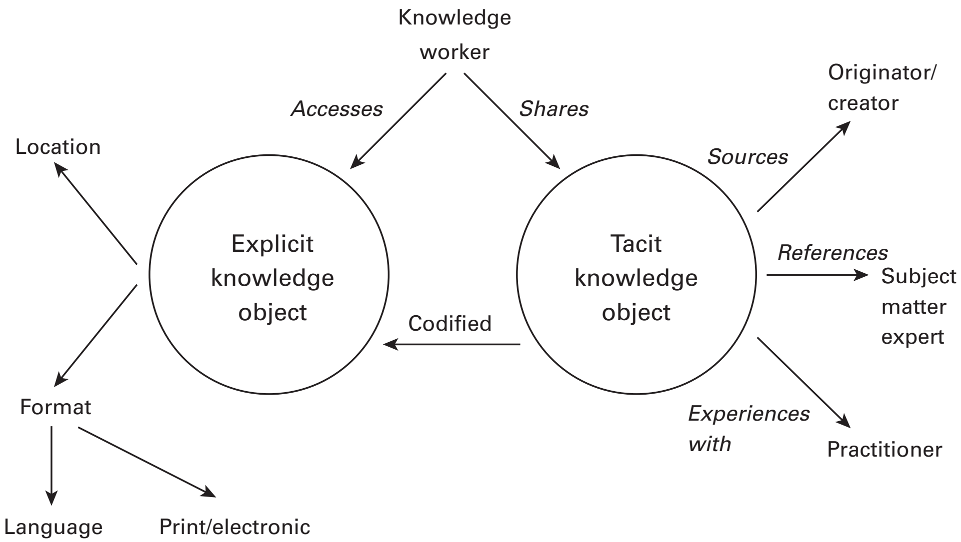

Figure 4.6
Example of a concept map

To implement CommonKADS, the organization is analyzed to identify knowledge-oriented problems, describe the organizational aspects that may affect knowledge solutions (e.g., culture, resources), and 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 it is used in, and whether 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 compact and efficient. The decision tree is typically a flowchart, with alternative paths indicating the impact of different decisions being made at that juncture point. A decision tree can represent many rules, and when you execute the logic by following a path down it, you are effectively bypassing rules that are not relevant to the case in hand. You do not check every rule for applicability, and you can take the shortest route to the correct outcome. Decision trees' graphical nature makes them easy to understand, and they are obviously well suited for coding process knowledge—for example, 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 when parts wear out. Another example, shown in figure 4.7, helps guide the decision to consolidate or to develop a new product as a risk management decision tree.

Knowledge Taxonomies

Concepts can be thought of as the building blocks of knowledge and expertise. We each have our own internal definitions of concepts we use to make sense of the world around us. Once key concepts have been identified and captured, they can be arranged in a hierarchy that is often referred to as a 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

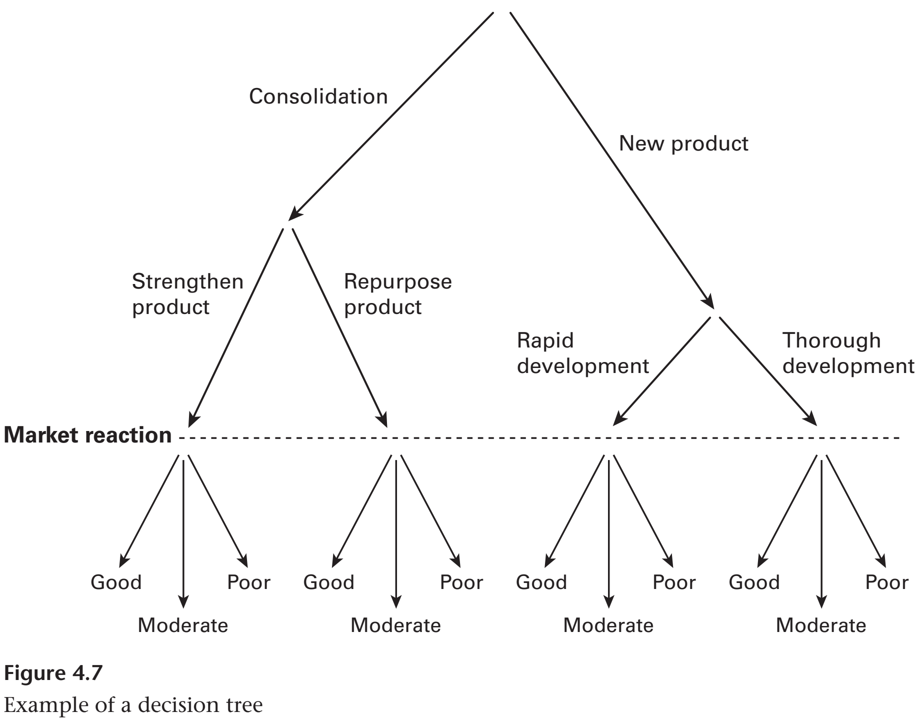

Figure 4.7
Example of a decision tree

organization at large. A knowledge dictionary is a good way to keep track of key concepts and terms that are used. This may be compiled as you acquire and code knowledge, and it should clearly define and clarify the professional jargon of the subject matter domain. However, although it is a good starting point, a knowledge dictionary is not sufficient to organize knowledge.

On the positive side, explicit knowledge is tangible; on the negative, there is so much of it that most users cannot find the valuable organizational knowledge they need to do their work. Tacit knowledge needs to first be identified and then codified to the extent possible. The remaining tacit knowledge is "pointed at" in the sense that we can at least document who knows what. The knowledge repository of an organization needs to be organized so that every knowledge worker can easily and quickly (and accurately) find what is needed. The second step in compiling a knowledge dictionary is creating a knowledge taxonomy. At first, the need for a taxonomy may not be obvious. Some decision makers invariably ask why a good keyword search engine can't do what is needed, but using only keywords to find content has drawbacks, discussed in more detail in chapter 6. One issue is choosing the right keywords. Another is that unstructured content is difficult.

Unstructured content that has been filed without reference to any standards or guidelines is typically scattered throughout the organization on numerous noninteroperable systems. Adding to the difficulty is that there is usually a large amount of legacy content that has already been accumulated and the taxonomy development is being brought in too late. Other typical challenges are many users not being familiar with taxonomies and their development (and their benefits) and the need to keep the taxonomy updated (high maintenance requirements), partially because the useful lifespan of knowledge (actionable knowledge) should be quite short. Taxonomy development is a dynamic and ongoing organizational process.

Taxonomies are basic classification systems, typically hierarchical, that enable us to describe concepts and their dependencies (figure 4.8). The higher up the concept is placed, the more general the concept is. The lower the concept, the more specific an instance it is of higher-level categories.

> Just as a library would be of little use if it failed to organize and catalog its books, so accumulated business information provides little value to an enterprise unless it is organized into a logical, consistent framework for retrieval or analysis. (Walli, 2014)

An important concept that underlies taxonomies is the notion of inheritance. Each node is a subgroup of the node above it, which means that all the properties of the higher-level node are automatically transferred from "parent" to "child." As shown in

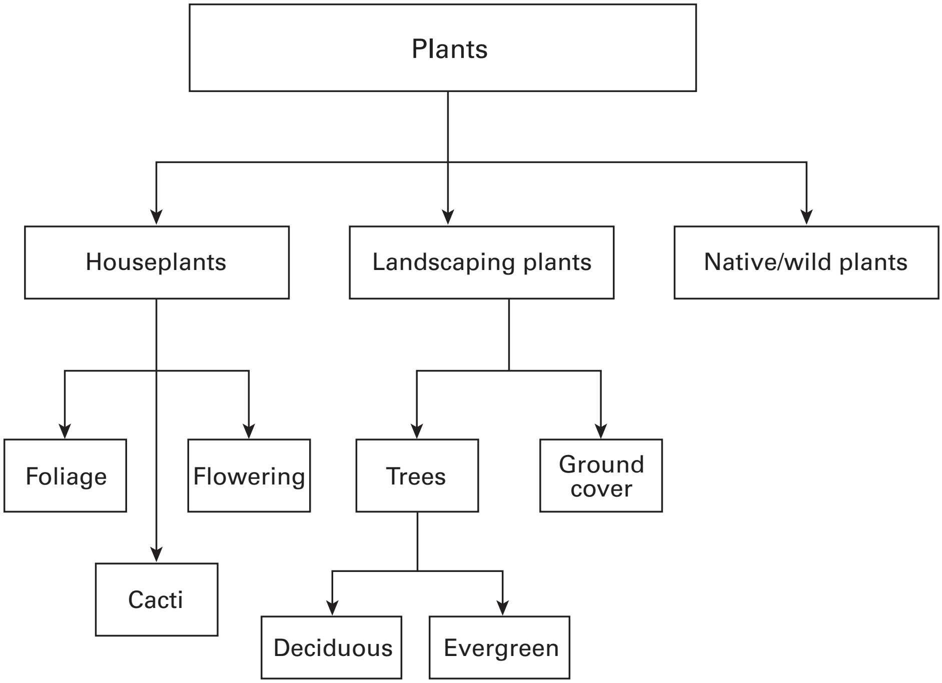

Figure 4.8
Example of a knowledge taxonomy

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 a 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 taxonomy's classification scheme, which cannot be theoretical but must be empirical (i.e., reflects how people actually name and group content in their work). Unlike traditional taxonomies, such as the first comprehensive biological species taxonomy developed by Linnaeus (1767), an organizational taxonomy's purpose is not to come up with a universally accepted way of describing reality. An organizational taxonomy, in contrast, is a mixture of a depiction of concrete components and abstract concepts that together make up the context of that company. Consensus is vital because the taxonomy serves to help achieve the goals of the organization by helping knowledge workers communicate better, code knowledge better, and organize coded knowledge in such a way that it can be used by everyone today and in the future when workers 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, as opposed to specific instances of a category. Classification schemes can be personalized, such as the names we give our personal email folders or desktop files. There is no problem because there is typically only one user—you (and you usually 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 an email subject heading and before naming a file to be sent as an attachment. Why? The names must make sense to you and the recipient. We have no choice but to standardize a bit more and achieve some consensus if a number of people are working with the same content. At a 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 of course rarely feasible (and not cost effective), so developing an organizational thesaurus, along with a knowledge dictionary, will help. The thesaurus will contain all the synonyms and cross-references prevalent in the organization—for example, one group decides against using "knowledge management" and prefers "knowledge sharing," but another division uses "knowledge networks." All three terms would appear in the thesaurus, allowing some customization at the level of the different groups, but *knowledge management* would be highlighted as the formally accepted term for the organization. Another benefit of a good thesaurus is that a keyword search engine can use each term to retrieve all relevant content (see chapter 8).

Most small- and medium-sized organizations will primarily use a procedure manual to develop a taxonomy, and larger organizations may be better positioned to purchase the expensive automated software tools available. In all cases, however, a hybrid approach is best. Although automated systems provide a start, especially when the volume of existing legacy content is significant, human intervention is almost always needed to correct and refine the classification—and, of course, to ensure consensus. Several manual taxonomy techniques help groups work together to create the categories and develop a thesaurus. The most popular techniques are card sorting (Nielsen, 1994) and affinity diagramming (Gaffney, 2000).

Card sorting is a low-tech method of understanding users' mental models of how knowledge should be organized. The best tools to use are index cards or sticky notes, such as Post-it notes, 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, a preliminary taxonomy is already in place. Open card sorting is better for understanding participants' perceptions, and closed card sorting is better for validating an existing taxonomy (e.g., document classification scheme or web navigation design).

The general steps are to distribute the cards to participants and ask them to group the 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 (and jot down why they were rejected). The user groups should be diverse to represent the organization as a whole, and each can be homogeneous (if seeking a consensus) or heterogeneous (to have a broad taxonomy and to create a thesaurus). A mixture of both types of groups is 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.

Card sorting requires a representative sample of participants to ensure that all organization-wide perspectives and contexts are well represented. There are two general high-level approaches: in fixed (or closed) card sorting, the cards already have labels on them, and in open card sorting, each card is labeled by participants (Coxen, 2004). In most knowledge taxonomy development efforts, a combination of the two will likely be used. Some prelabeled cards can be used to get things started, and participants can then add others. In this collaborative process, terminology and categories are cocreated and consensus reached. A knowledge manager or taxonomist facilitating the workshop ensures that all voices are heard, all points of view are respected, and discussions are collegial (even if the end result is an agreement to disagree).

Users stop when they feel they have exhausted all the possibilities. The facilitator may ask them to try to aggregate cards into bigger groups if there are too many groups (a good rule of thumb is the "magical number" of seven plus or minus two, which Miller (1956) found is the number of items our cognitive abilities can best handle). Once everyone has finished, the facilitator enters everyone's results into a spreadsheet. There will be some agreement at the outset about groupings and some disagreement. A statistical technique called cluster analysis can provide a visual representation of the results. Groupings that were different may be due to using different labels to denote the same concept or may indicate that additional subcategories are required. Once the preliminary taxonomy has been completed, the same participants may be asked to validate this classification scheme through a closed card-sorting exercise.

Jiro Kawakita (1991), an anthropologist, created the affinity diagramming method in the 1960s as a means of sorting large numbers of brainstormed ideas into groups, which are 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 participants sort the notes or cards according to the relationships they see among the items. Each group is then given a name. The participants explain both their grouping and their naming. The same idea may belong to more than one group. Again, small numbers of groups are most efficient (groupings of seven plus or minus two). Box 4.4 is an example of an expertise locator system.

As discussed in the section on knowledge elicitation ("Tacit Knowledge Capture at the Individual and Group Levels"), a modified form of the Delphi method can be used to present the nomenclature and the categories that result from the card sorting to a group of experts. The experts then participate interactively in a facilitated group session to validate, revise, or otherwise change the resulting taxonomy. A representative cross section of users, taxonomy experts, researchers, practitioners, and those who play a role in the governance (e.g., taxonomy policy) is best. The advantage of using either the classic Delphi method or a modified form is that it offers a system for arriving at a consensus of expert opinions (e.g., Dalkey & Helmer, 1963; Hsu & Sandford, 2007).

Although card sorting originally was done in person using physical cards, it can be partially or completely automated by using software. An example of automated card sorting is 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; see Johnson, 1967), multidimensional scaling (e.g., Kruskal, 1977), affinity modeling (also known as the KJ method; see Kawakita, 1991), or network scaling (e.g., Schvaneveldt, Durso, & Dearholt, 1985). Cluster analysis classifies data that is initially unclassified. In hierarchical cluster analysis, the groupings are arranged as a hierarchical tree. Repertory grid analysis is rooted in a theory that each person functions as a scientist who classifies, or organizes, his or her world, and individuals construct theories and act on the basis of these classifications and 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 4.3.

Card-sorting workshops can be conducted remotely, which became necessary during the COVID-19 pandemic. In-person card sorting has the advantage of allowing richer, more interactive, and real-time discussions, but remote sessions can also offer

Box 4.4
A Vignette: University Blue Book

A large North American university contacted its library school for 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 central reference tool that would enable the groups to quickly contact the researcher most appropriate to their needs; respectively, to present research to a group of potential philanthropists, to answer questions from the media regarding a current event, and to meet with companies interested in commercializing results of research at the university. Some researcher profiles existed, but they were scattered over personal websites, university departmental web pages, and other standalone applications. The challenge was to present the same research to three different target audiences, each with its own preferred terminology.

The information science students 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 for the preprinted cards. A multifaceted taxonomy (described in greater detail later) was the result and was accompanied by an extensive thesaurus. The database captured the three different perspectives (four, really, counting each researcher's preferred terminology and groupings). Each user group became a facet and could search the database using its specific perspective and its specialized language.

An example of the system's usefulness is the following:

Educational researchers work on social cognition and emotional intelligence (terms used by the researchers themselves) issues to better understand the antecedents of peer pressure and bullying. A cyberbullying incident brings reporters to call the education department to find someone to speak on the topic (Kowalski, Limber, & Agatston, 2008), and the term popularized by the media is *cyberbullying*.

The donor relations department wants to showcase some of the research being done with adolescents to garner the interest of potential philanthropists who have expressed interest in this specific age group.

A computational linguistics company that identified online hate literature is interested in adapting their software to identify instances of cyberbullying.

At least eight different but related tags apply to this small specialized field of research: social cognition, emotional intelligence, peer pressure, bullying (a subgroup of peer pressure), cyberbullying (a subgroup of bullying), adolescent behaviors, online hate literature, and computational linguistics. The database can easily substitute equivalent terms to better respond to the information seeker's needs and to better adapt to the terms they are more familiar with.

Table 4.3
Major taxonomic approaches to knowledge codification

Taxonomic approach	Key features
Cognitive or concept map	• Each key concept is represented as a node in a graph and the relationships between these key concepts are explicitly defined. • Can show multiple perspectives on the same content. • Fairly easy to produce and intuitively simple to understand.
Decision tree	• Hierarchical 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, more specific knowledge to automatically inherit all attributes of the higher-level parent concept they are related to. • More complex, and will require more time to develop because it must reflect user consensus.
Automated knowledge taxonomy	• Several 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 to form subgroups or thematic sets. • Good solution if there is large amount of legacy content to sort through. • More expensive and still not completely accurate—will need to be validated and refined for maximum usefulness.

benefits. Remote card sorting can reach more participants, and some may find it easier to express their opinions when they are participating remotely (more time to think, easier to insert their voice in the discussion). Participants whose first language is not being used during the workshop may find it easier to type their contributions because they can check spelling and grammar.

In addition to a hierarchy, taxonomies can organize knowledge as lists, trees, polyhierarchies, matrices, facets, or system maps (Lambe, 2007). Organizational knowledge is often best represented using a multifaceted taxonomy or polyhierarchy that makes use of more than one classification rule (or facet). The guideline is that each facet be clearly distinguishable from the others (e.g., shape, color, and cost are three facets that do not overlap in any way). Facets should ideally be orthogonal, or not correlated with one another, but they can be more flexible when applied to organizational knowledge.

Another guideline is that each facet can be clearly understood by all users (if they are not, a thesaurus is needed to keep track of equivalent terms).

The multifaceted taxonomy is an excellent fit for knowledge because it can better accommodate the complexity, subjectivity, and dynamic nature of the content. Although it requires more effort to set up, its benefits will more than make up for this extra effort because users will be able to search using multiple attributes. The incorporation of multiple facets is more likely to capture all the perspectives on a given best practice, for example, or the different ways of classifying, to make visible a lesson learned. The lesson could be the type of person or team involved, the root cause of the problem, or which organizational unit was involved. This is a significant improvement over having to come up with precise keywords, and there is the added benefit that simple exposure to the way knowledge is organized in a company will help employees better understand their company and how things work and how things are done.

Good examples of a faceted taxonomy may be found at http://wine.com, which classifies wine according to region, taste, price, and so on, and http://www.epicurious.com, which classifies recipes according to event, type of cuisine, time to prepare, and so on. Others that most will be familiar with include iTunes (for music), Amazon (for online shopping), and the US national firefighters' lesson learned system (http://www.firefighternearmiss.com/). A multifaceted taxonomy is often used for business content, because 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 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.

Although collaborative, or social, tagging and "folksonomies" continue to be very popular, these tend to be better suited for personal pursuits such as personal photo collections or social media content. A folksonomy allows users to create and use their own tags, which is not structured enough for an organizational taxonomy, but a hybrid approach may prove useful. An example is TaxoFolk by Kiu and Tsui (2011). A hybrid approach could, in theory, combine the best of all possible worlds and provide the added bonus of creating a more inclusive taxonomy. A top-down taxonomy is typically designed or at the very least validated by a specialist (e.g., a taxonomist) or someone in authority. However, it is almost impossible to include all the possible variations, nuances, and cultural differences that come into play with language and therefore with taxonomies. The fixed portion of the taxonomy could be the top-down cards, and other, blank cards could be filled in by the general population of users. Kiu and Tsui (2011) describe one such approach using an artificial intelligence algorithm that can derive the integrated classifications.

Many decision makers will opt to use automated taxonomy development and maintenance systems. There are several options. Using an existing taxonomy as a starting point may be possible. If the subject area has already been addressed, then it may be possible to find a public or third-party taxonomy. These exist in the business, medical, scientific, engineering, public policy, and academic discipline areas. Most organizations will find that these taxonomies are not specific enough, however, and their subject matter experts will have to expend a significant amount of effort to customize it for their use.

Commercially available taxonomy development tools include Synaptica and SmartLogic. These typically use natural language processing and techniques such as statistical clustering and semantic analysis to analyze topics and subtopics. This is a good example of using big data analytics when the data consists of existing company documents. Most applications work best on text and documents, but managing multimedia and even multilingual content is progressing. WordMap, for example, uses text mining to identify categories that then classify new content. Automated taxonomy software can analyze new content and assign tags, metadata as well as a place in the taxonomy. These approaches will never be 100 percent accurate but they can make a head start, especially if taxonomists are faced with a large volume of legacy data.

Identifying content owners when creating the knowledge taxonomy of the organization is vitally important, to help ensure that content will always be kept up to date. The organization will also have a clear idea of who among 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 for information about information. For example, content should be tagged with content owners, best-before dates, classification information such as keywords, business-specific information such as intended audience, and the vertical industry it belongs to. An illustration appears in box 4.3. A well-crafted taxonomy with these characteristics will not only organize knowledge that is being accumulated but also help knowledge users share this knowledge with others currently in the organization, preserve this knowledge for future (often unknown) knowledge workers, and help all users find and use this knowledge much more easily. These processes are explained in more detail in chapters 5 and 6.

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 adept at structured interviewing (because they conduct reference interviews), developing classification frameworks, and other relevant skills. Analyzing and reworking the tacit and explicit information clarifies what the organization knows and what it needs to know. It is not

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

necessarily cheap or easy, but it captures key knowledge and improves 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.

Notes

1. I thank Rebecca Katz for her contributions to this section.
2. See https://www.blueoceanstrategy.com.

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5 Knowledge Sharing

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

This chapter addresses the social nature of knowledge, knowledge networks, communities of practice, and other ways of sharing knowledge. Several important conceptual frameworks are presented to study the social construction of meaning. Knowledge-sharing groups are situated in a historical context, and their evolution in organizations is described with particular emphasis on the development of social capital. The abrupt shift to working from home during the COVID-19 pandemic is discussed together with its impact on virtual knowledge sharing. Techniques and technologies such as social network analysis 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. Sharing valuable and verified content is contrasted with sharing and disseminating fake news, and how misinformation can be detected and even prevented is discussed.

Learning Objectives

1. Describe the key components of a community of practice.
2. Compare major differences between a team, a knowledge network, and a community of practice.
3. Outline the major phases in the life cycle of a community and the corresponding information and KM needs for each.
4. Define the major roles and responsibilities in a community of practice.

5. Characterize knowledge-sharing channels with respect to the dimensions of social presence and media richness, and understand which are best suited for tacit knowledge sharing and which are better for explicit knowledge sharing.
6. Analyze the flow of knowledge in a community of practice using appropriate tools and techniques to identify enablers and obstacles to knowledge sharing.
7. Discuss how communities can be linked to organizational memory to foster organizational learning and innovation.
8. List tools and technologies used in collaboration and compare their strengths and weaknesses.

Introduction

Once knowledge has been captured and codified, it needs to be shared and disseminated throughout the organization (figure 5.1). The implicit assumption seems to be that users are all good researchers or searchers. Unfortunately, often there has been no training in 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 effectively use the needed information" (ALA, 1989). *Information seeking* rarely appears as a requirement in job descriptions, and yet McKinsey estimates that

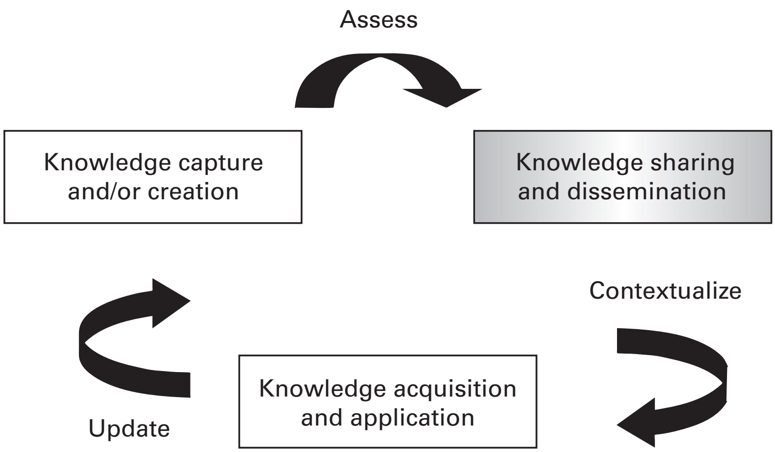

Figure 5.1
An integrated KM cycle

> employees spend 1.8 hours every day—9.3 hours per week, on average—searching and gathering information. Put another way, businesses hire 5 employees but only 4 show up to work; the fifth is off searching for answers, but not contributing any value. (Rosauer, 2021)

Workers succeed in finding what they seek less than 50 percent of the time. In parallel, economists have raised the alarm about the "productivity paradox," or the surprising decline in productivity (as measured by standard indexes) despite massive investment in computers (Harris, 1994). See box 5.1.

This means that although 80 to 85 percent of a company's information is hard-to-access tacit knowledge, explicit knowledge is apparently no easier to find and use. We can only imagine, 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 surveyed forty managers at a large accounting organization to identify the sources of information people used in organizations that had a well-developed KM system or infrastructure (Bartlett, 2000). The results showed that people still first turned to people to find information, solve problems, and make decisions. In fact, the company knowledge base ranked only fourth among the five choices for preferred sources of information, as shown in table 5.1. More recent studies confirm that people prefer to receive knowledge from other people first rather than searching a knowledge base, such as searching for health or COVID-19 information (e.g., Statista, 2020).

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. Not finding information has a cost. Although it is impossible to measure the exact cost of employees not finding information on a company's intranet, the cost analyzer 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 5 and 20 seconds.
4. Enter the average employee's annual salary.
5. Push the Calculate button. (dack.com, n.d.)

Table 5.1
Results of the IBM Institute survey

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

Cross and Parker (2004) also 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 than to an impersonal source such as a database or KM system. 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 re-creating existing information they didn't know existed than they spend creating original material. I was involved in a similar study undertaken with a large aviation company in the United States. This longitudinal study took place over seven years and studied how individuals in the organization sought out and found information. The research team observed highly skilled professionals as they went about their daily work. These workers preferred to contact other people to find, retrieve, and make use of information because it was the most successful strategy.

There are several reasons for other people being the preferred source of information. 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 get the information we were looking for but also learn where it was. The other person may help us reformulate our question or query, may tell us where we were on the right track and where we strayed, and is 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 skills. Talking to other people provides a highly valuable learning activity that is primarily a tacit-tacit knowledge transfer, because this type of knowledge is seldom explicit or captured in a document.

These studies all point to learning being a predominantly social event (Cohen & Prusak, 2001). Present-day organizations have difficulty providing opportunities for such social one-to-one knowledge exchanges in their traditional form—that is, as informal hallway, watercooler, coffee machine, or smoking area chats—because large numbers of employees are widely dispersed. Technology offers a new medium through which employees who share similar professional interests, problems, and responsibilities can share knowledge. This is typically through email groups, discussion groups, and other interactions in a virtual shared workspace hosted by the organization's intranet, and they are often referred to as communities of practice (CoPs).

CoPs can be defined as a group of people, along with their shared resources and dynamic relationships, who assemble to make use of shared knowledge, enhance learning, and create a shared value for the group (Adams and Freeman, 2000; Seufert, Von Krogh, & Bach, 1999). 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 CoP as a knowledge-sharing community within organizational settings originated with Lave and Wenger (1991). Many organizations have implemented CoPs, and an example is provided in box 5.2.

Demarest (1997) distinguishes two basic orientations to KM: information-based (codifying and storing content) and people- or interaction-based KM (connecting knowers). This mirrors the personalization versus codification KM strategies discussed in chapter 3. Information-based approaches focus primarily on knowledge capture and codification, as we saw in chapter 4. The information-based approach tends to emphasize explicit knowledge over tacit and favors the externalization objective. The learner is viewed as a tabula rasa, or blank slate, and content is simply poured into

Box 5.2
An Example: ICL

ICL Consulting has changed its entire organization into communities. These fall into two types: professional and interest. All employees belong to a professional community dependent on their function (sales, project management, consultancy, and so on), and any employee can belong to one or more communities of interest (KM, quality improvement, and the like). 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, developing into a true community spirit. The interest communities regulate themselves and have an administrator to facilitate the web space and other coordination activities.

this container. 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 Brown and Duguid (2017, p. xlv) observe, "Information and individuals are inevitably and always part of rich social networks." Critics maintain that this oversimplifies knowledge and ignores the social context of knowledge (e.g., Conrad & Poole, 2002).

People- or interaction-based approaches, in contrast, place a great deal of emphasis on knowledge-sharing interactions, which in today's organizations tend to be associated with CoPs (Thomas, Kellogg, & Erickson, 2001). This social constructivist approach to learning and knowledge transfer seems to be much better suited to the discipline of KM.

The Social Nature of Knowledge

KM needs to view knowledge as something that is actively constructed in a social setting (McDermott, 2009). Group members produce knowledge by their interactions, and a group memory is created. Social constructivism views knowledge not as an objective entity but as a subjective, social artifact (Berger & Luckmann, 1966). Social constructivists argue that knowledge is produced through the shared understandings that emerge through social interactions. As individuals and groups of people communicate, they mutually influence each other's views and create or change shared constructions of reality (Klimecki & Lassleben, 1999). The social constructivist perspective views knowledge as context dependent and thus as something that cannot be completely separated from a knower (Lave & Wenger, 1991). Context helps distinguish between KM 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 and tangible content.

Huysman and DeWit (2002) describe a collective acceptance of shared knowledge as 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) explains 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 to be described as institutionalized knowledge (Huysman & DeWit, 2002). An example is provided in box 5.3.

Box 5.3

An Example: JPL Information Providers Network

The Special Library at the Jet Propulsion Laboratory of the California Institute of Technology took the lead in forming a CoP for information professionals (Bailer & Hendrickson, 2004). The purpose of this CoP was to promote knowledge sharing and networking to help connect JPL employees. The CoP adopted an inclusive approach—the more the merrier—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 people with a variety of titles, affiliations, and responsibilities within JPL came to the first meeting. Next, a referral directory was developed to identify members (and organizations) of the network having relevant information but not having a network representative. The referral directory is a form of corporate yellow pages, or expertise locator system, and included the following information for each member or organization:

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

Members had access to an email distribution list, but the main CoP channel used was a face-to-face meeting that was held quarterly. At these meetings, the referral database was updated, new projects were reviewed, and news was exchanged with other attendees. At some meetings, speakers presented new tools (e.g., the KM team presented a new knowledge capture template). Only six people were present at the inaugural meeting, but the network gradually grew to about thirty members who regularly attend all the meetings.

Over time, the library-led initiative became a part of the organization. The JPL Information Professionals CoP is a good example of an informal network that self-organizes, or evolves without directives from management sponsors. The library continues to play the lead role, coordinating and not actively managing the CoP. This type of CoP is often referred to as an organic entity—one that is free from strict rules (e.g., membership eligibility), nonhierarchical, informal, participatory, and primarily face-to-face. The JPL CoP has helped break down organizational silos through its interdisciplinary participation. Few if any other such opportunities exist 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 and relaxed, in contrast to reporting to a supervisor. Among their peers, they are open to sharing their knowledge in a mutually beneficial manner.

Because individual memory is limited, we need to embed this knowledge in more permanent forms, such as documents, emails, and so on. This institutionalized knowledge then becomes an organizational legacy that remains in the corporate memory for subsequent generations to learn from. Critically, the context of each item of knowledge must also be captured: when it occurred, who is knowledgeable about it, who submitted it, and so on. Without this context, the knowledge product is not complete and cannot be successfully used, applied, or even understood.

Knowledge Networks

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

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

The existence of a community implies that members have many things in common, including a profession and some goals. A network is all about sharing with those the members relate to. Network members may not know all that much about one another other than some preferences. LinkedIn is a popular business networking site that helps its members connect to other professionals to find a job, a business partner, or industry experts, whereas the Centers for Disease Control and Prevention has networks that are CoPs:

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

However, not everyone agrees with the distinctions and examples provided by Wenger. LinkedIn is not considered to be a KN by many people, because most organizations would require stronger ties and more substantive connections to exist in a network where knowledge is shared and applied to work. Often a critical element of a KN is that members are working together to achieve a common goal—whereas in LinkedIn, the objective of an individual may be job hunting. Another perspective is offered by Pugh and Prusak (2013), who define effective KNs as "collections of individuals and teams who come together across organizational, spatial, and disciplinary boundaries to invent and share a body of knowledge" (p. 79).

Pugh and Prusak (2013) note that KN members share a goal and also social and operational norms. This means that KN leaders can influence knowledge-sharing behavior of members. They propose a typology of four KN goals: coordination, learning and innovation, translation and local adaptation, and support of individual members. Coordination refers to ensuring members share best practices. The learning and innovation goal represents the acquisition of knowledge, both from within and external to the network. New knowledge, new practices, new models, and so on, are cocreated and shared by members. Translation and local adaptation goals refer to identifying and adapting as needed knowledge that can address members' specific problems or challenges. Members are best suited to vet and judge relevancy and contextual compatibility of best practices. The final goal of supporting individual members is the most common goal: a safe space to ask questions and get peer feedback. In some organizations, the KN is an integral part of onboarding employees.

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

1. Leader's theory of change
2. Objectives, outcomes, and purpose
3. Role of expertise and experimental learning
4. Inclusion and participation
5. Operating model
6. Structures and infrastructures
7. Facilitation and social norm development
8. Measurement, feedback, and incentives

The leader's theory of change is his or her expectation of the effect the KN will have—how will member behavior change? For example, will members perceive a greater sense of belonging? Will they form a more cohesive group that shares goals?

Objectives, outcomes, and purpose refer to the specific targeted outcomes of a KN, such as a specific problem to solve, as well as the overall raison d'être of the network. These are usually documented in the KN charter. The roles of expertise and experimentation refer to the duality of knowing and being perceived as an expert, yet also being able to say when you don't know and want to learn something. Examples include safe discussions in which people can admit mistakes, reflect, experiment, and contribute to collective learning. Inclusion refers to the diversity of the members' profiles and the level of comfort in working with people who have different personalities, levels of commitment, degree of autonomy, and other characteristics. The structural operating model is the governance of the KN—any formal policies or guidelines, such as a charter that sets out the roles and responsibilities of leaders and members. The convening structures refer to how meetings are organized, whether they are real-time and face-to-face or technology-mediated, and so on. Facilitation and social norm development identify how the KN will be facilitated, what style or tone will be used, and how good behavior such as reciprocity will be established and sustained. Finally, measurement, feedback, and incentives refer to how the KN is assessed, what data are collected and how, and how participation is rewarded. The four goal types together with the eight dimensions are useful in assessing existing KNs and designing new ones.

Sociograms and Social Network Analysis

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

In the context of KM, SNA maps relationships between people to identity knowledge flows: who do people seek information and knowledge from? Who do they share their information and knowledge with? In contrast to an organization chart, which shows formal relationships (who works where and who reports to whom), an SNA chart shows informal relationships (who knows whom and who shares information and knowledge with whom) (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,

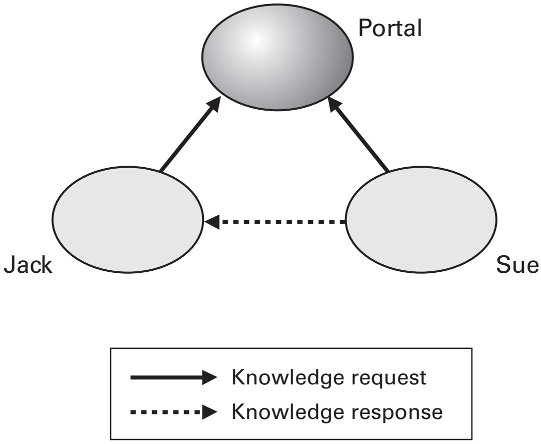

Figure 5.2
Mapping the flow of knowledge

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).

Social relationships and knowledge flows that can be seen can be evaluated and measured. Network theory is sympathetic with systems theory and complexity theory. Social networks are also characterized by a distinctive methodology that encompasses techniques for collecting data, statistical analysis, visual representation, and so on. The results of SNAs can be used at the level of individuals, departments, or organizations to unblock information bottlenecks and to accelerate the flow of knowledge and information across functional and organizational boundaries. A social network should be thought of as a dynamic or moving target, and it will need to be constructed more than once. For example, data gathering and analysis provides 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.

SNA typically uses questionnaires or interviews to gather information about the relationships among a defined group or network of people. Responses are then mapped using a software tool designed for the purpose. Key stages of the process often include the following:

- Identifying the network of people to be analyzed (e.g., team, workgroup, department)
- Clarifying objectives, formulating hypotheses and questions
- Developing the survey methodology and designing the questionnaire
- Surveying the individuals in the network to identify the relationships and knowledge flows among them

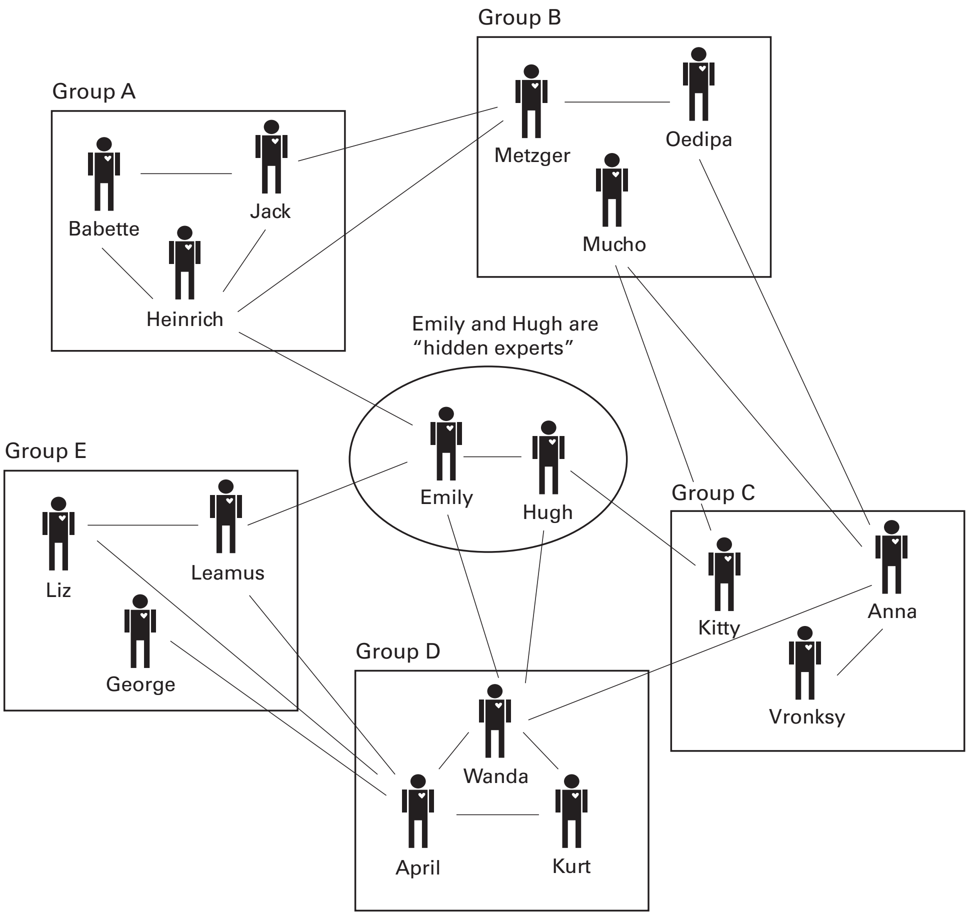

Figure 5.3
Knowledge flow analysis example (adapted from Krebs, 2002)

- Visually mapping out the network with a software mapping tool
- Analyzing the map and the problems and opportunities highlighted in interviews or workshops
- Designing and implementing actions to bring about desired changes
- Mapping the network again after a suitable period

Knowing what information to gather leads to a relevant, meaningful picture of your group or network. Good survey design and questionnaire design are therefore key considerations. Questions address the following:

- Who knows whom and how well?
- How well do people know each other's knowledge and skills?
- Who or what gives people information about x, y, or z?
- What resources do people use to find information, feedback, ideas, or advice about x, y, or z?
- What resources do people use to share information about x, y, or z?

Despite the availability of several different SNA tools, a user-friendly, end-to-end solution that can be applied in a variety of business settings is still needed (Dalkir & Jenkins, 2004). Existing tools have little support, tend to be proprietary, have short track records, and tend to be heavily weighted toward the statistical analysis of gathered data while not supporting initial data collection.

Expertise Locator Systems

Communities are all about connections between people, and these connections are often used to develop an expertise locator system. Although 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.

Software exists for the development of corporate yellow pages (table 5.2 has examples). Most create an initial profile of an individual's expertise on the basis of an analysis of published documents and questionnaires or interviews, whereas others focus on emails. These are popular KM applications and often the first KM implementation a company will undertake, mostly because they can be developed fairly quickly (one to two months) and they can provide almost instantaneous benefits to individuals, communities, and the organization itself.

Expertise locator systems were among the earliest KM applications, and they remain one of the best methods for wider-scale knowledge sharing in organizations.

Knowledge-Sharing Communities

The notion of a community is, of course, not necessarily a new concept. As far back as 1887, writers such as the German sociologist Ferdinand Tonnies compared the more direct, more total, and more significant interactions found in a community with the more formal, more abstract, and more instrument-driven relationships found in a

Table 5.2
Software to develop expertise locator systems

Name	Website
AskMe	http://www.hivemine.com/
Autonomy Collaboration & Expertise Network	https://www.microfocus.com/en-us/solutions/collaboration/
BA Insight	https://www.bainsight.com/expertise-locator/
Tacit Software	https://www.oracle.com/corporate/acquisitions/tacitsoftware/
TrackStar	https://skillstrackingsoftware.com/
WhoKnows	https://corp.whoknows.com/

Source: Garfield (2017).

society (Loomis, 1957). Tonnies argues that there are two basic forms of human will: essential will (the underlying, organic, or instinctive driving force) and arbitrary will (deliberative, purposive, and future or goal oriented). Groups that form around essential will, in which membership is self-fulfilling, Tonnies called *Gemeinschaft* (often translated as "community"). Groups that were sustained by some instrumental goal or definite end he termed *Gesellschaft* (often translated as "society"). The family or neighborhood exemplified Gemeinschaft; the city or the state exemplified Gesellschaft.

More recently another sociologist, Anselm Strauss (1978), describes Internet communities as "social worlds." Even before there was an Internet, there were "invisible colleges," which consisted of academics who, though spread 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 an age-old social glue. These early communities were made possible by the printing press and are sometimes referred to as textual communities, because they circulated primarily 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.

The first virtual communities emerged about a decade after the establishment of the Internet. The Internet itself was an initiative called ARPANET and intended to make it easier for researchers to share large data files. 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) argue that virtual communities have economic and social significance. Like Rheingold, they recognize that virtual communities are based on the affinity among their participants, which encourages them to participate in ongoing dialogue with each other. Knowledge sharing among 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 accompanied 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 quickly became apparent that this medium worked well but only after participants had met in person and established some 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, & Harrison, 2001). Many presentation coaches quote the landmark studies by Albert Mehrabian (1981) that identify communication as 55 percent visual, 38 percent vocal, and 7 percent verbal.

Brown and Duguid (2017) point out the neglect of the social aspects of knowledge sharing when they note that documents do more than merely carry information. They "help structure society, enabling social groups to form, develop, and maintain a sense of shared identity" (p. 177). The community-forming character of the Internet is by now well known. For example, several 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 messaging systems between users. Similarly, transactional websites such as eBay and Amazon hold value in terms of not only their product offerings but also the ability of visitors to the site to annotate content and thus communicate with other visitors.

Although technology is a feature of some communities, technological means of interacting was not a necessary component of communities. Technology comes into play when members are dispersed and have fewer occasions to meet face-to-face. The critical components of a community lie in members sharing common work problems and a membership that sees clear benefits of sharing knowledge among themselves and who have developed norms of trust, reciprocity, and cooperation. Of course, all this changed with the advent of the COVID-19 pandemic, when most employees found themselves working from home. This full-time remote working evolved into a hybrid mode of work starting in 2021. The impact of remote knowledge sharing was quite sudden and significant, particularly with respect to the sharing of valuable knowledge in general and tacit knowledge more specifically. Remote knowledge sharing is discussed in more detail in the section on knowledge sharing in the workplace.

Types of Communities

All communities share some basic characteristics, regardless of their type. Wenger (1998) identifies these as joint enterprise, mutual engagement, and shared repertoire (figure 5.4).

Joint enterprise refers to the glue that binds members together—why they want to interact with one another. Reasons for interacting with one another typically are 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, they have a certain job title, or they know someone. There are membership rules, and each member agrees to carry out certain roles and responsibilities to help achieve the goals of the CoP. Finally, a shared repertoire, or repository, refers to the shared workspace where members can communicate and where they can store

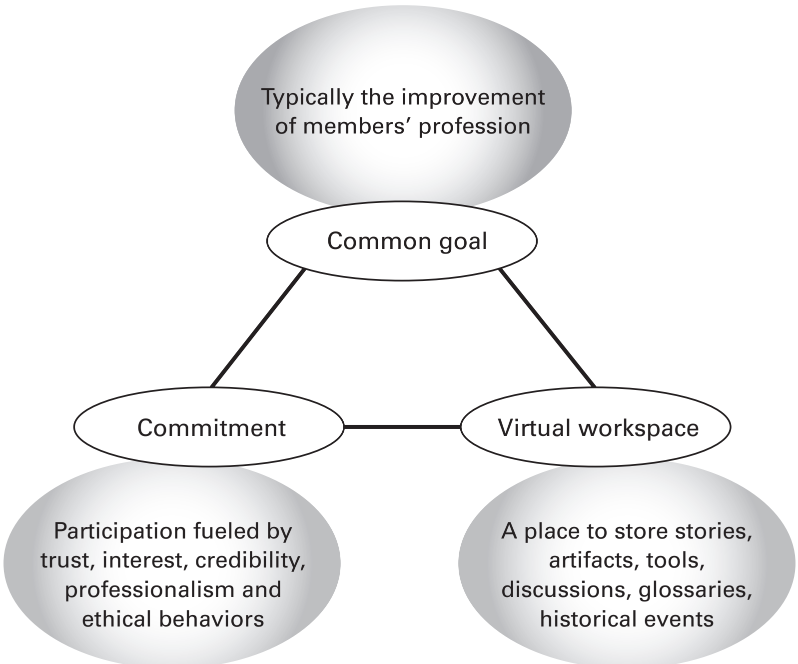

Figure 5.4
Common characteristics of CoPs (adapted from Wenger, 1998)

and share knowledge products, their profiles, and so on. The shared repertoire is typically space on a server—it may be an intranet within an organization or on the Internet. What is important is that there is a place for real-time exchange 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 characteristic 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 him- or herself, the other members will quickly realize this. This is illustrated by Hardin's (1968) tragedy of the commons scenario (see box 5.4).

The many types of CoPs are typically defined as a function of some common focal points:

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

Box 5.4
A Vignette: Tragedy of the Commons

> Picture a pasture open to all. It is to be expected that each herdsman will try to keep as many cattle as possible on the commons. Such an arrangement may work satisfactorily for centuries because tribal wars, poaching, and disease keep the numbers of both man and beast well below the carrying capacity of the land. Finally, however, comes the day of reckoning, that is, the day when the long-desired goal of social stability becomes a reality, and the logic of the commons remorselessly generates tragedy. As a rational being, each herdsman seeks to maximize his gain. "What is the utility *to me* of adding one more animal to my herd?" Since the herdsman receives all the proceeds from the sale of any additional animal, the positive utility is nearly +1. The negative impact is the additional overgrazing created by one animal. However, all the herdsmen share the effect of overgrazing: the negative utility for any particular herdsman being only a fraction of −1. The only sensible course for him to pursue is to add another animal to his herd, and another, and so forth. But this is the conclusion reached by each and every rational herdsman sharing a commons. Therein lies the tragedy. (Hardin, 1968, p. 1243)

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 by the recognition (or lack thereof) it has from the host organization (Wenger, 1998): unrecognized, bootlegged, legitimized, supported, and institutionalized. These categories often reflect the maturity level of a community, but not all communities will necessarily aspire to become institutionalized (Iverson & McPhee, 2002).

A CoP is not a group such as a work team or project group. Many online communities may be described as communities of interest because they have an open membership that is catalyzed by interest in a common theme—for example, a hobby. A CoP 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 relates to improvement of the common profession or a professional theme that members are interested in. However, they form in ways quite unlike those of a professional organization because communities self-organize and emerge from the bottom up.

Roles and Responsibilities in Communities and Networks

Communities consist of people, not technology (Cook, 1999). Community members often take an active role by contributing to discussions or helping other members—they participate. Other members may simply read what others have posted without taking an active role themselves. These members used to be known as lurkers, but because of the term's derogatory connotation, they are now known as legitimate peripheral participants.

In almost every case, the more participation in the community, the greater the value created for both community members and community creators. However, in most communities, readers outnumber posters by ten to one or more. People who visit a community regularly but who do not post represent 90 percent or more of the total community. But passive members in most cases actively use and apply the content they have accessed online.

Kim (2000) lists the key roles:

- 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 feel familiar enough with 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.

CoPs require several 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 for the community to succeed, and this translates into real time. Depending on the type of organization, the number of members and other scope variables, a good rule of thumb is to budget 10 to 20 percent of a knowledge worker's time as being devoted to CoP work.

Nickols (2003) defines more community roles: champion, sponsor, facilitator, practice leader, knowledge service center or office, and members. The champion ensures support at highest possible level, communicates the purpose, promotes the community, and ensures impact. The sponsor serves as the bridge between the CoP and the rest of the formal organization, communicates the company's support for a CoP, and may remove barriers to resources such as time and funding. 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 share knowledge, know-how, and best practices to benefit the business by participating actively. They participate in discussions, raise issues and concerns regarding common needs and requirements, alert other members to 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, learn.

CoP facilitators have perhaps the most demanding role. They clarify communications, make sure everyone participates, and ensure that dissident views are heard and understood. They are the chief organizers of events such as meetings (face-to-face and virtual). 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 affect 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 are models who 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 or knowledge integrators who interface with all CoPs to ensure clarity and lack of duplication of the information disseminated within and from the CoPs. They maintain information-sharing relationships with all CoPs, inform CoP members about relevant activities elsewhere, and inform others about relevant CoP activities. The knowledge center coordinates information from CoP members to avoid duplication, redundancies, and poor quality (e.g., in postings to CoP websites and forums), and they filter knowledge and requests for help (using, e.g., yellow pages). Finally, all the members of the CoP share the responsibility for marketing and promoting the CoP, generating interest in it, generating enthusiasm for it among current members, and demonstrating its value. Everyone must ensure continued support and resources from sponsors, recruit high-potential prospective members, and invite them to special CoP events. Members are expected to leverage the knowledge created and learning generated by the CoP, write and publish articles or descriptions of results in company publications, and 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. CoP moderators are much like a radio or TV show host. They are conversation managers who keep discussions focused, inject new topics or provocative points of view when discussion lags, and seed discussion with appropriate content. They must often be critical 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 organizes and manages 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 into organizational memory and learning (e.g., map of intellectual assets, yellow pages or expertise directory, and CoP best practices and lessons learned).

Finally, there will be new roles and structures at the organizational level. For example, the World Bank inspired the Canadian International Development Agency to institute KM. The agency has implemented over four hundred best practices and lessons learned and thirty CoPs. The agency's KM secretariat, in the senior vice president's office, coordinates knowledge sharing within and among branches. The four or five staff work closely with two organizations: the branch KM leaders group (which has a representative from each of the thirteen agency branches) develops KM agenda, expected results, communication strategy, and specific KM issues. The network (CoP) leaders group (which consists of the leaders of each of the pilot CoP networks) helps networks learn from each other, achieve their objectives, share lessons learned, and solve problems.

Knowledge Sharing in the Virtual Workplace

The establishment of a community identity depends heavily on knowledge sharing. Even something as simple as an online or paper newsletter can 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, because discussions can grow around this kernel. Personalization efforts, to some extent, work against this sense of community because different members 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 forms of conversation. Each communication medium has its strengths and weaknesses. Choosing the appropriate mix of channels to optimize knowledge sharing is important. Most communities organize their knowledge-sharing interactions as informal exchanges between peers. Communication genres are chosen primarily on the basis of the developing relationship between community members (Zucchermaglio & Talamo, 2003). The choice of communication medium appears to be a function of specific professional tasks and the stage of maturity of community development. Zucchermaglio and Talamo (2003) conducted a three-year longitudinal study of an interorganizational CoP. They found that it took about six months for communications to become predominately informal and email based among community members. Concurrent with this was an increasing formality in how community members communicated with those external to the community, which indicates that a sense of community boundary has been established.

One important type of knowledge sharing that occurs in a community involves the evolution of a best practice (an improved way of doing things) or lessons learned (learning from both successful and unsuccessful events). Figure 5.5 shows how a good idea can evolve and ultimately be incorporated into the organizational memory or knowledge repository. The knowledge-sharing processes involved include searching, evaluating, validating, implementing (transferring and enabling), reviewing, and routinizing (Jarrar & Zairi, 2000).

Table 5.3 shows the results of an American Productivity and Quality Center study that looked at how best practice knowledge was shared and transferred within organizations (APQC, 1999). Knowledge sharing occurred 51 percent of the time 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 difficult to detect. SNA can help identify knowledge hoarding or knowledge black holes, in which content is received but nothing is ever sent out.

The channels used for virtual knowledge sharing are often characterized by social presence and media richness. Thurlow, Engel, and Tomic (2004) define social presence as the degree to which knowledge sharers feel they are talking with another person. The highest degree of social presence, of course, exists in a face-to-face exchange where knowledge sharers can easily hear others' tone of voice and see facial expressions and therefore easily infer nontextual cues. A teleconference provides audio cues and

Figure 5.5
Knowledge sharing of a best practice or lesson learned (adapted from APQC, American Productivity and Quality Center)

Table 5.3
Knowledge transference within a company

Method	Frequency of use (%)
Verbally at team meetings	23
Departmental meeting	21
Written instructions	17
Ad hoc verbally	16
Intranet	9
Video	5

Source: APQC (1999).

a videoconference provides both visual and audio contexts. An email or discussion forum, however, must rely on text, which has a lower social presence. Emoticons (e.g., a smiley face to indicate a joke), uppercase letters to simulate shouting, shortcut expressions, and so forth, are ways to overcome this limitation.

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 have the fastest feedback (people can react right away to what has been said or typed), participants are able to use natural language, and the degree of social presence is high. Social presence and media richness do tend to go together for the most part, but some channels possess low media richness and 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, using channels high in both social presence and media richness is more imperative (Vickery et al., 2004).

Social presence and media richness are good criteria to consider when deciding on the best knowledge-sharing approach to use, including whether to use technology-mediated knowledge sharing and the specific type of technology or tool. During the pandemic, many people could use only remote technology-mediated knowledge sharing. Remote work remains the way of work for many, but others have adopted a hybrid model of work. Some amount of remote work is expected for all knowledge workers. The sharing of valuable organizational knowledge will see a significant effect. Tacit knowledge appears at risk of not being shared well if sufficient social presence and media richness are lacking.

How to Select the Knowledge-Sharing Approach

In choosing a knowledge-sharing approach, the first step is to assess the degree to which the knowledge to be shared is explicit or tacit (as discussed in chapter 4). Next, is the knowledge confidential or sensitive? Is it complex (e.g., requires knowledge of context and backstory)? The third question is who will be doing the sharing. Do the people know each other well? Have they worked together in the past? Are facilitators who have a track record of reciprocity and trust present? Are there obstacles present such as imbalance of power or authority? Language barriers? As a rule of thumb, the more tacit the knowledge, the more complex, sensitive, or confidential it is, and the less people know each other and the less they have established trust, then the higher the degree of social presence and media richness required. The highest degree is face-to-face meeting for both media richness and social presence. Table 5.4 ranks knowledge-sharing channels according to their media richness.

The lowest media richness is nonverbal, such as documents to read. Asynchronous tools such as email have lower media richness than synchronous ones such as a phone conversation.

The lowest social presence is, again, in any approach that does not allow immediate feedback and interactivity or give the sense of an interaction with another human being. If social presence is high enough, you soon forget that you are using a tool to communicate with someone. This is the goal of video-based interaction in real-time using Zoom, MS Teams, or other tools. Email and chat have lower social presence because you must translate what you want to say into typed text and because interpreting the context and tone of what you read is harder. Therefore, we use capital letters for emphasis and emojis to convey nonverbal cues.

Table 5.4
Media richness of knowledge-sharing channels

Information channel	Information richness
Face-to-face conversations	High
Videoconferencing	High
Telephone conversations	High
Emails	Medium
Handheld devices	Medium
Blogs	Medium
Written letters and memos	Medium
Formal written documents	Low
Spreadsheets	Low

In choosing knowledge-sharing approaches, look at the types of exchanges that will occur. Most 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). Another excellent measure of the success of knowledge sharing is reuse, analogous to a citation index. Scholars and researchers produce publications, and a metric perhaps more meaningful than the number of papers published is the citation index, which tracks how many others have used a work. When someone refers to another's 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 KM system as well, and in some organizations, this is used to evaluate how good a knowledge sharer a given employee is.

Knowledge-sharing communities do not just provide access to data and documents; they interconnect the social network of people who produced the knowledge. A good KM system includes information on the people who make use of the knowledge. 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). Making the knowledge visible encourages these interchanges. This typically involves making the interactions online visible—"I know that you know x, y, z" and "I know that you know that I know a, b, c." This helps create mutual awareness, mutual accountability, and mutual engagement to more closely knit group members together.

Figure 5.6 shows a high-level representation of a CoP made more visible by using social computing systems such as the Babble system (Erickson & Kellogg, 2000). Babble

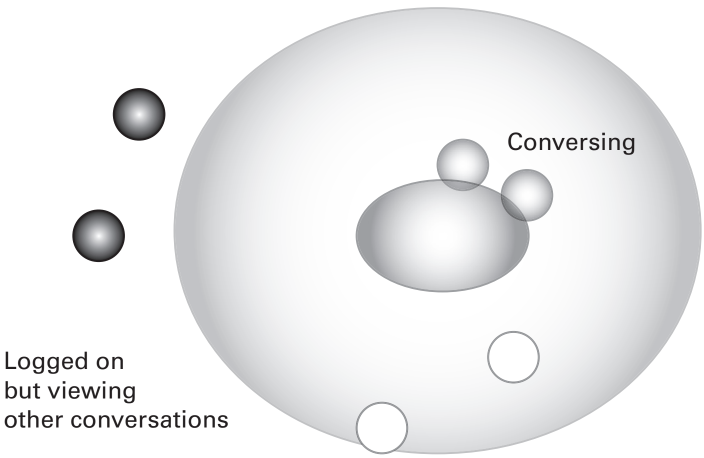

Figure 5.6
Making CoP interactions visible (adapted from Erickson & Kellogg, 2000)

was designed as an online multiuser environment to support the creation, explanation, and sharing of knowledge through text-based conversations.

Social computing refers to digital systems that draw on social information and context to enhance the activity and performance of people, organizations, and systems. Examples include recommender systems, such as those that advise which books, music, or movies you would like. Social presence is an important concept in virtual networks because it indicates the sense members have that other people are present. Because communities are all about social interactions for learning and knowledge exchange, a social connection must be felt. Buddy lists are another example of establishing social presence. Buddy lists let you know who else is online when you log on to a virtual space.

Other Ways of Sharing Knowledge

Knowledge can be shared in organizations in many ways. Some of the more common are peer assists and after-action reviews (discussed in chapter 4 and knowledge cafés, world cafés, storytelling, and tools such as wikis (discussed in the next section).

A knowledge café is a facilitated workshop that fosters open and creative dialogues on a specific topic or theme that is of interest to all the participants. The expected outcome is that all participants will have contributed their thoughts and perspectives on the topic to create collective knowledge, share ideas, and catalyze insights. Participants gain a much deeper understanding of the topic than they had before the café. David Gurteen is a strong proponent of knowledge cafés.[1] Importantly, a knowledge café is not a broadcast or a lecture. No one person should be addressing the larger group for any length of time. Knowledge cafés are conversations. Typically, the session begins with a facilitator providing an overview of the knowledge café's purpose and way of functioning. This can be omitted if participants are already familiar with knowledge cafés. Next, the facilitator welcomes everyone and outlines the subject or theme to be addressed and asks an open-ended question to get everyone started. For example, what would prevent you from sharing your know-how with someone in your company and why? The larger group then breaks into smaller groups of about four or five people each who start discussing the question posed. After about forty-five minutes, the groups reconvene and report their key findings to the larger plenary group. If time permits, participants form new groups by changing tables and continuing the conversation. This ensures that different perspectives on the question posed are identified. The whole event can last from ninety minutes to several hours. Ideally, there should be between fifteen and thirty participants. Usually, nothing is documented so as to not interfere with the conversational flows. When successful, everyone will have learned through their interactions with others.

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

The seven design principles for world cafés are the following:

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

The facilitator typically outlines the reason everyone is together at the beginning of the world café. The purpose, the scope, who is in the room and why, and what the expected outcomes are should all be addressed. The meeting space should be safe and inviting so that everyone feels comfortable. Sticky notes, colored markers, paper tablecloths, and so forth, create a fun and creative space to work in. These are crucial to participants engaging in creativity, listening, thinking, and of course, speaking. Ask good questions that will elicit a good conversation. Make sure questions are relevant to the participants. Make sure everyone is heard. Some world cafés use talking sticks or other physical objects that are passed from one speaker to the next to ensure more widespread participation. As participants move around tables and connect with new people, they connect different perspectives. Facilitators may ask participants to change tables after a specified period has passed, depending on the time that is available for the event. One member may stay behind at each table to fill in the new members that join. As they listen to others, participants begin to identify patterns, and powerful insights will emerge. Finally, facilitators will help harvest the collective learning from the event by reconvening the plenary group. Each group is asked to share its key points for the others to hear. Unlike knowledge cafés, world café outcomes are typically documented (and usually recorded in some form) during this harvesting stage.

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

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

The Role of KM Technologies

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

Common collaboration tools include blogs, wikis, social bookmarking, digital repositories, visualization tools, and online meeting platforms. The latter have become a daily form of working since the pandemic lockdown. Even after people started returning to their physical workplaces, many continue to work from home or have a hybrid schedule. Although online meetings offer high degrees of media richness and social presence, they are often a bit ephemeral. Tools such as Zoom, for example, allow you to save comments that were typed into the chat and record the whole meeting, but components making the tools more effective for remote collaboration are missing. Most collaboration platforms require members to prepare and maintain their profiles and have a place where they can comment on what others have already contributed. Some type of event calendar is usually required. MS Teams is an example of a tool that offers these additional features and is, as a result, able to store more organizational knowledge, which can in turn contribute to organizational memory. Other tools offer options such as the ability to poll members, ranking systems to rate content usefulness or popularity, and metrics or usage tracking (Cianciolo & Evans, 2013).

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

Research on using tools to share tacit knowledge has sometimes been contradictory; some researchers (e.g., Falconer, 2006) find it is possible. Castaneda and Toulson (2021) found that social media was effective in sharing both explicit and tacit knowledge. Others found that tacit knowledge was impossible to share using any technology (e.g., Flanagin, 2002). A more nuanced approach that considers media richness and social presence is needed to understand how to share tacit knowledge. For example, Castenada and Toulson (2021) looked at 217 knowledge workers to study how well tacit knowledge could be shared using information and communication tools. They found that only those information and communication tools that facilitated dialogue between knowledge sharers enabled sharing of tacit knowledge (e.g., videoconferences). Others, such as email, which did not facilitate dialogue, were not effective in sharing tacit knowledge.

Media-rich and high social presence information and communication tools, such as interactive online storytelling and collaborative games, may prove effective (e.g., Castenada & Toulson, 2021; Spraggon & Bodolica, 2017). If knowledge sharers can communicate effectively using a tool, they should be able to share tacit knowledge.

Online, we don't share physical space and we thus miss out on some nonverbal cues (and we sometimes don't even get the verbal cues if we are on email). It has become harder to communicate, collaborate, and share knowledge in the postpandemic world.

> We tend to learn at work by being in the same room, by being able to ask questions and immediately get answers, from listening to conversations, by watching how more competent people perform and even from watching body language during meetings. . . . The pandemic has changed the landscape of knowledge sharing. (Murphy & North, 2021)

Feitosa and Salas (2020) make four major recommendations for ensuring that knowledge sharing can take place in the postpandemic workplace: monitor trust, focus on process gains, foster inclusion through psychological safety, and monitor teamwork. We have already addressed the critical role of trust among knowledge sharers. This trust must also be maintained throughout remote collaboration. Because bouncing ideas off a colleague by walking into an office is no longer possible, much more deliberate planning is needed for selecting the best knowledge-sharing channels and platforms.

One of their most important recommendations is to be conscious about creating safe and inclusive remote work environments. This can be as simple as allowing people to switch off their cameras, announcing at the beginning of a meeting that interruptions are expected and okay (e.g., family members or pets wandering into the room), and making meeting recordings available to those who could not attend. These measures will go a long way to establishing a feeling of belonging, trust, and safety and being as inclusive and respectful as possible. The last recommendation is to provide feedback more often than you would if you were able to have more face-to-face interactions. This reassures knowledge workers and makes miscommunication and misunderstanding less of a risk.

To increase effective remote knowledge sharing (and remote KM), Ejembe (2020) outlines the importance of developing trust when meeting virtually and strengthening communication. Ejembe (2020) adds another important observation: "Remote work makes it impossible to drop by an associate's desk to be reminded of a process or shown where a document can be found" (p. 4). Remote knowledge workers have to be more independent, which means resources they need have to be easier to find. Good KM practice uses repositories and taxonomies to ensure content is well organized and findable. This can be as simple as aggregating resources, links, templates, guidelines, and so on, in one place (e.g., MS Teams group or a secure intranet). Just being able to point or link to content that is physically stored in disparate systems would be helpful.

> The key point is that remote work does not just happen by default. It requires sustained investments in high-trust organizational culture, guided by a clear strategy and deliberate execution. Establishing a sound KM culture has been an integral part of that strategy, and thoughtfully creating, capturing, sharing and storing knowledge has stood [the global development company] DAI in Nigeria in good stead for the stress test of COVID-19. (Ejembe, 2020, p. 6)

Gaskell (2020) notes that successful mentoring has become challenging in the disruption caused by the pandemic. This is primarily due to the difficulty in sharing tacit knowledge using remote working tools. Face-to-face interaction is essential for mentoring because we often share tacit knowledge we didn't even know we had. Tacit knowledge is always easier to share when people are working together in proximity and mentoring, coaching, or observing. These are all difficult if not impossible to do when working remotely, which risks valuable tacit knowledge not being shared or even being lost.

This shift toward working from home will likely remain after the pandemic ends. Several major companies are allowing employees to permanently work from home because of benefits such as decreased office rent and costs. Surveys show that more than two-thirds of workers in North America, Europe, and Australia say they are more productive when working from home. For example, Lund et al. (2021) found that 20 percent of the workforce is expected to continue working remotely three to five days a week, depending on location around the globe. A significantly higher number of people are predicted to be working from home postpandemic than prepandemic. The majority will consist of knowledge workers.

In summary, a CoP, mentoring, storytelling, succession planning, coaching, and knowledge repositories (in decreasing order of effectiveness) are the most effective for sharing knowledge in organizations. Studies may vary their ranking, but most confirm that long-term, face-to-face interactions in real time and in proximity are much better at sharing knowledge in general and tacit knowledge in particular (e.g., Mazorodze & Buckley, 2020). Interacting via technologies reduces the media richness and social presence to the detriment of knowledge-sharing effectiveness. However, not all technologies do so to the same degree.

Obstacles to Knowledge Sharing

Several obstacles can hinder knowledge sharing within organizations. Chief among these is the notion that knowledge is property and its ownership is important. To counteract this obstacle, reassure individuals that authorship and attribution will be maintained. In other words, no one will lose the credit for a knowledge product they created. In fact, maintaining the connection between knowledge and the people who are knowledgeable about it is paramount in any KM system. Knowledge is power, as the saying goes, but in reality, the more that information is shared, the more opportunities there are for knowledge creation occur. But because individuals are usually rewarded for what they know, not what they share, knowledge is hoarded, often leading to negative consequences, such as empire building, reinvention of wheels, feelings of isolation, and resistance to ideas from outside an organization. To combat hoarding, revise the reward and censure systems of the organization. Stop rewarding knowledge hoarding and start providing valued incentives for knowledge sharing.

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

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

Another caveat: although an assessment may show that organizational knowledge sharing is weak, it actually may be flourishing—but it has not been detected because employees are not using the organizational knowledge repository. 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.

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

SNA is a useful tool because 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 CoPs that have emerged. Weinberger quite aptly refers to these undernets as the "lifeblood" of the organization. In fact, many corporate top-down KM initiatives are met with lack of interest and lack of activity, and investigation invariably turns up the existence of the *other* network—the one people really use!

The undernet is often the first resource employees turn to regardless of how much the official KM system and the training to use it cost. This is in keeping with the increasingly prevalent view that KM succeeds when it is a demand-driven initiative rather than a top-down technology push. Most questions are in the form of Does anybody know . . . ? Has anybody ever done . . . ? This knowledge sharing occurs among professionals with concrete decisions to make and problems to solve. They connect with their peers, and the undernet is the result of their connections. Ideally, such grassroots or bottom-up knowledge systems should be accommodated by the organization-wide systems. Knowledge brokers are individuals who can move among more than one network, and they can play a key role in putting together a company's big picture. Formal, top-down KM systems tend to encapsulate more formal, explicit knowledge, whereas community networks tend to be less formal, be more tacit, and consist of more work-in-progress content. Ellen Knapp, PricewaterhouseCoopers's chief knowledge officer puts it this way: "[Formal KM systems are] about teaching. Kraken [the company's undernet system] is about learning. You can't have one without the other" (Stewart, 2000).

Knowledge Sharing and Misinformation

We are firmly anchored in a post-truth world. *Post-truth* is an adjective "defined as relating to or denoting circumstances in which objective facts are less influential in shaping public opinion than appeals to emotion and personal belief." Oxford Dictionaries defined the word in 2016 and named it word of the year (OxfordLanguages, 2016). People tend to be prone to confirmation bias (Nickerson, 1998) in that it is easier to stay within our comfort zones. It is easier to share knowledge with people who already share our views, our values, and our biases. We therefore more readily believe, accept, and repeat statements that support our established views (Nickerson, 1998). In the online world, this translates into liking and sharing social media posts. The corollary is that we also tend to reject or avoid any statements that go against our views, even if these statements are well supported by evidence (e.g., Enfield, 2017). Information avoidance is a well-known and well-studied phenomenon in the field of information behavior. Sweeny et al. (2010) review some of these models and also others from disciplines such as psychology.

One of the best-known and most widely applied models is the Wilson (1999) model of information behavior. This model provides a good foundation for better understanding how and why people seek out information and why they sometimes choose to remain ignorant. One example of information avoidance is people who are not comfortable when new information they have found does not fit comfortably within their established mental models, or the ways they have made sense of their surrounding world up until that point. Others may balk at any information that would make them discard their long-held and greatly valued beliefs. This is confirmation bias at work again, but information overload and lack of time may also contribute to information avoidance behavior. In the post-truth world, KM can integrate *agnotology*, or the study of ignorance, and *epistemology*, or the study of knowledge.

Why are we living in a post-truth world now? Misinformation is not new; it has been around for a very long time. Today, however, many different channels push information at us in real time, and we simply cannot deal with the information overload. This overload has been trending upward for a long time. The French sociologist Jean Baudrillard said in 1994, “We live in a world where there is more and more information, and less and less meaning” (Baudrillard, 1994, p. 79). The combination of information overload and lack of time to verify everything, especially content that contradicts our strongly held beliefs, leads to information avoidance behavior and, in turn, to greater consumption and sharing of misinformation.

The history of post truth is long, starting with the first use of propaganda (did Nero really play his fiddle while Rome burned?). Wendling (2018) provides a good summary of the major milestones in the history of misinformation. Online misinformation exploded during the 2016 US presidential election and continues to be in the forefront as COVID-19 fake news proliferated. The advent of Internet and social media have increased the geographic reach of sharing of fake knowledge. At the same time, these technologies have also made it possible to share and spread this misinformation almost instantaneously.

Crowd-sourced content started to gain popularity beginning with such applications as Wikipedia and now most people obtain their news not from mainstream media such as print or television news but through social media sites such as Facebook. This has created a form of groupthink where there is very rapid sharing of knowledge between people in well-bounded networks of family, friends, and colleagues who then repost and continue sharing this content. There is a well-known theory in psychology called repetition theory (Hasher, Goldstein, & Toppino, 1977) that basically explains that the more something is repeated the more the consumer of that content believes it to be true. A perfect social media storm for misinformation to take hold.

These well-bounded knowledge-sharing networks are sometimes referred to as echo chambers or filter bubbles (e.g., Bruns, 2019). The term *filter bubble* was originally limited to search engine and personalization algorithms that provided customized content based on a person's online behavior. In other words, if you searched for a particular product, you would start seeing advertisements for similar products. This customization easily extended to providing only those news stories that match your interests and therefore your viewpoints. *Filter bubble* now extends beyond these forms of content editing and appears to overlap *echo chambers*. Bruns (2019) concisely defines the two terms:

> Echo chamber: emerges when a group of participants choose to preferentially connect with each other, to the exclusion of outsiders (e.g., by friending on Facebook, following on Twitter, etc.). Filter bubble: emerges when a group of participants choose to preferentially communicate with each other, to the exclusion of outsiders (e.g., by comments on Facebook, @mentions on Twitter, etc.). (p. 4)

People live in a bubble of content created by personalization algorithms (artificial intelligence [AI] that recognizes patterns) of the social media services. Living in a bubble, you receive only content that you consider favorable or interesting. The same algorithms are used in database marketing to present to you things you are likely to buy (typically forms of recommender systems). We also create our own social media bubbles (e.g., Facebook) whose scale is exponentially greater because it takes only one click to Like a post. The value of knowledge content is increasingly measured by reach (such as the number of Likes and how quickly the content was Liked) instead of validity.

Fake content has grown in sophistication and is harder to spot. Fake news created by AI is more successful at getting users to click on malicious links than that created by humans (e.g., Dalkir, 2021). AI can generate fake content that tricks cybersecurity experts and not just the public. It can produce synthetic text ("readfakes"), and other tools generate fake photos and videos ("deepfakes"). Imitating people speaking in a video used to be hard (e.g., the people didn't blink), but spotting fake content is getting more difficult; it is now possible to put words into the mouth of anyone, including political leaders, by starting with about forty minutes of real voice and video recordings. It is possible to simulate lip movements and imitate speech patterns, tone, and pronunciation in truly astounding ways (for an example, see a fake Barack Obama video at https://www.youtube.com/watch?v=AmUC4m6w1wo&ab_channel=BBCNews).

AI is good at creating fake content, but it may also help detect and (even better) prevent misinformation. For example, researchers reverse engineered the fake Obama video to create equally sophisticated AI-based methods to detect such forgeries. The language used in fake news tends to use more emotional words, such as "hate" or "shocking," than valid content does, and tools (e.g., sentiment analysis) can spot that. Fake news tends to use more photos and videos, and headlines often do not match the actual content. There is also strong evidence that fake news has a signature: a distinctive dissemination pattern on social media that differs from how valid knowledge is shared (Dalkir & Katz, 2020). Zhao et al. (2020) found that this pattern could be detected within five hours after the first reposting of fake content on Weibo in China and Twitter in Japan. This is promising news for early detection of misinformation.

Social media has proved to be a double-edged sword: On one hand it shares knowledge, including tacit knowledge, as evidenced by dancing on TikTok or baking bread on YouTube. On the other hand, it is very effective at spreading misinformation—spreading it faster much more widely, even globally.

How can KM help? As discussed in chapter 2, in the McElroy knowledge processing life cycle, all knowledge is first treated as a knowledge claim that needs to be validated (figure 5.7). KM processes can be used at the individual, group/community and organizational levels to filter, validate, preserve and act upon valid content (McElroy, 2003). Knowledge claims thus are either accepted, rejected, or not proved. The community of trusted users provide feedback via the KM system when they use the knowledge.

Some key recommendations include the following:

- Increase trust in your own networks.
- Trust general content that comes from your trusted network.
- Believe organizational knowledge that has been vetted by your professional CoP or KN.
- Remember that knowledge exists and is shaped by both context and community.
- Ask yourself whether the knowledge is true or not yet proved before you decide to share it with others.
- Consider using *proven practice* instead of *best practice*.

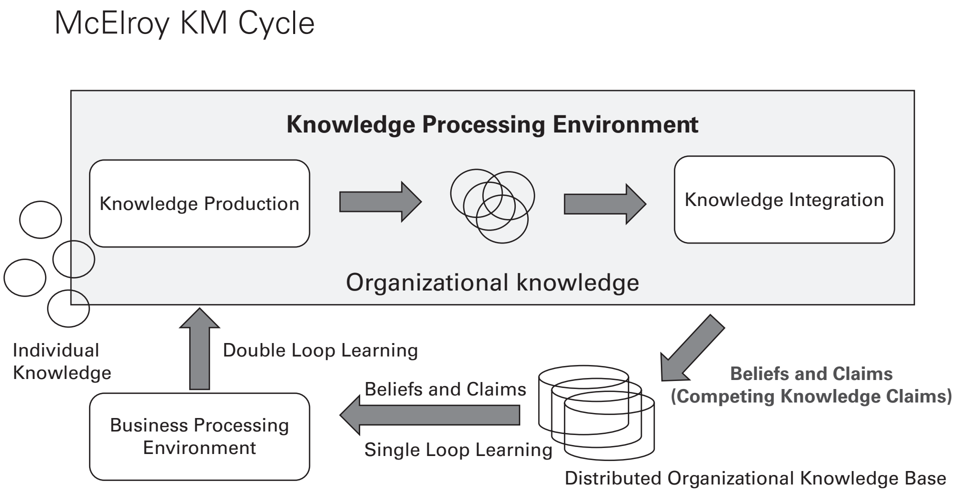

Figure 5.7
Knowledge claims in the McElroy (2003) knowledge processing cycle

The post-truth world is here to stay for the foreseeable future. Many spreading fake news do not intend to deceive; nevertheless, the consequences of fake news, alternative facts and misinformation can be serious. We need to be more vigilant and not automatically accept all knowledge as true or valid.

Organizational Learning and Social Capital

Human capital refers to individuals' education, skills, and background necessary to be productive in an organization or profession. Sociologists such as Coleman (1994) and Granovetter and Swedberg (2001) argue that the differences in individual success are explained by more 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* refers to the institutions, relationships, and norms that shape the quality and quantity of an organization's social interactions (Lesser & Prusak, 2001). Social capital is not just the sum of the individuals that make up 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). The concept is still evolving, and calls are increasing for expanded investment by business, government, and other organizations that promote the development and maintenance of social capital. Institutional settings are conducive to the development of high levels of social capital. Firms, because of their denser social capital, have an advantage over markets in creating and sharing intellectual capital.

Knowledge-sharing communities are the primary producers of social capital. Individuals develop a network with others who share similar professional interests. That community is a "Who's Who," a yellow pages, to connect members. The members evaluate content, solve problems, and make decisions on the basis of vetted, validated, and current knowledge. Social networks can increase productivity by reducing the costs of doing business. Social capital facilitates coordination and cooperation. But there is a downside: some communities, groups, or networks can be isolated, parochial, or working at cross-purposes to the organization's collective interests (Portes & Landolt, 1996).

A broader understanding of social capital accounts for both the positive and the negative aspects by including vertical and horizontal associations among people and behavior within and among organizations. This view recognizes that horizontal ties give communities a sense of identity and common purpose but also stresses that horizontal ties can actively preclude access to information and material resources in the community (e.g., tips about job vacancies, access to credit). Horizontal ties must transcend social divides (e.g., religion, ethnicity, socioeconomic status).

Measuring the Value of Social Capital

Organizations have begun to implement CoPs to achieve benefits:

- Building loyalty and commitment 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

Whether communities are achieving these objectives is difficult to measure. CoPs come packaged with a business plan—they are there as a business reason, and as such they must be evaluated just as any business initiative is—for the return on the company's investment.

One way of measuring value is to calculate the additional value that a community member has compared with the average site visitor. For example, a community member on a transactional website who purchases twice as much per month as the average user generates additional revenue. Similar comparisons may be made with respect to usage for noncommercial sites. Communities that are actively managed seem to 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 with the necessary expertise, processes, tools, and infrastructure.

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

Another approach is to measure the value of the social capital that has been produced as a result of knowledge sharing. Social capital has been measured in several innovative ways, though for several reasons obtaining a single true measure is probably not possible or perhaps even desirable. Measuring social capital can be done by using different types and combinations of qualitative, comparative, and quantitative research methodologies (Sveiby & Simons, 2002; Woolcock & Narayan, 2000). Social capital comprises concepts such as trust, community, and networks that are difficult to quantify. The quest to measure not just the quantity but also the quality of social capital increases the difficulty. 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 (severe acute respiratory syndrome).

It may also be possible to adapt methods used in measuring social capital of countries or societies. For example, in research comparing northern and southern Italy, Putnam (1995) examines social capital in terms of the degree of civic involvement, measured by voter turnout, newspaper readership, membership in choral societies and football clubs, and confidence in public institutions. These indicators are higher in northern Italy, which shows significantly higher rates of governance, institutional performance, and development when other orthodox factors are controlled for. Putnam

(2000) uses a similar approach for a US study, combining data from both academic and commercial sources to show a persistent long-term decline the US 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 US social life. Similarly, the World Values Survey measures interpersonal trust in twenty-two countries by asking questions such as "Generally speaking, would you say that most people can be trusted or that you can't be too careful in dealing with people?" (Knack & Keefer, 1997). The Social Capital Initiative at the World Bank funds social capital projects that will help define and measure social capital, its evolution, and its impact (e.g., Narayan & Cassidy, 2001). Refer to chapter 10 for additional ways of measuring KM and CoPs.

The idea that every person connects to another by only six links, or six degrees of separation (Watts, 1999), stems from the famous experiment by Milgram (1967), in which he asked 160 people in Kansas and Nebraska to each direct a letter to a person in Massachusetts selected by Milgram. They were to send it to an acquaintance who 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.

Note

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

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6 Finding Knowledge

> All that is gold does not glitter; not all those that wander are lost.
> —J. R. R. Tolkien (1892–1973)

This chapter brings us to the final step in the KM cycle, when the knowledge that has been captured, coded, shared, and otherwise made available is put to actual use. Without this step, all the preceding KM efforts are in vain. KM can succeed only if the knowledge is used. In this last step it is imperative to understand what knowledge is of use to what set of people and how best to make it available to them so that they not only find and 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 locator systems and other collaboration aids help groups of people find and apply valuable knowledge and know-how. Content management systems can optimize knowledge application on an organization-wide basis.

Learning Objectives

1. Understand how user and task-modeling approaches can promote effective knowledge use at the individual, group, and organizational levels.
2. Describe the design of an organizational KM architecture.
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 help users put knowledge into action.

Introduction

As discussed in chapter 1, KM addresses one of two general objectives: knowledge reuse to promote efficiency and innovation to introduce more effective ways of doing things. Knowledge application is the actual use of knowledge that has been captured or created and put into the KM cycle (figure 6.1).

Knowledge eventually is made accessible to all the knowledge workers in an organization with an implicit assumption that the knowledge will be used. This assumption is often unfounded. Having captured, coded, reorganized, and made knowledge available, we are still only in the third quadrant of the Nonaka and Takeuchi model from chapter 3. The knowledge spiral is completed when knowledge is internalized. Internalization, recall, consists not only of accessing and understanding the content but also of consciously deciding that this is a good—ideally, better—way of doing things, and hence the knowledge is applied to a real-world decision or problem. Internalization consists of finding relevant knowledge and making use of it to do your work (i.e., continued use and reuse).

Knowledge objects are annotated references, components (programs or text), templates, patterns, or other types of containers. For example, consulting companies often reuse project proposal templates because they convey the company brand and contain useful reusable objects such as testimonials and company description. The goal is to reduce the time it takes to complete tasks while maintaining a high quality of work. The benefits to new employees are enormous because they can perform at a fairly high

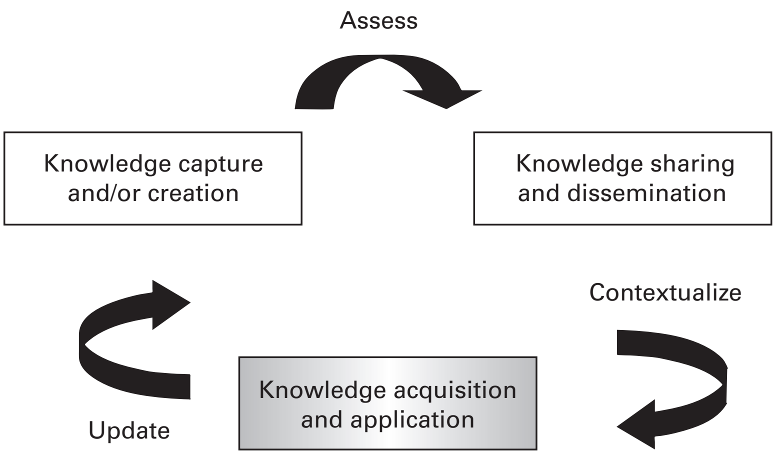


Figure 6.1
An integrated KM cycle

level on their first day on the job through a reuse library. 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 supports learning organizations that provide all employees with access to corporate memory so that both the individuals and the organization improve. Corporate memory is often incomplete, having captured only explicit knowledge. Including or at least being able to point to where the tacit knowledge associated with a given knowledge object resides is imperative. Rendering all knowledge explicit is never possible or even desirable. If knowledge workers can easily locate and communicate with individuals in the company who are connected to a given knowledge object (e.g., those familiar with how it is used), then the ability to apply or to make use of this knowledge is greatly increased. In the example of the proposal-writing knowledge object, the template can easily include examples of successful past proposals (best practices) and the individuals involved in their preparation who can be contacted for advice, a read-through, or other help.

The essence of problem-solving, innovation, creativity, intuitive design, good analysis, and effective project management involves tacit knowledge more 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, particularly in reuse. Documentation (explicit knowledge) equaling understanding is a fallacy. We seek understanding 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 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.

When we attack reuse as a KM problem, we begin to ask new questions or at least look for different avenues for solutions. How do we go about finding the knowledge we need? How do we gain confidence that it does what we want it to do? What is the distance (organizationally or geographically) between the knowledge creator and users? Are there other people who have used this knowledge whom we could talk to and learn from? Do we have access to the owner or creator? Have others found this knowledge effective? How should we go about validating this knowledge? Is it a proven practice?

Hatami, Galliers, and Huang (2003) find that a key to organizational success in the face of global competition is the ability to capture organizational learning, effectively reuse the knowledge through efficient means, and synthesize these into more intelligent problem recognition, strategic analysis, and strategic choices. By tapping into their organization's memory, decision makers can make more intelligent business decisions. This is achieved when individuals access data, information, and knowledge residing in repositories. However, retrieval alone is not enough—knowledge application must follow, and the success of knowledge application appears to be a function of the characteristics of the individual, the knowledge content, the purpose of reuse for the task at hand, and the organizational context or culture.

Knowledge Application at the Individual Level

Characteristics of Individual Knowledge Workers

Individual differences play a major role in knowledge-sharing behaviors (Hicks & Tochtermann, 2001). Wilson (2000) and other information science researchers note the importance of recognizing individual differences to understand how they look for and find information and knowledge.

> Different people will experience reality differently, which influences information behavior. The context of search as given, e.g., by the individual personal characteristics of the searcher, has become an important part of information behavior research. (Schmidt & Wolff, 2016, p. 1)

Knowledge workers vary with respect to their familiarity with the subject matter and their personality and cognitive styles. Several studies (e.g., Ford et al., 2002; Kuhlthau, 1993; Spink et al., 2002) have found significant correlations between online searching behavior and the Paskian cognitive styles of holistic and operational learners. The business world heavily favors the Myers-Briggs Type Indicator (Myers et al., 1998) to assess differences in personality styles. Some research has been done to correlate Myers-Briggs type with knowledge-sharing behaviors. For example, Webb, 1998, found in a study of the consulting firm PricewaterhouseCoopers that a strong outgoing personality was important in knowledge sharing irrespective of qualifications and prior experience. Workers' personality style, learning style, and preference for receiving information, as well as how they can best be helped to apply knowledge, need to be considered. 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 users' abilities and goals. A useful framework is the Bloom taxonomy of learning objectives (Bloom, Mesia, & Krathwohl, 1964), discussed later, which was designed to help teachers set learning goals. The taxonomy can be easily adapted to knowledge application goals for each knowledge object in a repository.

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

Personalization and profiling are currently a popular means of characterizing visitors to a website. This is particularly true of virtual stores, where customer data can be analyzed to improve marketing efforts. However, in KM we are less concerned with database marketing applications of personalization and more with ensuring that knowledge finding and application is adapted to knowledge workers. The easier it is for a knowledge worker to find, understand, and internalize knowledge, the greater the success in applying this knowledge. Another approach to user modeling is proposed in figure 6.3.

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

We need to find and use content on the basis of an individual's personal model, how the person perceives the knowledge world around them. This is influenced by background (e.g., information technology vs. sociology), length of time with the company, knowledge of the topic, and other preferences ranging from the linguistic to the format to receive knowledge (e.g., visual learners, who prefer diagrams, vs. those who prefer to read text). These are often represented as semantic networks (figures 6.4 and 6.5).

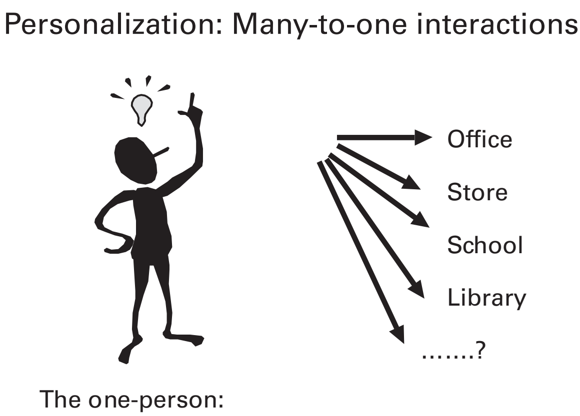


Figure 6.2
The personalization concept

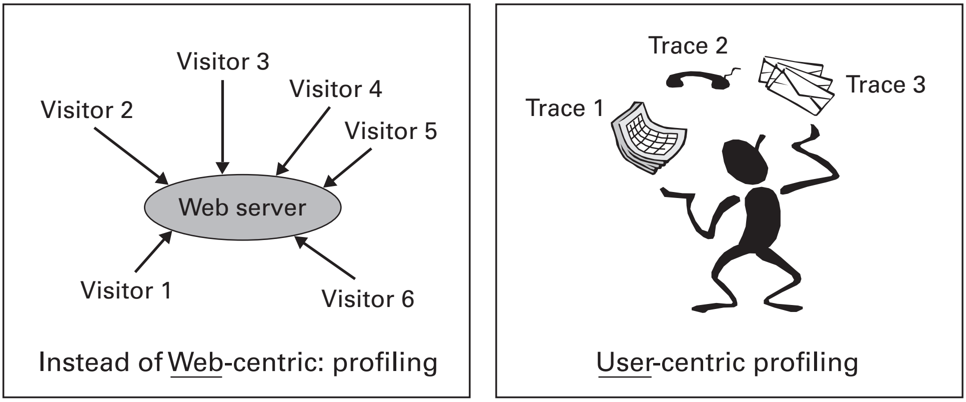
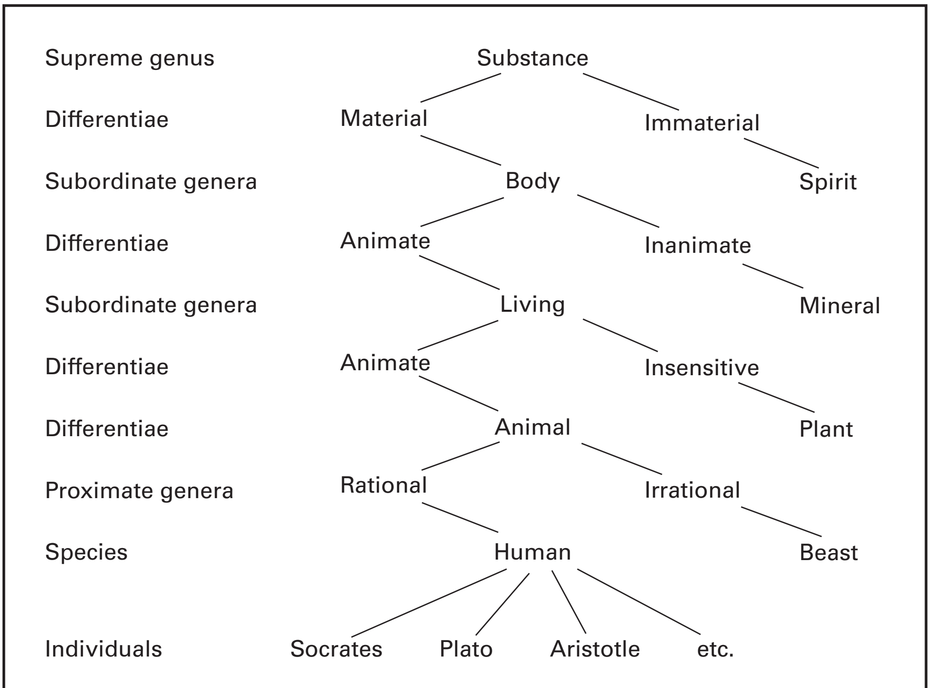


Figure 6.3
An alternative approach to personalization



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

Figure 6.4
Example of a semantic network

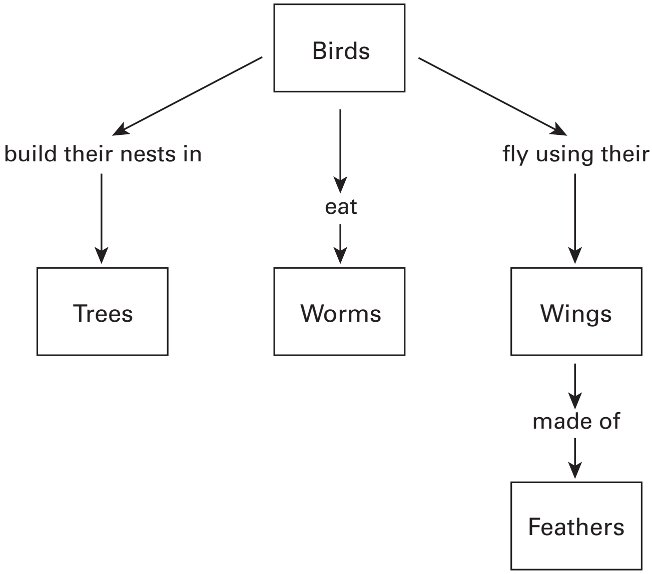


Figure 6.5
Example of a semantic network (continued)

There are also systems that monitor users' tasks online and interpret them in context, based on traces they leave behind. These systems work well for tasks that are well identified and where knowledge can be described in a clear ontology (e.g., a postal address template). An agent (a software routine) sees changes in the computer system according to an observation model. It generates 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 on to 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 a file, those three distinct episodes can be identified. Agents that assist users in performing tasks can then reuse these episodes. The assistance episodes themselves can be reused in the future (figure 6.6). In this way, the system has modeled how users behave when they are undertaking these types of tasks.

Importantly, user modeling is an ongoing process, not a one-shot deal. Dynamic profiling systems need to be based on a mix of human and automated trace facilities 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).

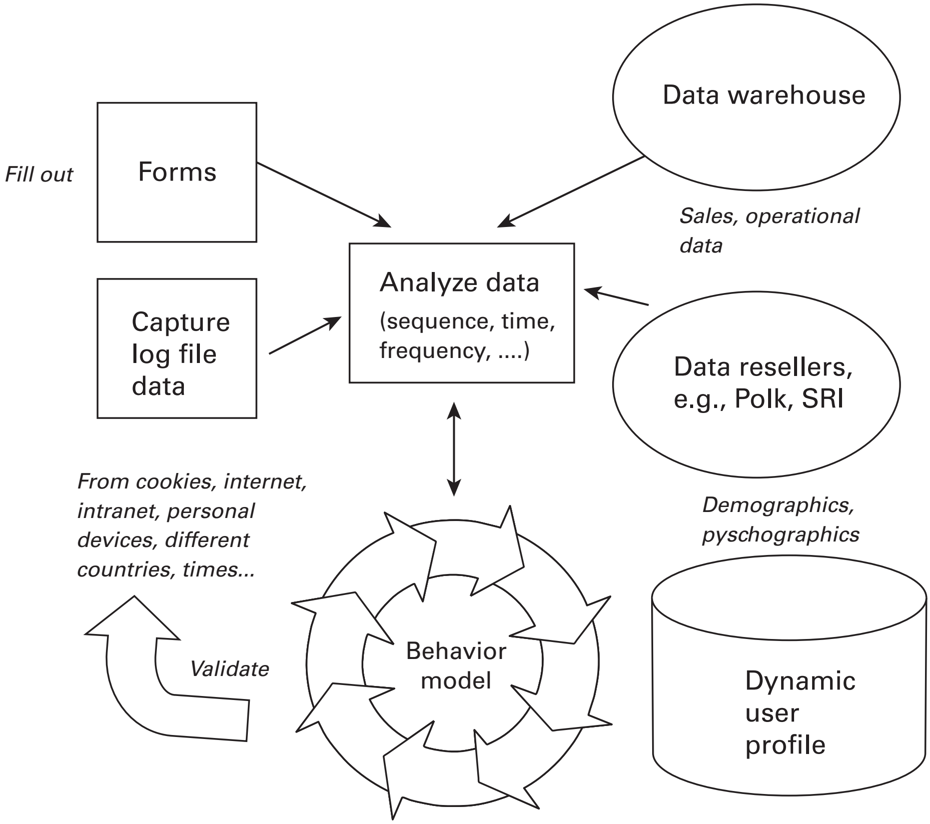


Figure 6.6
Dynamic profiling system design

Bloom's Taxonomy of Learning Objectives

Bloom, Mesia, and Krathwohl (1964) divided knowledge into a hierarchical scheme that distinguishes among psychomotor skills, affective domain (e.g., attitudes), and cognitive domain (e.g., knowledge). The cognitive domain is more commonly used, although attitudinal changes are often required in KM, too. Bloom et al. emphasize that learning is hierarchical, and learning (objectives) is at the highest level, 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). Knowledge in the Bloom taxonomy refers to a fairly low-level of mastery, such as memorizing something. This is not the same meaning that knowledge has in the KM domain.

Table 6.1
Bloom taxonomy of the cognitive domain

	Level	Description	Action verbs that can be used
1	Knowledge	Remember previously learned material	Recall, repeat, define, describe, list, identify, label, match, name, state
2	Comprehension	Grasp the meaning of material	Classify, convert, discuss, explain, generalize, give an example of, translate, summarize, review
3	Application	Use learned material in new and concrete situations by applying rules, methods, concepts, principles, laws, and theories	Articulate, assess, develop, discover, extend, operationalize, predict, demonstrate, sketch, practice, illustrate
4	Analysis	Break down material into its parts to understand structure; identify parts, relationships between parts	Correlate, diagram, differentiate, discriminate, infer, outline, separate, subdivide, compare, contrast, inventory, relate
5	Synthesis	Creatively put parts together to form a new whole	Adapt, categorize, combine, compile, compose, design, integrate, model, plan, propose
6	Evaluation	Judge the value of material on the basis of definite criteria	Appraise, conclude, criticize, decide, defend, judge, justify, evaluate, rate, value, score, prioritize

Source: Adapted from Bloom (1956).

The affective domain concerns how we deal with things emotionally, our feelings, values, appreciation, enthusiasms, motivations, and attitudes. The five major categories are listed in table 6.2.

The psychomotor domain concerns 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 are listed in table 6.3.

These taxonomic categories can be turned inside out to understand what users are trying to do. The level of internalization can be identified for effective performance; for example, setting a minimum threshold that must be reached 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 determines 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 (the 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 presenting a project team member's

Table 6.2
Affective domain as characterized in the Bloom taxonomy

Receiving phenomena: awareness, willingness to hear, selected attention (e.g., listen to others with respect)	Asks, chooses, describes, locates, names, points to, selects, replies, uses
Responding to phenomena: active participation on the part of the learners; attends and reacts to a particular phenomenon	Answers, assists, complies, conforms, discusses, labels, performs, practices, presents, reads, recites, reports, selects, tells, writes
Internalization of a set of specified values, and clues to these values are expressed in the learner's overt behavior and are often identifiable (e.g., sensitive to diversity)	Completes, demonstrates, differentiates, explains, invites, joins, justifies, proposes, reports, selects, shares, studies
Organizes values into priorities by contrasting different values; resolving conflicts between them and creating a unique value system (e.g., professional ethics, accountability)	Adheres, compares, defends, explains, formulates, generalizes, identifies, modifies, synthesizes
Internalizes a value system that controls behavior; the behavior is pervasive, consistent, predictable, and characteristic of the learner (e.g., team player, autonomy)	Acts, discriminates, displays, influences, listens, performs, practices, proposes, qualifies, questions, revises, solves, verifies

Source: Adapted from Krathwohl, Bloom, and Masia (1964).

résumé when preparing a project proposal. The knowledge worker who prepares the bid would be expected to have a level of understanding that allows executing this task with the required proficiency. He or she must not only be skilled in the selection of team members to include in the proposal but also be able to repackage their résumés in the best form, on the basis of past successes. Another example, using the affective domain in the Bloom taxonomy, makes use of this same best practice but addresses how to judge whether candidates who meet the technical skill requirements also possess the appropriate soft skills, such as being a 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. Far more useful is assessing 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. Only through changes in behavior can knowledge use 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,

Table 6.3
Bloom taxonomy of the psychomotor domain

Perception: The ability to use sensory cues to guide motor activity. (e.g., detects non-verbal cues during conversation).	Chooses, describes, detects, differentiates, distinguishes, identifies, isolates, relates, selects
Set: readiness to act. Mental, physical, and emotional dispositions (mindsets) that predetermine response to different situations (e.g., knows own limitations).	Begins, displays, explains, moves, proceeds, reacts, shows, states, volunteers
Guided response: early stages in learning skill with trial and error. practicing (e.g., driving a car with instructor next to you)	Copies, traces, follows, reacts, reproduces, responds
Mechanism: intermediate stage in learning a complex skill. Habitual responses where movements performed with confidence and proficiency (e.g., driving a car by yourself).	Assembles, calibrates, constructs, dismantles, displays, fastens, fixes, grinds, heats, manipulates, measures, mends, mixes, organizes
Complex overt response: skillful, proficient performance with quick, accurate, and highly coordinated performance (e.g., parallel parking a car).	The key verbs are the same as for mechanism, but with adverbs and adjectives such as quicker, better, and more accurate
Adaptation: can modify movement patterns to fit special requirements (e.g., trainer adapts to real-time learner feedback).	Adapts, alters, changes, rearranges, reorganizes, revises, varies
Origination: create new movements to fit a particular situation or specific problem (e.g., create a new theory, new music).	Arranges, builds, combines, composes, constructs, creates, designs, initiates, makes, originates

Source: Adapted from Harrow (1972).

simply being aware that knowledge exists within the organization is easily observed when knowledge workers can locate the content within a knowledge repository. Access is typically tracked using log file statistics, similar to a website's hits or visitors. Knowledge application, however, requires that knowledge workers have attained much higher levels of comprehension such as analysis, synthesis, and evaluation. Only at these levels can knowledge be truly applied. In contrast to someone who can point to a template in the knowledge base, knowledge application will be manifested by a change in how a knowledge worker goes about doing his or her job.

The affective component is equally important to take into consideration when analyzing knowledge at the application level. Often, the reason knowledge is not being used is not because it has not been understood. Rather, it is often because the knowledge worker is not convinced that the new best practice or lesson learned will significantly improve the outcome. An attitudinal change is often a critical prerequisite to internalization. Someone being made aware of and understanding a given practice is not enough—the person must also believe that it is 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 relates more to physical work and skills.

Facilitation of knowledge application requires more than a user model. We also need to know what the users are doing, what their goals or purposes are in applying this knowledge object. A task model is also required. As with the user model, the task model better characterizes the reasons someone would apply a particular knowledge item.

A user- and task-adapted approach is highly recommended to facilitate internalization processes. This means that we need to know about users and what they are trying to do to support them. This is similar to what a reference librarian or coach would do—that is, try to understand who you are and what you are trying to accomplish. Someone who is browsing to pick up general information and background on a subject of interest may be mistaken for someone who is lost in a sea of information. But someone who has a looming deadline and is looking for a specific template to help with the task as quickly and accurately as possible would not want to be flooded with too much information. These people are looking for only specially selected, vetted, and guided nuggets of knowledge—sometimes referred to as just-in-time knowledge and just-enough knowledge.

Task Analysis and Modeling

Task analysis studies what knowledge workers must do with respect to specific actions to be taken or cognitive processes to call on to achieve a task (e.g., Preece et al., 1994). The most used method is task decomposition, which breaks down higher-level tasks into subtasks and operations. The lower levels may make use of task flow diagrams, decision flowcharts, or even screen layouts to illustrate the step-by-step process for a task. A good task analysis shows the sequencing of activities by ordering them from left to right. To break down a task, ask How is this task done? For a subtask at a lower level, to build up the structure ask Why is this done?

The task decomposition can be carried out in stages:

1. Identify the task to be analyzed.
2. Break down the task into four to eight subtasks. Specify the subtasks in terms of objectives; the subtasks should cover the whole area of interest.
3. Draw the subtasks as a layered diagram ensuring that it is complete.
4. Decide on the level of detail into which to decompose the task. Making a conscious decision at this stage will ensure that all the subtask decompositions are treated

consistently. Decide whether the decomposition should continue until flows are more easily represented as a task flow diagram.

5. Continue the decomposition, ensuring that the decompositions and numbering are consistent. A written account in addition to the decomposition diagram is usually helpful.
6. Present the analysis to someone 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 between users interacting with other users and any problems related to these interactions. Screenshots from the current system may also provide details of interactive tasks. Task flows show the specific details of current work processes and may also highlight areas where task processes are poorly understood, carried out differently by different staff, or inconsistent with the higher-level task structure. An example of a task analysis is shown in table 6.4.

Task analyses are an important first step in the design of effective knowledge application.

Another important concept is that of cognitive load. A famous experiment by Miller (1956) found that our span of immediate memory is severely limited—holding only seven (plus or minus two) discrete items in our minds at one time. Following Miller's

Table 6.4
Tying shoelaces

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

study, psychologists investigated how chunking, or combining items into more general categories, can overcome this information-processing bottleneck in humans. Chunking is why mnemonics work. For example, to recall a list of things, a mnemonic trick is to visualize each item in a different room of your house. Knowledge-based task analysis can capitalize on such useful methods by reducing, say, a document into discrete knowledge chunks (figure 6.7). Each chunk then becomes a knowledge object. This is another important distinction in how KM carries out content management as opposed to, for instance, document management systems. KM operates at a finer level of granularity—the work has been done a priori so users need not wade through thick technical documents or other containers of knowledge. These have been broken down into the valuable knowledge nuggets that are of greatest use. Content management in KM thus breaks down documents into their conceptual components and maps the components using concept indexes, semantic networks, or hierarchical knowledge taxonomies.

The best approach, then, requires a user model, or trace, which records interactions between the user and the system. The user model captures the objects of interest—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 with task analysis, these yield a model of the user and the task the user is attempting to perform, and these two sources of information help in providing the best possible support for knowledge application in that case. Figure 6.8 illustrates a sample user and task model.

Episodes related to tasks usually share some features. Once these common features have been identified for a given task, they can be considered a signature of the task, or evidence that the user is performing this task. The user- and task-adapted approach results in a better understanding of user needs and characteristics of the tasks users are applying knowledge to.

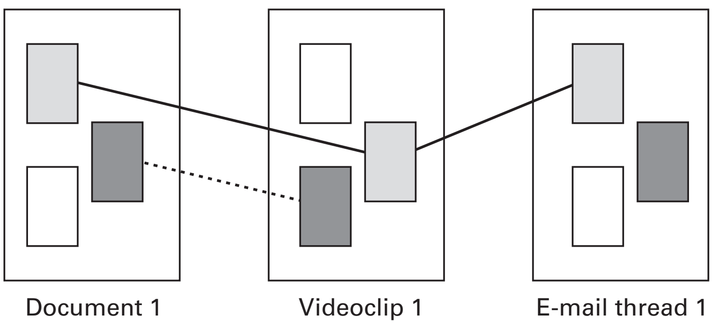


Figure 6.7
Chunking in content management

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 6.8
Sample user and task model

Knowledge Application at the Group and Organizational Levels

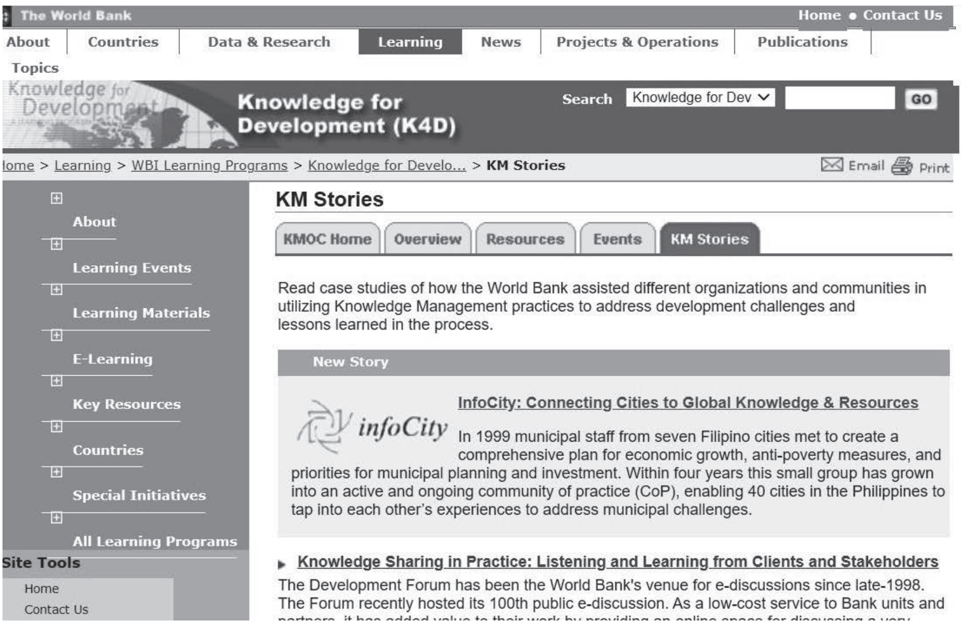
A KM system is an information technology application that is organization-wide and that can be used to store, share, and collect knowledge that employees need in order to learn, collaborate, and successfully perform their jobs. A KM system for an organization is often referred to as a knowledge repository or knowledge base; at the group level, they are known as community or project repositories. The organizational KM system may be an in-house development or a commercial system. Each business unit in an organization—the information technology department, the library, HR, or strategic services—represents a KM unit.

Although diverse, KM systems contain some common features:

- Profiles of who works in the organization (often with an organizational chart) and an expertise locator system
- Links to the different communities of practice
- Best or proven practices, lessons learned, stories (can be multimedia)

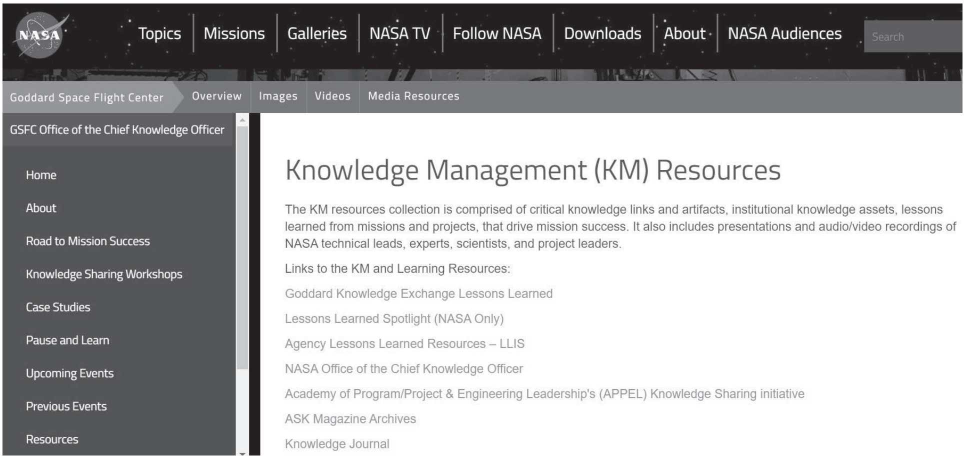
- Links to experts and expertise (who is knowledgeable about what)
- Resources such as templates, demos, articles for major tasks
- Learning resources such as e-learning, tutorials, case studies (formal and informal training)
- Links to events (e.g., lunch-and-learn sessions, webinars, invited speakers)
- Collaboration spaces and tools (e.g., how to find a mentor)
- Visualization tools to better see links among knowledge, people, and processes
- FAQs

A KM system always has a search feature but also a visible taxonomy that users can start from to find information. The taxonomy has the added benefit of helping users better understand the organization itself and how its knowledge is organized. Organizations with good KM systems include the World Bank (figure 6.9) and NASA (National Aeronautics and Space Administration) (figure 6.10).



http://web.worldbank.org/archive/website01537/WEB/0__C-142.HTM

Figure 6.9
The World Bank KM system



https://www.nasa.gov/content/knowledge-management-km-resources

Figure 6.10
The NASA KM system

Maier and Hadrich (2011) note four general approaches to organizational KM systems: a centralized infrastructure; specifically targeted processes, projects, or themes; communities of practice or knowledge networks (supported by information and communication technologies to help in knowledge sharing); and a focus on specific types of content such as a lessons learned knowledge base. The ideal KM system would be a centralized system with a single one-stop interface that any employee can use to search for, find, and use any knowledge that has been historically and geographically aggregated. The reality is that KM systems (and often KM) tend to consist of silos that do not easily interact with one another. Most organizations have local knowledge bases, and most knowledge workers share and collaborate directly, bypassing the formal KM system. “Almost all large organizations have a centralized intranet and/or groupware platform in place that offers a solid foundation for [a KM system] . . . and rely on organization-specific developments and combinations of tools and systems rather than on [a] standard [KM system] solution” (Maier & Hadrich, 2011, p. 786).

Most KM systems, not surprisingly, focus on explicit knowledge that has already been documented, but many others have added features that allow collaboration and knowledge sharing and e-learning. Finally, Maier and Hadrich (2011) state that demand from users is increasing for more media-rich channels. The future trend is likely to be toward greater media richness and social presence to accommodate tacit knowledge reuse and explicit knowledge.

Knowledge Retrieval versus Knowledge Finding

Knowledge retrieval can be a misleading term. At face value, it seems to represent the layer following data retrieval and information retrieval. But knowledge finding, using, and reusing cannot be completely automated. As discussed in previous chapters, the nature of knowledge, of knowledge users, and of knowledge-intensive organizations is simply too complex and too contextual. So *knowledge finding* is the preferred term, to avoid concept confusion. Technological applications for retrieving knowledge are addressed in more detail in chapter 8.

Knowledge cannot hover in an abstract, disconnected state: knowledge and KM need to be anchored on effective data, records, document, archival, and information management systems. Knowledge is complementary and should be integrated in the organizational repositories and the organizational information technology infrastructure. Often knowledge cannot (and arguably should not) be disentangled from data, records, documents, archives, and so on. Thus, adding knowledge on to these existing layers of finding content may be best: a content management system. Further, even integration only at the conceptual level can be effective, such as a single interface that allows users to search for content regardless of which system or server the content resides in. The key to finding knowledge in the future is ensuring that additional knowledge content is part and parcel of existing organizational content repositories and the processes used with them.

Knowledge retrieval systems organize valuable content in a structured way so that users can find this content. We could equate information retrieval with knowledge retrieval if knowledge retrieval were direct: that is, users search the knowledge repository to find content. However, KM is not just for connecting people to content but also for connecting people to people. So knowledge retrieval functions are not sufficient to cover all KM processes. As noted in chapter 4, many rely on using only keywords to search for content. The major shortcoming of keyword searching is that retrieval depends on how well content was tagged with meaningful keywords. Other search and knowledge retrieval functions are needed, and they must be well anchored on established, proven information retrieval practices (e.g., Chowdhury, 2010; Goker & Davies, 2009; Van Rijsbergen, 1979). For example, Yao et al. (2007) extended Van Rijsbergen's (1979) comparison of the differences between data and information retrieval to the retrieval of knowledge. Key differences include Boolean search being a main method to find data whereas information and knowledge are retrieved using partial and best matches. Knowledge retrieval focuses more on the organization of the knowledge and semantics, whereas data and information retrieval rely more on indexing. Table 6.5 summarizes this comparison.

KM systems can be viewed as activity systems that involve people making use of objects (tools and technologies) to create artifacts and products that represent knowledge to achieve a shared goal. Previous information management systems focused on a small portion of such a system, such as a narrow set of objects in the form of a collection of records or simple communication among team members. KM systems 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. KM systems have already met with significant success in the business sector and are spreading to other sectors, including education (Marshall & Rossett, 2000) and instructional design (Ganesan, Edmonds, & Spector, 2001). Table 6.6 provides some examples of KM systems.

The organizational KM architecture comprises at least three levels: the data layer, which is the unifying abstraction across different types of data with potentially different storage mechanisms (e.g., database, text documents, video, audio); the process layer, which describes the logic that links the data with its use and its users (other people or other systems that use that data); and the user interface layer, 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 6.11.

KM cannot be supported by the simple amalgamation of masses of data, however. KM requires the structuring and navigation of 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. Tools and techniques are available for the knowledge application phase of the KM cycle. Dissemination and publication tools

Table 6.5
Data, information, and knowledge retrieval characteristics

Data	Information	Knowledge
Boolean matching	Partial or best match	Partial or best match
Deterministic model	Statistical model	Semantic model
Numbers, rules	Natural or markup language	Concept graph, semantic network, ontology
Database (e.g., numbers)	Collection (e.g., documents)	Knowledge base (e.g., stories)

Source: Adapted from Yao et al. (2007).

Table 6.6
Knowledge application support technologies

Name	Description	Website
MindManager	High-level knowledge visualization and mapping tool	http://www.mindjet.com
MS Teams	Team collaboration software	http://www.microsoft.com
MS SharePoint	Web-based collaboration	http://www.microsoft.com
Slack	Team communication	http:/www. /slack.com
Visio	High-end flowcharting tool	http://www.microsoft.com/office/visio/
DropBox	Digital filing cabinet (document management system)	http://www.dropbox.com
Prism	Enterprise content management system	https://prismsoftware.com/
WalkMe	Electronic performance support system	https://www.walkme.com/
Elucidat	E-learning	https://www.elucidat.com/
Confluence	KM system	https://www.atlassian.com/software/confluence/use-cases/knowledge-management-software
Tribe Community Platform	Community of practice	https://tribe.so/

typically involve a knowledge repository design and include, for example, routing and delivery of information to those who need it or who have subscribed (push vs. pull approach). Email and workflow are examples of push technologies that notify users of changes such as newly posted content or expired content. Pattern matching against user profiles can better target where pushed content should go.

Other tools help structure the content and navigate through it. They provide a classification scheme for the organization's knowledge assets. We saw examples of these knowledge taxonomies in chapter 5. Navigation guides are in the user interface layer. Once the content has been properly indexed and organized, multiple views can be made available for the same underlying content 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 locator systems should be available from the user interface layer of the KM architecture, so that user interface topics link to the relevant KM content, people, and processes.

In general, a knowledge repository will contain more than documents (document management system), data (database), or records (records management system). A

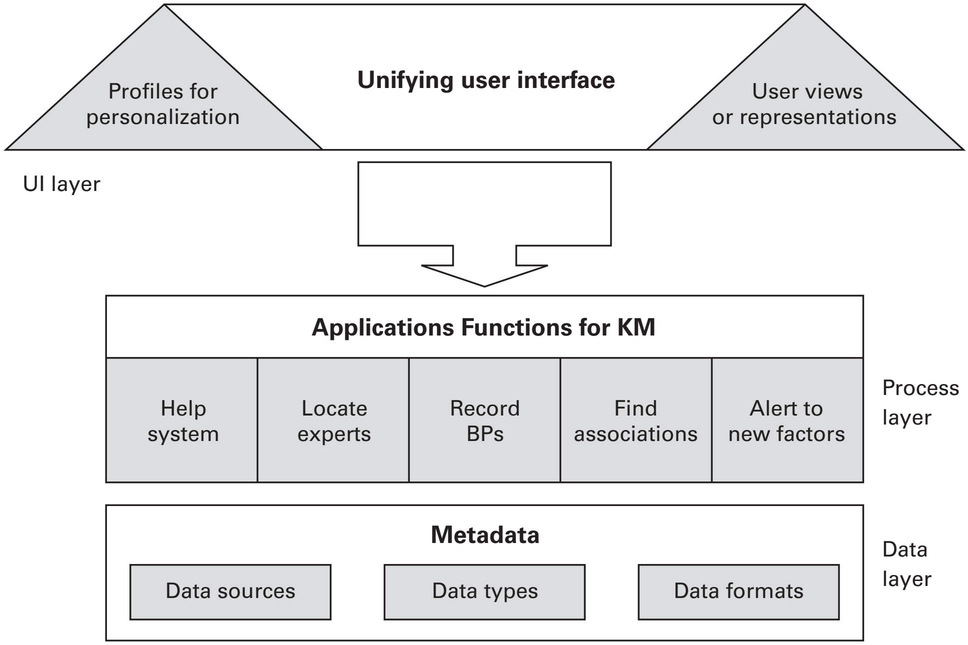


Figure 6.11
KM organizational architecture

knowledge repository contains valuable content that is a mix of tacit and explicit knowledge, which is based on the unique experiences of the individuals who are or were a part of that company and the know-how that has been tried, tested, and found to work. Davenport, De Long, & Beers (1998) distinguish among repositories that store external knowledge such as that gathered from competitive intelligence, demographic or statistical data from data resellers and other public sources, and internal knowledge repositories that store informal information such as transcripts of group discussions, emails, or other forms of internal communications. Internal knowledge repositories have a less constraining or less formal structure to better accommodate its fluid, subjective knowledge content.

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

Many organizations have also integrated KM applications with e-learning, or remote technology-mediated learning. Knowledge must be understood, learned, or internalized before it can be applied. E-learning can therefore be seen as a knowledge-sharing channel that requires a 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 in-depth one-to-one interactions. With online learning, students can relearn through replaying a video, viewing the lecture slides, and asynchronously interacting with classmates and instructors. The major advantage of e-learning is the time and travel cost saved by people not having to go off-site. 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 using a blended learning model (a combination of some e-learning with some face-to-face instruction, tutoring, or discussion). Box 6.1 describes an example.

Knowledge Reuse

Reusing knowledge involves recall and recognition and applying the knowledge, if we use Bloom's taxonomy. Reusing knowledge typically begins with forming a search question. Differences between experts and novices quickly become apparent here, because

Box 6.1

An Example: GetSmart—E-Learning Solution for the NSDL

> The National Science Digital Library (NSDL) GetSmart system (Marshall et al., 2003) exemplifies integration of KM and e-learning. GetSmart was designed by blending 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 concept mapping to support student learning. From a KM perspective, GetSmart is a system for the generation, codification, and representation of knowledge 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 or 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.

experts know the right questions to ask. Next, experts are searched for and located using expertise locator systems, or yellow pages, as we saw in chapter 5. The appropriate expert or advice is 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, sometimes referred to as recontextualization of knowledge (decontextualization occurred to some degree during knowledge capture and codification).

Three major roles are 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 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, automatic classification systems 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, depending on the individual who is doing the reusing and the purpose of knowledge reuse, a suggestion compatible with the user- and task-adapted approach that has been outlined in this chapter:

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. For example, a doctor consults a patient's chart to see what medications had been prescribed recently by other doctors, or special education teachers and therapists share student files to see which interventions did or did not work. This is the easiest form of knowledge reuse because 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 (CoP). They are peers who share a profession. This form of knowledge reuse requires a higher degree of filtering and personalization, typically by CoP knowledge librarians. Reusers need more reassurance about the source's credibility—they must be able to trust that the content is valid and should be applied. They are less likely to completely overlap in their contexts, so it is likely that knowledge reuse requires 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: 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 it. Electronic performance support systems and other performance support aids such as e-learning modules are also of great use to such reusers.

Secondary knowledge miners are analysts who study knowledge repository use to extract interesting and meaningful patterns. They are analogous to the usage analysts 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 actively accessed and should be archived, which have been superseded by newer and better best practices, and so forth.

Different types of reusers interface differently with knowledge repositories and 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 CoP. Because 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 container maintainers are.

Knowledge reuse requires context and a great deal of metaknowledge (knowledge about the knowledge), such as explanations on how to use it or how to carry out a procedure. In addition, metaknowledge provides the why for this being the best way. In addition to connecting people with content, knowledge reuse also connects people with people to share knowledge, validate it, enhance it, and better understand it. The contribution process can (and should) be guided by the KM group, but a KM system needs to make the accumulated knowledge of the organization available for reuse, so all contributors are welcome.

KM and Information Technology Systems

What is the relationship of KM with information technology (IT) and other organizational information systems such as databases, document management systems, records management systems, and archival systems? In general, KM never replaces these existing systems but is either integrated with them or represents additional content in the form of explicit and tacit knowledge. A KM system is usually maintained by a specific group, often IT, in the organization, whereas every knowledge worker contributes knowledge to the KM system. A KM system can be part of a content management system and may include other components, such as a document management system, multiple and diverse databases and data management systems, records management systems, and archival systems. Horizontal applications can be through all these components, such as workflow systems, decision support systems, job aids, taxonomy systems (tagging, adding metadata), collaboration tools, communication tools, and storage capabilities.

Systems that support KM provide specific functions related to communication (email and discussion forums), coordination (shareable calendars and task lists), collaboration (shareable artifacts and workspaces), and control (internal audit trails and automatic version control). User-centered KM systems contribute to an organizational culture of sharing by providing a sense of belonging to a community of users and by supporting reciprocity among users (Marshall & Rossett, 2000). KM systems 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.

KM systems support many information functions (Edmonds & Pusch, 2002):

- Acquiring and indexing, capturing, and archiving
- Finding and accessing
- Creating and annotating
- Combining, collating, and modifying
- Tracking

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

KM systems therefore work with several other IT applications and systems. The major difference lies in the target unit that is managed (e.g., Porter, 2021). In data management, specific data is created, analyzed, shared, stored, and preserved. Examples are budget spreadsheets and forecasts. A database is an organized collection of data that can be organized in table form such as a spreadsheet (e.g., Excel). These tables can be interconnected to store such content as descriptions of products in inventory or country profiles for an multinational company. A database management system allows users to search, sort, and reuse this content. Document management focuses on creating, classifying, tagging, and preserving documents (text or multimedia content).

Document management systems typically target digitized files. An example is DropBox. Information systems allow individuals, teams, and the organization to better reuse accurate and timely data and information.

Information management consists of collection, storage, curation, dissemination, archiving, and destruction. A KM system, in addition, allows reuse of both tacit and explicit knowledge, some of which may not reside in any form of IT but instead reside within the heads of experts. KM focuses not only on content itself but also how it can be shared. Information, combined with experience and judgment, intuition, context, and historical experience, is the basis of knowledge. We cannot be too black and white, however, about categorizations because knowledge application and reuse almost always come with data, documents, and information. It is not an either-or choice but rather a pulling on one node of a large net when searching for knowledge and reusing the whole catch that the net brings up. A nonfishing example is a dense procedural manual. Even if the manual is extremely well done and easy to follow, the performance level of the user will not reach the level of more experienced, articulate people using the manual, who can explain, guide, coach, and correct as the person applies the contents of the manual.

KM and Archival and Records Management

What is the relationship between KM and archival and records management?[1] Again, they are and should be complementary activities. Archives tend to preserve content and meet compliance requirements (such as legal requirements to keep certain types of content for a certain period).

> Archivists and records managers have long been knowledge managers. The challenge is to move beyond this. Specifically, records management professionals need to recognize the intellectual capital they control and to capitalize on opportunities for knowledge creation and the enhancement of organizational learning. This means that archivists and records managers must rethink traditional identity markers, such as the records center, as the sole domain, physical records as the object of work, and records management or archives as the core area of responsibility. (Yakel, 2000, p. 24)

However, archival science has evolved as has the field of all information professionals. Menne-Haritz (2001) provides an example of a new paradigm on archival processes such as access, assessment, and preservation. The KM lens on archival science and practice shifts the focus from preserving and storing content as is (to preserve authenticity) to ensuring that access to what is stored meets the needs of organizational knowledge workers—in the present and in the future. The notion of preserving in order to meet legal requirements is becoming extended to preserving to meet the needs of knowledge workers, teams, and the organization. "Knowledge builds the bridge between the past from which it learns and future which it helps to prepare for" (Menne-Haritz, 2001, p. 81). The custodial paradigm can be extended to include ongoing access. Part of why this is easier to do now is that most of the content is digitized, and online access will not endanger the physical materials. A main benefit of looking at KM and archives as complementary functions is that valuable content is assessed, accumulated, combined, and stored to help ensure that knowledge content can be applied by all who need it. "Archives do not store memory. But they offer the possibility to create memory. Their function is that of amnesia prevention" (p. 59). Organizational memory and corporate amnesia are discussed in chapter 11.

KM and archives are similar in that both have as an objective capturing valuable organizational knowledge so that people are aware it is there, can find this content and make use of it, and continue to reuse it over time. Both prepare and classify sources in such a way as to help their findability. Archival methods such as finding aids are perfectly suited to document (or render explicit) the organizational traces of past actions.

> Archival methods show how to use the past to gain new knowledge, not only in the form of explicit description of facts, but also in the form of past experiences as they can be reconstructed from traces left over by past events. (Menne-Haritz, 2001, p. 81)

The concept of an open and live archive is in perfect alignment with KM. This again extends the notion of an archival record as a piece of history that is frozen and cannot be modified, preserving its authenticity. If this archival record is viewed as a tool for learning, then it is acceptable and even desirable to allow third-party insights and investigations. These can also be recorded as annotations and preserved along with the original record. The additional knowledge we gain about this content is just as valuable and can also be accessed and reused by others.

The archived object need not be a document, but it could be an object. Myriad diverse people from different fields of expertise will interact with the archived object and learn from it but also add to what we know about it (e.g., Dalkir, 2017). The knowledge generated by the community of users who both take and contribute knowledge about this archived content can also collaborate, even if it is an asynchronous form of collaboration mediated by the object and the knowledge about the knowledge. For archives to be found and read is not enough; they also need to be understood. We need to know who knows what about this archive. Above all, this knowledge then needs to be applied and reused.

Neither KM nor archives should be thought of as a storeroom because this implies passivity. KM cannot succeed unless knowledge is actively applied, used, and reused. Tombs (2004) argues that information and communication technologies can be used to manage knowledge in such a way as "to deliver a future where technology manages every piece of information, making it tangible, physical, something we could work with like steel or paper" (p. 90). Although this is a potential goal for information, tacit knowledge is not a good candidate, at least not for complete codification. There will always be some tacit knowledge applied only to reuse and share by collaborating with the knowledgeable people.

Jones and Vines (2016) point out that the perception of a storeroom is prevalent in most organizations because they tend not to have digital libraries. Instead, they rely on IT to manage publications and resource collections. This leads to challenges to reuse because knowledge workers fail to search and find the content they need. Or they find the content but have no idea of its provenance, meaning, usefulness, and validity. Its relationship to other documents, projects, and programs is obscure, and users are not able to place this content in context. Without a clear link to what this knowledge is supposed to be used for, the value of having preserved it is far from obvious. Archival approaches put metadata context front and center and should therefore be an integral part of KM initiatives (e.g., Duffy, 2001). In a similar vein, Franks (2018) notes that

> not all information is created equal. Some will be classified as records, but other useful information may never be designated as a formal record (e.g., work in progress). Therefore, organizations are justifiably concerned about managing all information and not just *official records* (those processing legally recognized and enforceable qualities necessary to establish a fact). (p. 37)

KM manages unofficial knowledge more frequently and in greater quantities than official knowledge. Works in progress are a good example as is bouncing ideas off trusted colleagues. The challenge is to share, store, and reuse this content and the final official document that has been translated and published, or posted on the organizational intranet or website. KM needs to not only be conceptually interdisciplinary but also leverage its diverse disciplinary roots in actual practice (e.g., Duranti & Xie, 2012). Records management cannot easily capture content that does not exist in a tangible form, whereas KM is better at managing the tacit knowledge of employees. In an ideal world, KM would work closely with records and archives managers and with librarians and other information professionals so as to not reinvent wheels that have stood the test of time. Chapter 13 discusses the KM team in more detail, including how the team links to organizational units such as HR, IT, corporate libraries or resource centers, and archives and recordkeeping units.

Note

1. I thank Lori Podolsky for her help with this section.

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7 Organizational Culture

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

This chapter describes different types of organizational cultures with a view to understanding the 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 KM.

Learning Objectives

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

Introduction

The organization's cultural environment plays a crucial role in what happens to KM within that organization (figure 7.1). What is organizational culture? The literature on

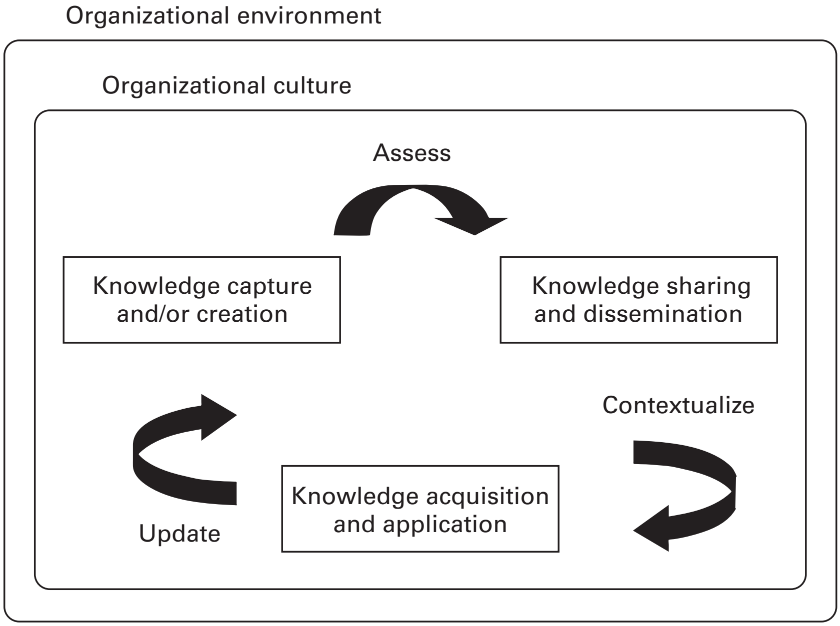

Figure 7.1
An integrated KM cycle

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

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

There are, not surprisingly, many definitions of organizational 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 re-create the worlds in which they live" (1997, p. 141). Morgan asserts that cultural analysts have three basic questions:

- 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 founding 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 in terms of both its causes and its effects. Using an outcomes perspective, culture can be defined as a manifest pattern of behavior, behavioral consistencies across individuals, or the way things are here. Culture thus defines the consistent ways that 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 are the following:

- 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 by and about the group

- Climate—the feelings evoked by the way members interact with one another, with outsiders, and with their environment, including the physical space they occupy
- Metaphors and symbols—which may be unconscious or embodied in other cultural elements

Other authors define corporate culture as the set of understandings (often unstated) that members of a community share. Shared understandings consist of norms, values, attitudes, beliefs, and paradigms (Sathe, 1985). *Merriam-Webster's Dictionary* defines culture as the "integrated pattern of human knowledge, belief, and behavior that depends upon the capacity for learning and transmitting knowledge to succeeding generations."[1] Organizational culture can be taught to new members of the organization as the correct or accepted way to think, perceive, and feel with respect to organizational work, problems, and so forth.

Although every organization has its own culture, strong or weak, most organizations do not create their culture consciously. Culture is created and ingrained into people's life unconsciously. Unless they make a special effort, people will not recognize that the attitudes, beliefs, and visions they have always taken for granted are standardized assumptions that they may pass to future generations. Making sense of culture is difficult because, even though the artifacts of culture can be easily sensed, the core of the culture, values, which are "broad, nonspecific feelings of good and evil, beautiful and ugly, normal and abnormal, rational and irrational—[are] feelings that are often unconscious and rarely discussable" (Hofstede et al., 1990, p. 291). Cultural artifacts are both conceptual (such as language) and material. They mediate interaction with the world, coordinating people's activity with the physical world and with each other.

There is a reciprocal relationship between organizational culture and communication (Pepper, 1995). On the one hand, communication is the tool that helps employees transmit organizational culture to each other and to the newcomers of the organization, and it also enables the culture to be maintained and developed in its certain way. In a sense, culture comes into being through constant communication among the members of the organization, and communication changes the cultural assumptions over time. On the other hand, culture deeply shapes and alters the communication within a specific culture. There is a strong link between organizational culture and organizational communication. The culture can support discussions around some topics but discourage others. In addition, the culture of an organization plays a role in determining communication interactions such as who talks to whom, about what, and when (Neher, 1997). Organizational culture, therefore, may be thought of as the way 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).

Of course, people don't always behave as expected and the preceding cultural profiles are generic. The climate control of a large building offers a good analogy to organizational: although a temperature may be set for the whole building, microclimates abound, 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 may be characterized as having a particular type of culture, many different types of microcultures are in evidence throughout the company. Some of these may be detected in its communities of practice, the different types of professionals or skill sets that make up the company's human capital, and so forth.

One way of exploring cultures is to classify them into types. Organizational culture can be differentiated in many ways. Goffee and Jones (2000) identify four types of organizational culture. They used two dimensions to create the four distinct types. The first dimension, sociability, is a measure for friendliness. A highly sociable culture indicates that people within the culture tend to be friendly to each other without expecting something in return. Solidarity, the second dimension, measures the task orientation. High solidarity means that people work well together toward goals, even they if have personal disputes or conflicts.

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, shown in table 7.1. The third level is ultimately the basis for all values and actions.

Table 7.1
Levels of culture

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

Source: Adapted from Schein (1992).

Artifacts, visible structures and processes, are easy to detect (e.g., a dress code), but they may be difficult to understand. They represent the tip of the iceberg, and discerning or deciphering what lies beneath them is a challenge (e.g., what is the reason for this dress code?). General and abstract statements that express certain ideas and truths about human beings usually represent basic assumptions in organizational culture. They are the expression of a philosophy, of a general concept of individuals and society. Given the diversity of such concepts and the contradictory characteristics they have, these assumptions often have an eclectic, heterogeneous, fragmentary, and unilateral aspect.

The values shared by the members of an organization represent the second layer in culture analysis. From an organizational perspective, values express essential meanings of basic assumptions. Therefore, values define a set of organizational expectations of 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 an organization expressive area or expressive culture. Its origins can be found in both the organization's history and the personal histories of its members.

Norms form the instrumental and visible area of organizational culture. They represent the most evident layer for someone who encounters 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. Therefore, 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, mandatory norms produced by managers or experts hired for this purpose alone and informal norms produced by the 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 and are based on certain values spread in an informal space. An expressive culture is one that reflects the emotions, feelings, and aspirations of the organization's personnel. An illustration of microcultures is provided in box 7.1.

Norms are directly involved in the change process, because they allow interventions in a field accessible to individuals. Those who want to understand and comprehend organizational culture refer to its philosophical and value layers. Those who want to change culture and use it as a maintenance or development tool refer mainly to its normative layer or normative culture. A normative culture is one based on a set of formal rules, norms, prescriptions, positions, and hierarchies, and it emphasizes compliance with rules.

Box 7.1
A Vignette: Microcultures

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 one group, a 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 toward 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 each propose a different idea: "Why don't we go over to that big tree there? But if there is lightning, it wouldn't be safe. How about the tent? That makes more sense plus it has 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. . . ."

These illustrate four different microcultures:

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 (adapted from Kotter, 1996)

Norms also represent one of the premises for cultural unity, the reference system for managers in personnel assessment. Such assessments sustain norm strengthening and are often accompanied by bonuses. Norms are thus a reference system for personnel as well, whose attitude toward them represents the framework that produces 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 bringing assumptions to the surface can be extremely difficult. Schein uses the classic three-step approach to discuss change—unfreezing, cognitive restructuring, and refreezing. The key issue for leaders is that they must become marginal in their own culture to a degree sufficient to recognize its maladaptive assumptions and to learn new ways of thinking as a prelude to unfreezing and changing their organization.

What are some ways of analyzing culture and assessing whether an organization is ready to implement KM and a knowledge-sharing culture? The best way is to ask. Organizational cultural analysis is typically conducted using some combination of a survey (a questionnaire) and structured interviews. A number of instruments exist that can help diagnose organizational culture (e.g., Harrison & Stokes, 1992). These are typically surveys or questionnaires that help identify the critical aspects of an existing culture and provide a profile of an organization's culture, often an orientation. A good example is provided by Agarwal and Islam (2014), who analyzed the culture of a university. They sent a web survey to 1,263 faculty members at fifty-nine universities to investigate whether they were ready for KM. They asked about individual factors such as trust, knowledge self-efficacy, collegiality, openness for change and reciprocity, and their perception of their university's readiness for KM. They found that the faculty exhibited a positive intention to share their knowledge and, accordingly, perceived positively their university's readiness to adopt KM. The study found that all the independent variables except for trust had significant effects on a faculty member's individual readiness to participate in a KM initiative. Of these, the strongest effect on individual readiness was that of openness to change, thus organizational readiness is strongly connected to individual readiness. Chapter 9 discusses organizational readiness in greater detail.

The most important aspects of an organizational culture are that culture promotes an ideal that mobilizes learning institutions in achieving it and that culture can bring uniformity, unity, and diversity. Culture is customs and rights and the organization's own way of doing things, norms, values, behavior patterns, rituals, and traditions. Culture implies structural stability, patterning, and integration. It arises from shared history, and adaptation and change are not possible without making changes that affect the culture. It is not always rational; more often it is not. Large organizations face 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). At this juncture—the resistance to any change in the organizational culture—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 to promote knowledge sharing and collaboration. In almost all cases, KM triggers a change that in turn triggers a maturing or evolutionary process. However, the instigator of change rarely meets with a receptive audience. A few will oppose change for the sake of opposition, but most will oppose it 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 they have neither ownership in the change nor vested interest in whether it succeeds. A knowledge-sharing culture is one built on a foundation of trust, and thus it is imperative to inform, involve, and inspire participants when making changes.

Corporate culture is a key component in ensuring that critical knowledge and information flow within an organization. The strength and commitment of a corporate culture is almost always 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 a culture that rewards the flow of knowledge horizontally as well.

Communication systems can be thought of as the disseminators of culture (Bloom, 2000). In ancient times, physical transportation routes fulfilled this role. For example, the Egyptians used the Nile to unite towns across 4,000 miles. The Phoenicians sailed to shuttle goods and ideas 2,400 miles away. Saint Paul used the Roman highway systems to send his epistles on 170-mile journeys. The Chinese used land and river routes to pull together a 3-million-square-mile empire. In all these systems, ideas flowed and were shared, exchanged, or integrated. The Romans did not just build highways—they spread a common language. The Chinese disseminated a common alphabet, the Incas a uniform system of accounting based on knots. Knowledge dissemination therefore needs a lingua franca, something in common like a language, standards, norms, or protocols.

The types of ideas to disseminate for KM implementation include a recognition that knowledge and knowledge creation is not a proprietary and solo undertaking but a collaborative and participatory one. This idea links to earlier discussions on the social construction of knowledge, an understanding of the individual differences and organizational contexts that can influence such perceptions.

In a knowledge-sharing culture, knowledge sharing is the norm, not the exception; people are encouraged to work together, to collaborate and share; and they are rewarded for doing so. The paradigm shifts 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 a major factor 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 provides a good indicator of how successful KM will be. 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 explain correlations. Their initial interviews of thirty employees addressed the sharing of explicit knowledge. They found that this sharing was mostly through databases, intranets, and shared drives, but 28 percent was still through face-to-face contact. The face-to-face sharing involved questions such as “Where is it? How do I get it? Who should I go see?”

The study also elicited information on why it was hard to share explicit knowledge and suggestions as to how it could be made easier. The major difficulties mentioned were that the knowledge was hard to find, there were different systems and no standards, the information was not where it was expected to be, the tools were difficult to use, and the database was difficult to access. Suggestions were to conduct training on knowledge retrieval, define a knowledge strategy to categorize in a standard way, standardize the information technologies, and create project websites.

Next, Gruber and Duxbury (2000) looked at how tacit knowledge was shared. The most popular means was face-to-face (90 percent) followed by informal networks (25 percent). Sharing tacit knowledge was impeded by attitudes that knowledge was power, not knowing who the expert was, not knowing if the knowledge existed, and loss of knowledge when people left the company. Some suggestions 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.

One of the fundamental components of organizational culture is trust: people must feel they are respected and treated in a professional way. Trust greatly enhances knowledge sharing and promotes a KM-friendly culture (e.g., Evans, Wensley, & Frissen, 2015; Serenko & Bontis, 2016). People don’t always expect complete reciprocity, but they do expect that their contributions will be acknowledged (attribution), showing an altruistic or benevolent trust. The ideal knowledge-sharing culture emphasizes communication and coordination between groups, is made up of experts who do not jealously guard their knowledge, actively and visibly encourages knowledge sharing at all levels of the hierarchy by recognizing and rewarding knowledge sharing and by embedding statements encouraging it in corporate and individual performance objectives. A culture that promotes knowledge sharing is one where tools and taxonomies are standardized to make access and exchange easy, where there are a significant number of semisocial events such as workshops for sharing with experts and other groups, where organizational goals explicitly include knowledge sharing, where trust is prevalent in all interactions, and where the communication channels flow across geographic, temporal, and thematic boundaries.

Gruber and Duxbury (2000) conclude that an environment that truly supports the sharing of knowledge has the following characteristics:

- Reward structure—recognition for knowledge sharing with peers
- Openness and transparency—no hidden agendas
- Supported sharing—communication and coordination between groups
- Trust—shared objectives
- Top management support—upward and downward communication

The Effects of Culture on Individuals

How does an organization's culture influence the behavior of its members? If consistent behavioral patterns are the products of a culture, what is it that causes many people to act in a similar manner? A culture, or more accurately, members of a reference group representing a culture, creates high levels of cross-individual behavioral consistency through social norms, shared values, shared mental models, and social identities.

Social norms are the most basic and most obvious of cultural control mechanisms. A social norm is simply an 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:

1. Peripheral norms are general expectations that make interactions easier and more pleasant. Because adherence to these norms is not essential to the functioning of the group, their violation generally results in mild social sanctions.
2. Relevant norms encompass behaviors that are important to group functioning. Violation of these norms often results in noninclusion in important group functions and activities.
3. Pivotal norms represent behaviors that are essential to effective group functioning. Individuals violating these norms are often subject to expulsion from the group.

Why do individuals comply with social norms? What explains the variance among individuals in a group in the degree of compliance with norms? That is, why do some members comply with all norms, whereas others seem to ignore them? Individuals motivated primarily by desire for acceptance, worth, status, and other forms of external validation would be most likely to comply with social norms. Social sanctions involve the withholding of acceptance, and individuals seeking acceptance are most likely to comply. Likewise, those with 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, which 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 without being sanctioned.

As a cultural control mechanism, shared values get their power in being shared. The issue is not whether an individual's behavior can be explained or predicted by his or her values but how widely that value is shared among organizational members and, more importantly, what part the organization or culture had in developing that value within the individual. Value is any phenomenon that bestows worth in the eye of the 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 several ways. For example, individuals who internalize the value of honesty feel guilty when cheating or stealing. This negative affect stops them from acting inconsistently with their internalized value. Public values arise when we believe that everyone around us holds a certain value (social value); we often act in ways consistent with that value even if we don't personally hold that value. This is done to gain acceptance and support from the group.

A mental model or theory defines a causal relationship between two variables. The idea that people rely on mental models can be traced back to Kenneth Craik's 1943 suggestion that the mind constructs small-scale models of reality that it uses to anticipate events. Mental models can be constructed from perception, imagination, or the comprehension of discourse. They underlie visual images, but they can also be abstract, representing situations that cannot be visualized. Each mental model represents a possibility. Cognitive scientists have studied this phenomenon over several decades (e.g., Gentner & Stevens, 1983; Johnson-Laird, 1983; Oakhill & Garnham, 1996; Rogers, Rutherford, & Bibby, 1992). 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 began to share common mental models about employees, competition, customers, unions, and other important aspects of managerial decision making. Mental models are often called basic underlying assumptions. Mental models strongly affect the behavior of individuals. Decisions are often based on one or more of our mental models. For example, if a manager believes that increasing employees' satisfaction will increase their performance, he or she is likely to do things that eliminate dissatisfaction among employees and to work hard to increase employee levels of satisfaction. When all managers of the organization share the same mental models or theories, they are likely to make very similar decisions when solving problems. This leads to a consistent way of doing things and solving problems in an organization.

In summary, organizational culture does the following:

- 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 or worth to the reference group of each social identity
- Provides values, cognitive schema, and mental models to influence individuals' behavior with respect to the groups or communities they are a member of (microculture) and with respect to the organizational culture as a whole

Organizational culture is not so much a discrete thing that can be pointed to. Envision it, rather, as the medium that the organization resides in. This medium is not only complex but also a moving target—organizational culture as a whole is dynamic and always in the process of changing. 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, and microcultures represent different work groups within an organization.

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 this usually means is that someone desires a behavioral change, such as employees paying more attention to customers, managers arriving to meetings on time, or some other set of behaviors. These patterns of behavior can be changed by changing the organization's structure (rules, regulations, and reward systems), but changing behaviors through culture involves changing the underlying mechanisms that drive behavioral patterns: namely, norms, social values, or mental models. Because these underlying culture control mechanisms are often taken for granted and are subconscious, they are difficult to change.

Changing structure by changing a rule and its enforcement mechanism is simple to do compared with 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 must change their entire social identity. Sometimes changes in the statuses of roles or identities cause even more resistance on the part of high-status role holders.

Changing behavior by changing structure may appeal because it appears easier, but it is often not successful because managers have not changed the underlying culture, and they find that the culture and structure are in conflict. Although organizational change is difficult and often lengthy, it is a critical requirement for most if not all KM implementations. Symbolic action is often required—that is, dealing with values, norms, and assumptions. Kilmann, Saxton, and Serpa (1986) provide guidelines:

- 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, a "do as I say, not as I do" attitude 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 highly valued and practiced at all levels of the organization.
- Culture is often transmitted through stories and myths that extol virtues held to be important to the organization. These stories are often told in informal settings and 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 also regaled with stories of key events in the organization's history, stories relating spectacular successes and disappointing failures. These stories relay the message "That's how things are done around here" to the new employees.
- 3. When a leader supports values during a crisis, when emotions often run high, he or she communicates that this value is important. For example, if the organization has strongly, repeatedly supported professional ethics and ends up losing a bid to a competitor that did not bother about such niceties, that value becomes even more powerful if the organization's leaders retain that value despite the competitor's behavior. This shows that values are not adhered to only when convenient but that they are always to be adhered to.

- 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 a strong message that teaching is not valued and that only research productivity is valued.
- Important and public decisions also communicate the importance of values. If the first thing to be cut in budget crunches is training, that sends the message that training is not valued. Resource allocation often reveals an organization's values. For example, budgets based on steady past performance send a different message than budgets based on past innovation and risk taking.
- Leaders communicate values by what they praise and what they criticize. It is important to pay attention to what is said. Social values can change with membership changes. As new members are hired, effort is made to hire new members who hold the new value. Different organizations will elect to implement this reward (praise) and censure (criticize) cycle differently. For example, at Buckman Laboratories, a hundred employees who have been voted as the top knowledge sharers are invited to take a trip to the head office where the company president himself bestows a gift of a fully loaded laptop to them in recognition of their excellent KM work.

Individuals making decisions and solving problems mostly do not question their basic assumptions (underlying mental models). They simply use them, without thinking, and arrive at a decision or a solution to their problem. If the solution does not work, they most likely question the inputs to their decision and attempt to make a better decision next time. As discussed in chapter 2, this is single-loop learning (Argyris & Schon, 1978). If the individual or group questions the basic assumptions and models underlying the decision, it is double-loop learning. Double-loop learning changes shared mental models. When attempting to change the shared mental models of a group, it is important to take time out from the day-to-day problem-solving processes to outline, challenge, and agree on changes to the shared mental model.

Most change programs inside companies do not work, because they address content (the knowledge, structure, and data in a company) or process (the activities and behaviors) but not the context in which content and process 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 mindset or the organizational culture. It includes all the assumptions and norms brought to the table. Context is perception, as opposed to facts or data. People don't go off and design their context—they just inherit it. Culture is also socially constructed and reflects meanings that are constituted in interaction and that form commonly accepted definitions of the situation.

Culture is symbolic, which is why it is best described by telling stories about how we feel about the organization. A symbol stands for something more than itself and can be many things, but it 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. Culture is unifying because it 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 holistic because it refers to the essence—the reality—of the organization: what it is like to work there, how people deal with each other, and what behaviors are expected.

Culture is rooted deep in unconscious sources but is represented in superficial practices and behavior codes and embodied in cultural artifacts. Allee (1997) defines a KM-enabling culture as a trusting environment where innovation is rewarded, experimentation and mistakes are tolerated (e.g., trial and error), and there is time to reflect as well as to act to continuously learn from the past and improve. Some characteristics of an effective KM culture are the following:

- Individuals, groups, and the organization and its external stakeholders all share knowledge.
- Leaders provide good role models and share their knowledge.
- There are appropriate rewards and incentives for knowledge sharing and innovation.
- There is trust, mutual respect, and reciprocity among employees.

Creating a knowledge-sharing culture requires the following:

- Knowledge journalists, who interview key people to document projects, best practices, lessons learned, and good stories
- KM get-togethers, which could be breakfasts, lunch-and-learn sessions, or any 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 role models
- KM pilot projects such as expertise locator systems or intranets with space devoted to communities of practice
- Performance evaluation criteria that reflect and assess knowledge-sharing competencies and accomplishments

- Censuring knowledge hoarders and rewarding knowledge sharers
- Workplaces designed to allow gathering places (Gladwell, 2000; Sullivan & Horwitz-Bennett, 2014)

The redesign of workplaces extends beyond simple physical office layout designs to facilitation of knowledge sharing. Owen (1997) developed open-space technology as a large-group facilitation process. In practice, open-space-technology meetings take on many forms and variations, but they follow the same general guidelines. Participants sit in a circle, initially with no agenda. The meeting opens with an agenda-setting exercise following which the group self-organizes into smaller discussion groups. Discussion group conveners are responsible for providing a report of the discussions, which is immediately added to a book of proceedings. At the conclusion of the meeting, or shortly thereafter, participants receive a copy of the proceedings, including all the discussion groups' reports and any action plans that were developed.

Open-space-technology meetings operate on four principles:

- Whoever come are the right people.
- Whatever happens is the only thing that could have happened.
- When it starts is the right time to start.
- When it's over, it's over.

The meetings have one law, the Law of Two Feet (or the Law of Mobility). It states, "If you find yourself in a situation where you are not learning or contributing, go somewhere where you can."

Gladwell (2000) discusses the influence of the set-up and character of offices on 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 that it is a fundamentally social phenomenon. Companies will therefore need to design for public and semipublic spaces to promote employee interaction. Many companies provide comfortable seating and access to the knowledge repository via a few workstations to promote both tacit and explicit knowledge sharing.

The cultural approach to open-space technology creates 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 more than brainstorming results—people raise topics they are passionate about and share their 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. They thus are 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, members may feel uneasy about talking with people they don't know well, not to mention sharing something that they are deeply concerned about.

Other characteristics of an organizational culture can encourage or discourage the recognition of belonging to the organization. Consequently, they influence the members' performance in the open space. Some examples of characteristics that are more connected with open space are individual initiative, integration, a reward system, and ethical climate. The facilitators shouldn't ignore the impact of organizational culture on the group of people who use the open space, and they should prepare for the possible outcome that is expected from participants. Then the facilitators can work out methods to encourage the participants to understand and use the open space as it was designed to be used.

Other practices that encourage a knowledge-friendly culture include not imposing practices from the top down, allowing cultural change to evolve over time, providing positive role models wherever possible, creating opportunities for people to get to know one another, and focusing on connecting people rather than capturing content.

Lessons learned from cultural change initiatives include the following:

- 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.
- Use new communication and information technologies capable of enhancing knowledge sharing to catalyze cultural changes by externalizing tacit knowledge, building up a permanent organizational memory, and including all members in a participatory development of content, rules, goals, and systems.

As Gruber and Duxbury (2000) discovered, KM requires a transparent organization where everyone can create knowledge, share it with others, and in return, know whom to ask to obtain knowledge they need to do their work. ” Tapscott and Ticoll (2003) discuss organizational transparency and the importance of having values of honesty and openness and being successful as an organization.

What Does a Successful KM Culture Look Like?

> Knowledge management culture is a supportive element of the organizational culture. A culture where the behaviours of seeking, sharing, developing and applying knowledge are encouraged and expected supports the establishment and application of the knowledge management system within the organization. There is also a personal dimension to a knowledge management culture, where ultimately each individual has responsibility to demonstrate commitment through their own behaviour and interactions. A knowledge management culture acknowledges the value of the individual and shared knowledge, as it benefits the organization. (ISO, 2018, annex C, p. 18)

In a successful KM culture, knowledge workers feel comfortable contributing what they know and offering their advice. There is accountability and transparency together with an open and honest sharing of content. There is no hoarding of knowledge, only protection of knowledge against loss. Colleagues feel they are working in a collegial rather than competitive environment. They perceive the organization as one that provides time and space for reflection and one that values learning through both successes and failures.

A successful KM culture has good role models in leadership, trust, engagement, and diversity and well-communicated customs and norms, policies, and procedures. The physical layout of the work environment is conducive to knowledge processing and the information technology infrastructure supports virtual knowledge processing behaviors. Finally, the organization has clearly defined KM roles and responsibilities and an appropriate investment in KM education and training. Major obstacles to a KM culture are summarized in table 7.2.

Impact of a Merger on Culture

Culture has been called the DNA of organizations; it is the patterns of human interaction that are 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 merging is a new organization, with a new culture that is more than the sum of its parts. Given this,

Table 7.2
Barriers to cultural change and possible solutions

Cultural barrier	Possible solution
Lack of time and meeting places	Seminars, e-meetings, redesign of physical workspaces
Status and rewards to knowledge owners	Establish incentives for sharing, 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

the preceding question can be asked in another way that is more appropriate for the situation: What is the impact of organizational culture on a merger and on the newly created entity?

Dayaram (2005) has shown that some of the most critical issues that arise in postmerger integration relate to culture. When you have two organizations coming together, the challenge is to intentionally form 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 lives and growing a new one in the process.

Those tasked with furthering cultural integration must assess these issues for the premerger partners and then address the following questions:

- 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 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 culture that will develop and evolve over the new organization's future. This can be the most challenging and, in many ways, the most rewarding work of postmerger integration.

Impact of Virtual Work on Culture

In a virtual organization, culture faces other challenges:

- No formalization, each worker follows his or her own norms, styles, and ideas
- No shared values, beliefs, ideas, or norms
- No frameworks or policies that guide individuals working in the organization

The interaction and communication among the members of virtual organizations tends to be more limited when it is mediated by technology (e.g., web conferencing). The development of a shared sense of belonging or a climate in the organization risks being almost nonexistent. This is particularly challenging for those who are new to the organization—for example, employees who were hired during the COVID-19 pandemic and never met any of their coworkers in person. Coy (2021), for example, notes that those who were hired during the pandemic were much more likely to quit their jobs because they lacked of a sense of belonging. They felt less welcomed by their supervisors, and they did not feel bonded with their coworkers. This was likely due to a "a lack of face-to-face contact with a wide circle of colleagues" (p. 1).

Virtual organizations or, at the very least, hybrid organizations are here to stay. What these organizations need to do today is build a culture that gives an existence to the organization in the minds of its members and a sense of identification and belonging that will bring them together despite limited interactions. And within this culture it is necessary for everyone to take his or her own developmental path, which is the core of the functioning of virtual organizations.

Spicer (2020) describes the impact of the pandemic and working from home on organizational culture as a profound disruption:

> Well known symbols of organisational life such as open plan workplaces filled with people wearing suits have been replaced by Perspex screens and personal protective equipment. Rituals such as water cooler chat have been replaced with zoom calls. The underlying values and assumptions of many organisations seem to have shifted from exploration and creativity towards safety and resilience. (p. 1737)

Savic (2020) found that the COVID-19 pandemic forced all organizations to quickly change the way they work. The old saying that necessity is the mother of invention was never more true as organizations innovated and digitally transformed at an incredible rate. Remote work became almost universally adopted, and the impact on the institutionalized ways of working, the culture, could no longer accommodate the speed and breadth of these changes. Working from home meant using different communication and management styles. Organizations had only a few days to establish new ways of working at a distance, which in turn meant acquiring, implementing, and becoming productive using new technologies such as video conferencing and e-learning. The biggest victim appears to be tacit knowledge because it is more difficult to share when using remote working tools. The impact of information and communication technologies on managing knowledge in general and tacit knowledge in particular is discussed in greater detail in chapter 8.

KM and Change: Can or Should KM Change Organizational Culture?

We now consider the actual relationship between KM and change (and change management). Corfield and Paton (2016, p. 80) persuasively argue that culture is oversimplified in practice, and the prescription is for KM to "change the culture." They carried out one of the all-too-rare longitudinal studies on KM and cultural change, the type of study that is particularly important because cultural change occurs over a long time. They looked at three organizations over the span of eight years. Although they looked at nonprofits, their findings are applicable to all knowledge-intensive organizations in the for-profit and commercial sectors. They operationally define culture as

> similar assumptions, values and norms . . . established within an organisation that then provide the setting for the conduct of organisational behaviour, relationships and decision-making. (p. 90)

Culture is not a singular entity but is made up of many different subcultures. These may sometimes map on to the different business units or professions. They can also be linked to "geography, market, hierarchy, function or internal divisionalisation" (p. 90). Culture is not a simple summation of all these subcultures. It is a highly complex phenomenon comprising a great deal of tacit knowledge embedded in the way things get done in the organization. This is partly why culture can persist even if employees leave. However, the institutionalization of culture, which renders behaviors as routine, does not mean culture does not change. Culture is also a highly dynamic phenomenon that reacts to environmental changes and evolves over time.

Schein (2010) arranges the stages, or life cycle, of an organization as either newly founded, midlife, or in decline. Corfield and Paton (2016) suggest that the introduction of change should consider the life stage of the organization. They used open-ended interviewing and one direct question concerning the organizational culture. The interviews helped draw out participants' perceptions of the relationship between KM and culture. None of the three case study organizations had previously carried out any formal organizational cultural assessment.

The results show that the organizations were in the middle stage of their life cycle, and they had significant numbers of distinct subcultures. The organizations' leadership had identified issues in terms of resistance to cross organizational sharing. Study participants, however, responded that resistance was due to not a decision to resist sharing but rather the difficulty of sharing. They often did not know colleagues in other parts of the organization. Many bemoaned that part of their KM role was to change culture, but they had no idea how to go about it. They felt leadership just expected this change to happen. Expectations were not realistic and not managed because many thought just bringing KM in would lead to a spontaneous (or rapid) change in culture. The other major barrier to a true knowledge-sharing culture was that the organizations were focused on action and allowed little or no time for reflection. When learning-review activities occurred, the focus was often on completing the process and was carried out in silos. There was no mechanism in place to share lessons learned and best practices with others or to learn from the past. There was also some evidence of "technology seduction" (Schein, 2010, p. 284) in that new KM technologies were perceived as the only change agents needed. If new KM software did quickly become part of how everyone did their job, change might occur. However, software training is rarely enough to bring about a change in understanding, attitudes, and values (and new technology is rarely uniformly used by all).

Once again, cultural change is a difficult process that takes a long time to implement. Estimates of eight to ten years are not unreasonable. There can, however, be wins along the way because change is implemented incrementally and iteratively, mirroring the implementation of KM. Communication is key in cultural change. "The ability to speak and share across the globe could be seen as the start of a major change" (Corfield & Paton, p. 98). Without communication, we cannot even begin to realize that we don't all hold the same perceptions or values. The culture box needs to be opened and examined, and the approach to cultural change needs to be nuanced to target the different subcultures within a given organization. The changes to be introduced will then be customized for each subculture. Chapter 9 discusses the KM strategy in greater detail, including how to facilitate short-term changes in culture as stepping-stones to the longer-term transformation needed to become a KM-enabled culture.

Note

1. *Merriam-Webster.com Dictionary*, s.v. "culture," accessed August 10, 2022, https://www.merriam-webster.com/dictionary/culture.

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8 Knowledge Management Tools

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

This chapter provides an overview of KM tools, which are all too often treated as black boxes (data goes in and knowledge magically comes out) by most users. New technologies are continually emerging, and many will have some intersection with KM. Implementations of KM require quite diverse tools that come into play throughout the KM cycle. Technology facilitates primarily communication, collaboration, and content management for better knowledge capture, sharing, dissemination, and application. The major categories of KM tools are presented and described, together with a discussion on how they can be used in KM contexts.

Learning Objectives

1. Describe the key communication and collaboration technologies that support knowledge sharing within an organization.
2. Define big data, analytics, and data mining and list some examples of where they would be used.
3. Define the difference between push and pull KM technologies.
4. Characterize the major virtual collaboration tools and explain how they would be implemented within an organization.
5. Sketch out the major components of a knowledge repository and explain its optimal use by organizations and organizational users.
6. Identify emerging social media technologies and describe how they are applied in a KM context.
7. Discuss benefits and drawbacks of using cloud computing technologies for KM.

Introduction

Technology is a moving target. New tools are continually developed and adapted to varying degrees by users. Sultan (2013) notes, "Some of these innovations, to use the terminology of Christensen [1997], are of a 'disruptive' nature such as the telephone, the Web and recently cloud computing" (p. 160). This chapter discusses disruptive technologies, such as big data, analytics, artificial intelligence, blogging, social media, and cloud computing, and their impact on KM.

Young (2010) reviews the most used KM tools and technologies. Table 8.1 lists the major KM tools, techniques, and technologies currently in use. The underlying theme

Table 8.1
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, big data, analytics, artificial intelligence • Expertise profiling • Visualization • Knowledge maps • Videos (e.g., exit interviews)	Communication and collaboration technologies (e.g., communities of practice) • Videoconferencing/web conferencing (e.g., Zoom, MS Teams, WebEx) • Chat rooms/instant messaging/Twitter • Webinars, YouTube • Email/discussion forums/ wikis, blogs • Groupware and collaborative workspaces • Social media	Knowledge acquisition • Content management systems • Online learning • Lessons learned databases • Storytelling databases • Best practices databases • Search tools • Cloud computing
Content management • Taxonomies • Folksonomies • Metadata • Manual tagging and classification • Automated taxonomy systems • Automated text analysis—summarization • Archiving • Content management systems • Document management systems	Networking technologies • Intranets • Extranets • Web servers, browsers • Knowledge repository • Portals • Cloud servers	Knowledge application • Workflows • Decision support systems • Customization/personalization • Push/pull technologies • Recommender systems • Artificial intelligence–based systems

is that of a tool kit. Many tools and techniques are borrowed from other disciplines and others are specific to KM. All need to be appropriately mixed and matched to address the needs of the KM discipline, and the tools included in the KM tool kit must be consistent with the overall business strategy of the organization.

KM has the complication that no single tool covers all the bases: a suite or tool kit of technologies, applications, and infrastructures are required to address all phases involved in capturing, coding, sharing, disseminating, applying, and reusing knowledge. *Digital workplace* and *digital transformation* increasingly describe the full spectrum of KM tools. One strategy for navigating through this complexity is to categorize the different types of KM tools. Rollet (2003) classifies KM technologies according to the following scheme:

- Communication
- Collaboration
- Content creation
- Content management
- Adaptation
- E-learning
- Personal tools
- Artificial intelligence
- Networking

Rollet's (2003) categories can also be grouped according to which phase of the KM cycle they are used in (figure 8.1). To decide which tool to use when, find the most appropriate tool for the KM process you are tackling.

Knowledge Capture and Creation Tools

Many types of tools can be helpful for the knowledge creation and capture phase of KM. Agarwal and Islam (2014) list such approaches as screen sharing, or co-browsing, to collaboratively look at content. It is possible to conduct knowledge elicitation interviews remotely using applications such as Zoom or MS Teams. These can be recorded and used later to share knowledge and to preserve this content for knowledge continuity. On websites such as Quora or LinkedIn, community members create a profile and answer questions that match their expertise areas. Concept mapping or diagramming tools such as MindManager, TheBrain, or Freemind visually organize the knowledge to be created or captured. This can be used with individuals or in groups. Groups can be

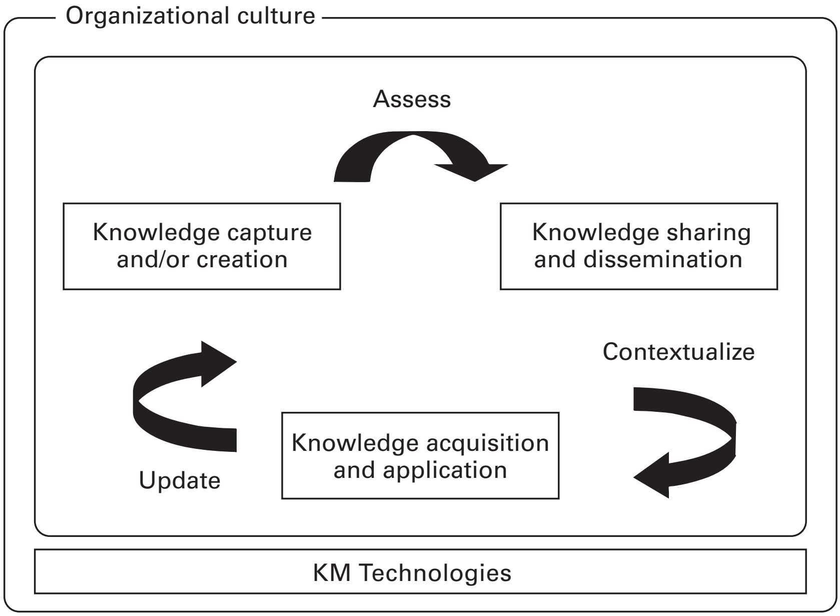

Figure 8.1
An integrated KM cycle

convened to tag knowledge content to better document it (e.g., folksonomies, or social tagging). Smartboards can also be used to identify and document knowledge during individual and group sessions.

Big Data, Data Mining, Knowledge Discovery, and Analytics

The amount of digital data we can collect and analyze, which is referred to as big data or big data analytics, has increased. We can now amass vast amounts of data quickly, easily, and inexpensively. Most of this data is unstructured content. Computing power has also increased, so we are able to analyze this enormous amount of data to discover patterns and trends, referred to as data mining. Big data analytics can be used for knowledge discovery, which refers to the ability to find previously unknown patterns in historical data. Humans are not as well equipped as machines for analyzing voluminous input.

Data mining and knowledge discovery are processes based on statistical analysis (typically cluster analysis) and that automatically extract predictive information from large databases. Using a combination of machine learning, statistical analysis, modeling techniques, and database technology, data mining detects hidden patterns and subtle relationships in data and infers rules that allow the prediction of future results. Raw data is analyzed to put forth a model that attempts to explain the observed patterns. A large volume of inputs is required, usually over a long period, but the model can then be used to predict and forecast outcomes (figure 8.2).

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 a certain state applicants lived in and likelihood of defaults on loans. 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 the British statesman Benjamin Disraeli has been attributed as saying, "There are three kinds of lies: lies, damned lies, and statistics."

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. Data mining applications often find gems, such as unexpected correlations that upon further study yield useful (and often actionable) insights into what is occurring. A famous example is that of the relationship between purchases of beer and purchases of diapers (box 8.1). Consumer analytics was the driving force behind the popularity of big data analytics. Companies gathered and analyzed large volumes of consumer data for their marketing and even product placement decisions.

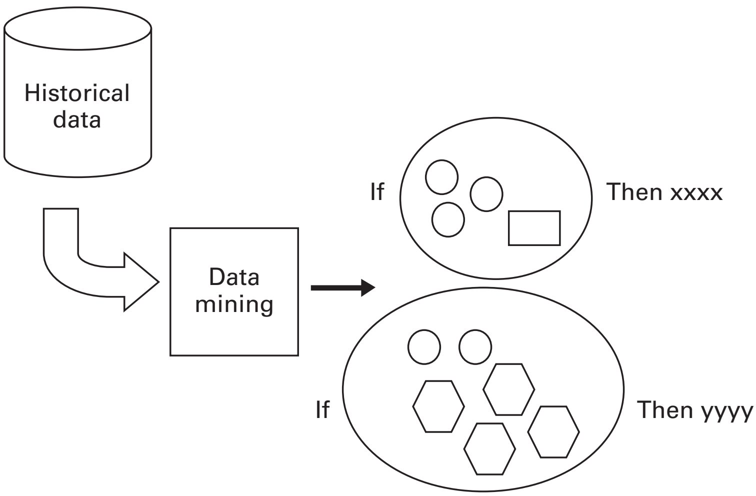

Figure 8.2
Predictive models

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 (that arrive in the same basket at checkout). A hypothesis was that mothers of newborns bought infant care items such as baby powder or cream when they came in to purchase diapers. Headquarters wanted to run a simple correlation check to validate whether all infant care items should be shelved in the same place. To their surprise, the highest correlation for an item bought at the same time as diapers for newborns was a case of beer. This was later explained by the observation that the fathers of newborns were more likely to be in the store to buy diapers and, while they were there, they picked up other equally essential items.

Analytics can be defined as studying past historical data to find trends, analyze the effects of certain decisions or events, or evaluate the performance of a given tool or scenario. "Analytics is the scientific process of discovering and communicating the meaningful patterns which can be found in data."[1] The goal of analytics is gain knowledge that can be used to make improvements or changes in a business. Statistical analysis tools (e.g., SAS, SPSS) discover patterns in numerical or quantitative data to produce descriptive information such as what is the average (mean) and what range is covered by the data (minimum and maximum). Data mining software (e.g., Rapid Miner) discovers relationships or patterns in data from different sources.

These tools and techniques can mine content other than data. For example, text mining and thematic analysis and web mining are used to look at what content users access, how often, and for how long (e.g., number of hits), which is helpful in content management. Similarly, skill mining or expertise profiling can detect patterns in online curriculum vitae of organizational members. Expertise locator systems can be automatically created on the basis of the content that has been mined. Commercial software systems can mine email data to determine who is answering what types of queries or themes. Organizational experts and expertise can be detected by looking at the patterns of questions and answers contained within the emails. A caveat applies to all data mining applications: a human being is always needed in the loop to carry out reality checks (i.e., to verify and validate that the patterns do indeed exist and that they have been usefully and valuably interpreted).

Traditional methods would require sampling the data, whereas big data can analyze the entire data set, regardless of size. Content has not only increased in volume but also become more heterogeneous. Sources have multiplied and now include social media such as Twitter and LinkedIn, and content is not limited to text but includes images, sound, and video. Finally, content is increasing at an exponential rate. If too much time passes, the analysis becomes even more complicated. Given the variety of content types to be analyzed, data mining has branched out to text analytics (data mining on text), sentiment analytics (data mining on text to detect words denoting emotions), and predictive analytics (data mining for forecasting).

KM's contribution lies primarily in tacit knowledge (experience and expertise), which becomes part of the organizational content to manage, together with data, records, documents, and information. Grover (2020) notes that big data analytics can provide new perspectives on large amounts of legacy organizational content. This could in turn lead to new ways of increasing operational efficiency and increasing innovation through knowledge discovery of previously hidden meanings in the content.

The analyses yield correlations and do not prove causality, so predications should be made with this in mind. Big data is legacy data and thus always consists of historical data. The potential risk is that historical data may be biased and understanding these biases requires human knowledge of the content domain. Finally, although emergent patterns are interesting, they cannot take the place of asking relevant strategic questions. Letting the data talk is good to do, but so is asking the right questions and then seeing what the data has to say. People who are knowledgeable in the subject will ask better questions. The best way forward will always be hybrid, despite impressive and ongoing advances in technologies. Leaving humans out of the loop is risky because we need knowledgeable people to make sense of the content and what the analyses provide.

Figures 8.3 and 8.4 show examples of how artificial intelligence (AI) works. Imagine thousands or even hundreds of thousands of numbers from 0 to 9 handwritten by different people. This is the data (the big data) that is analyzed. The more data the better. Imagine also that the data was gathered only from Europe, where the practice is to draw a line across the number 7 and to have a closed triangle for the number 4. The AI classification based on only this biased sample and other number configurations would be incorrectly discarded. Similarly, although the analytics would be expected to produce ten different categories because there are ten different numbers, when analysis on this data is first run, only nine categories emerge. This is because the numbers 6 and 9 are grouped into the same category. To the AI, these symbols are the same, just oriented differently. To a human, of course, the orientation is what distinguishes the different numbers. This AI was used to sort US mail by having the algorithm read the five-digit postal codes (Mitchell, 2006).

In summary, "big data offers tremendous potential, but companies that see it as a panacea to replace the insights and intuition, often accumulated through education

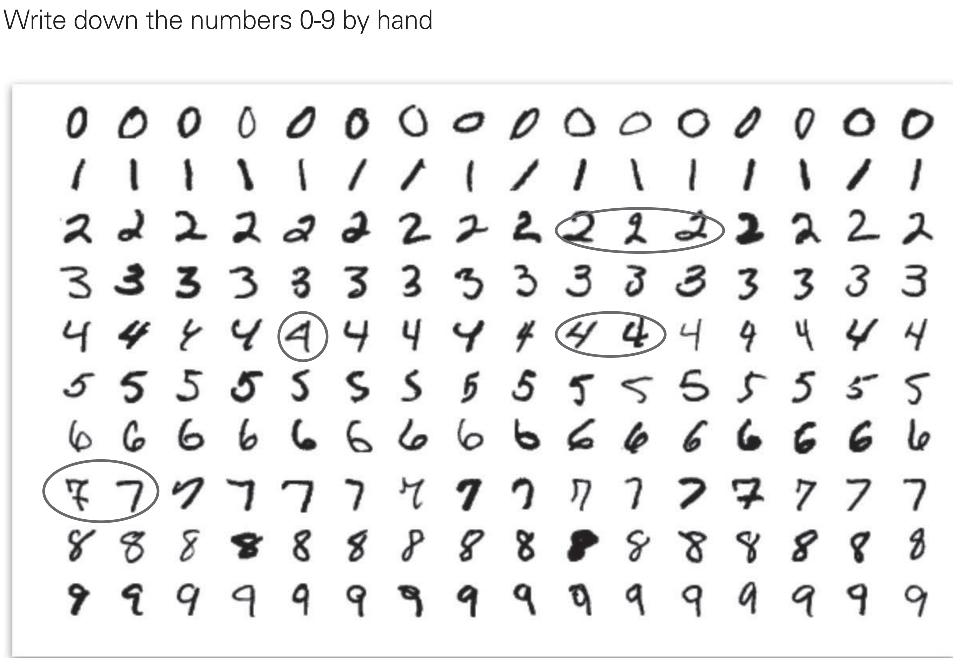

Figure 8.3
Big data analytics on handwritten numbers.
Source: https://towardsdatascience.com/part-5-training-the-network-to-read-handwritten-digits-c2288f1a2de3.

and experience would be [making] a mistake" (Grover, 2020, p. 3). It is vital that humans remain in the loop with these technologies, so that they can ask the best questions, access the relevant sources of data, and carry out a reality check on the results of the analyses to make sure they make sense. There are several ways of doing this. Knowledge that has been elicited from experts can be analyzed to detect hard-to-see patterns. Working from the opposite direction, large volumes of data can be analyzed first by AI and the resulting patterns then analyzed by human experts. The combination of the two approaches will yield rich results for KM.

> For [information systems] researchers, big data and analytics could provide important insights and predictions. But these do not replace theory, but feed into theory, and so the hard work of abstracting from these insights to a general archetypical problem is important to building cumulative knowledge. (Grover, 2020, p. 3)

Human skills and creativity are essential to complement big data analytics. This is echoed by many researchers (e.g., Dalkir, 2021; Zuang et al., 2017) who see the next

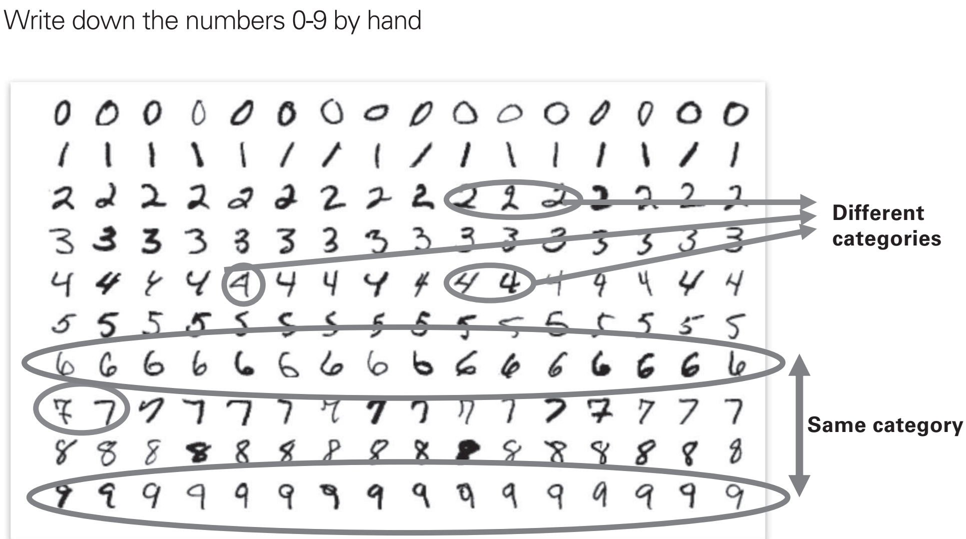

Figure 8.4
Why AI needs a reality check.
Source: https://towardsdatascience.com/part-5-training-the-network-to-read-handwritten-digits-c2288f1a2de3.

generation of artificial intelligence as one that integrates data-driven machine learning with prior human knowledge, common sense, and assumptions. The next disruptive innovation will be when we transform computation into reasoning to understand knowledge in its rich context and to then learn from real-world experiences.

> To be successful in realistic environments, existing AIs should identify and implement effective actions, given the fact of inescapable incompleteness in their knowledge about the world. (Zuang et al., 2017)

Visualization Tools and Knowledge Maps

KM is all about making knowledge visible. While KM often uses knowledge maps and visual representations to map out an expert's knowledge, these are rarely defined or adequately described (Eppler & Burkhard, 2008). The field of information and knowledge visualization can therefore inform KM and help advance both KM research and practice. Eppler and Burkhard define *knowledge visualization* as the use of graphic means to construct, assess, measure, convey, or apply knowledge such as complex insights and experiences so that others can make use of it. Knowledge visualization can therefore describe both tacit and explicit knowledge at all levels: individual, group, organizational, and even interorganizational and societal knowledge. Examples include sketches, diagrams, concept maps, visual metaphors (e.g., an iceberg model of tacit and explicit knowledge), and knowledge maps. Knowledge visualization differs from information visualization in that it aims to communicate the what, why, and how to help viewers co- or reconstruct the meaning that has been visually modeled.

Knowledge visualization is an effective means of communicating and sharing knowledge, and the key principles of a good communication strategy apply:

1) Identify what the content is.
2) State why this content needs to be visualized.
3) Identify the target group that should look at this visualization.
4) Describe the context in which this content should be visualized (e.g., place, media).

Eppler and Burkhard (2008) identify six major types of knowledge visualization:

- Structured text (e.g., highlighting words and using boxes to separate chunks of content, such as in a table)
- Sketches, which are usually hand-drawn rough depictions, such as capturing the main ideas of a brainstorming session or a drawing of an expert's mental model during knowledge elicitation interviews
- Conceptual diagrams or concept maps representing the relationships between ideas typically using circles and arrows; rendering abstract knowledge more concretely and explicitly identify the relationships between different concepts
- Visual metaphors, which use familiar images to explain more conceptual ideas (e.g., iceberg metaphor for knowledge types)
- Knowledge maps, which depict a context (e.g., landscape) and then place knowledge content on this context to show where different types of knowledge are located (e.g., map of a subject matter or knowledge domain to show its key authors, methods, and disciplines)
- Interactive visualizations (e.g., animations that viewers can control, manipulate, and interact with to better understand complex content, such as zooming in using a sort of Google Earth for knowledge content)

Knowledge visualization can be used throughout all stages of knowledge processes: creation, sharing, preserving, using, and reusing. It is particularly valuable in addressing tacit knowledge, which is often difficult to convey using only text. Asking experts to visualize their knowledge can assist in knowledge capture. A knowledge map is a common way of visualizing complex knowledge to be captured and codified. As Awad and

Ghaziri (2007) describe it, a knowledge map is not a repository of knowledge but rather a map showing where knowledge chunks are located. A knowledge map is analogous to the site map of a website—it is the conceptual representation of knowledge that clearly shows its scope (i.e., its boundaries or limits), its location (e.g., documents, procedure, or tacit knowledge), and the relationships between the chunks of knowledge. Stories are also often used to externalize expert knowledge (as described in chapter 4). Visualization is an excellent fit with storytelling and can be used to enhance stories with rich images and animation (e.g., multimedia stories).

Visualizing knowledge helps identify clusters, which eventually can lead to knowledge categories. Knowledge maps can classify captured knowledge, and they can be used throughout the KM process cycle to share, disseminate, and make use of the knowledge. Taxonomies are visual depictions of codified and organized knowledge content.

Expertise locator systems can leverage visualization by providing directions to where experts can be found in an organization and, more broadly, where different types of knowledge sources are located (in systems, in people, in archives, and so on). Knowledge audits frequently yield this type of location-specific identification of valuable knowledge in an organization, and a knowledge map is often included in the knowledge audit deliverables. Knowledge visualization decreases information overload and is a good component of user-friendly interfaces to KM systems.

Knowledge visualization can be done with or without the use of computers because knowledge maps can be paper based (Meyer, 2010). They can also be developed using software such as TheBrain or MindManager. Traditional knowledge-sharing methods that use mostly text (e.g., sharing documents) are probably no longer sufficient because of information overload and other factors. Visual knowledge representations may help. For example, visualization can be used to externalize individual and group knowledge during brainstorming workshops. This approach is also useful for cross-community knowledge sharing across heterogeneous knowledge networks and for interdisciplinary content when professionals need to collaborate. For example, Dalkir (2017) describes how architects, engineers, curators, building restoration experts, artists, and researchers all need to share knowledge about a specific object that forms part of the digital cultural heritage of a country such as an archaeological site or object. Another example described by Dalkir is using augmented reality as a visualization tool so that people can "walk around" the harbor in Nantes, France, as it was in 1900. The harbor was reconstructed to show how it looked for the World's Fair in Paris in 1900.

Visualizations can increase the speed and quality of knowledge sharing between individuals, groups, and organizations because it is easier to present multiple perspectives and tailor visualized knowledge to meet diverse mental models of recipients. More theoretical and empirical research is needed to arrive at proven practices and guiding principles for the use of knowledge visualization throughout the knowledge processing life cycle.

Knowledge visualization can build on or be integrated with information and data visualization. *Information visualization* is defined as the use of computer-supported interactive visual representations of abstract data to amplify cognition (Card, Mackinlay, & Shneiderman, 1999). The objective is to explore abstract data and gain new insights.

Knowledge visualization is defined as the use of visual representations to improve the transfer of knowledge between at least two persons or groups of persons (Card, Mackinlay, & Shneiderman, 1999, p. 520). The objective is to improve the transfer of knowledge, to make sure the recipient understands and can reconstruct the knowledge in the way the sender intended. This can be done by using sketches, diagrams, images (photos), videos, physical models, and interactive visualizations.

> Data visualization is the practice of translating information into a visual context, such as a map or graph, to make data easier for the human brain to understand and pull insights from. The main goal of data visualization is to make it easier to identify patterns, trends and outliers in large data sets. (Brush & Burns, n.d.)

Data is presented in a graphical or pictorial form so that we can see the patterns. Visualization can be thought of as visual data mining (Ferreira de Oliveira & Levkowitz, 2003). Examples include traditional pie charts but can be as sophisticated as interactive three-dimensional environments. Data visualization software coherently presents a large amount of information in a small space. It makes use of the human computer—your eyes—to detect patterns (e.g., virtual reality and simulation software) and walk around the data points. For example, researchers can walk around their data points to identify patterns of clustering. In this way, great volumes of data can be easily processed by today's computers and presented in a more visual form.

Information visualization is typically used for vast amounts of data that are not numerical—for example, the results of polls or trend analyses (Burley, 2010). Zuang et al., (2017) describe Tableau, which is software that can transform data into a visual representation complete with a color scheme based on the underlying data. This Show Me feature is useful when the data are just too complicated to understand by simply looking at spreadsheets. Visualization software can also process raw data. For example, the Palantir software tool integrates human domain knowledge to find connections between data derived from different sources to generate new knowledge.

Burkhard (2004) suggests the KM field can learn from architects who routinely use visualizations as a means of knowledge transfer. This is not the case with knowledge managers who, at most, use PowerPoint slides and clip art. He emphasizes that this is a missed opportunity because knowledge visualization can help customize content to recipients' cognitive backgrounds to ensure more effective knowledge transfer. Architects are highly skilled at transferring knowledge between specialists from different fields such as engineers, construction workers, and lawyers and clients. Combining different visualizations to show different levels of detail is one effective technique.

Visual representations are better than textual representations to do the following:

- Illustrate relationships
- Identify patterns
- Present both an overview and details
- Support problem-solving
- Communicate different types of knowledge

Human cognitive processing capacity is greater for images than text; we pay more attention to images and remember them better. Viewers of images have better recall, learn more effectively, maintain their focus, better see different perspectives, and are more motivated to engage with the content.

Finally, interactive visualizations also offer a rich way of capturing, sharing, and using knowledge. Rasmus (2013) describes how interactive software allows us to connect the dots between the mental models of the knowledge sender and receiver to optimize understanding of (and therefore be able to leverage) the knowledge content. Visual knowledge maps explicitly and visibly connect ideas and concepts of a subject matter or area of expertise. Software allows these links to be explored dynamically and in a nonlinear way. Rasmus (2013) relates how Dr. Craig Baker used TheBrain software to model his knowledge of cardiac surgery to teach medical students. Another example used MindManager to visually map the collective memory of the many agencies involved in recovery and reconstruction in New York following 9/11. This visual map was used in real-time to monitor the environment, deploy medical vans, and tackle remediation of the dangerous chemicals released. In both examples, visualization can represent the complexity of the knowledge domains involved, to capture and preserve this knowledge and also to make it available for others to access and use.

Visualizations and knowledge maps are best suited to capturing all stakeholders (and their different perspectives, knowledge needs, and contexts) in order to be useful for everyone involved. This is the major purpose of visualization, according to Smuts (2021), with the "aim to achieve transferring and sharing knowledge, as well as communicating ideas and insights" (p. 1). Visualizations are beneficial in complex, knowledge-intensive processes involving multiple (often very different) actors. This has become almost universally the case with the shift to working from home as a result of the COVID-19 pandemic. Smuts also reinforces the idea of KM being anchored in social, collaborative, and cognitive processes. He states that cognitive psychologists found that visual representations are more informative, better support learning, and improve comprehension and reflection compared with more linguistic information-processing activities.

Videos for Exit Interviews

The use of videos has already been discussed for several tools. They are also powerful media to capture expertise in exit interviews. Exit interviews are, of course, a misleading term. Although they are operationally useful (e.g., to recuperate employee access cards), much more time is needed for knowledge capture than a short interview at the end of someone's career. The best time to capture knowledge is during the career of the employee. Ideally, interviews should begin long before the employee leaves the organization. Videos can be used to capture structured interviews during knowledge capture. Goodman and Riddell (2014) note that it can be easier on experts if they don't have to prepare too much ahead of time. Goodman and Riddell advocate having other employees who want to learn about a given subject take turns asking the expert about it. This can be face-to-face or technology mediated. In either case, the question-and-answer session can be captured in a short video. Goodman and Riddell (2014) note that "[videos] can cover a lot of ground in a relatively short time" (p. 217). Many knowledge-capture activities are carried out with YouTube. An example is the World Bank's video stories (https://www.youtube.com/user/WorldBank). A minority of organizations use actual filming to achieve documentary quality. An example is Oxfam's digital storytelling initiatives such as the ones from India (https://www.oxfamindia.org/videogallery).

Content Management Tools

As discussed in chapter 6, content management refers to the management of valuable content throughout its useful lifespan. Content lifespan typically begins with content creation; handles multiple changes and updates, merging, summarization, and other repackaging; and ends with archiving. Metadata (information about the content) is used to better manage content throughout its useful lifespan. Metadata includes such information as source or 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 if applicable. Additional attributes such the storage medium, its location, and whether it exists in alternative forms (e.g., different languages) are also useful to include.

Taxonomies help overcome differences of language usage in an organization and even the use of different languages in content management systems. Traditionally labor intensive, the growing problem of information overload means that taxonomies are receiving significant attention. But how do you cope with the evolution of terms, whose meaning seems to change from one year to the next? Automatic or semiautomatic classification of information objects—natural language analyzers, text summarizers, and other technology—explicates the meaning—the concepts—behind blocks of text and appropriately tags and indexes objects to aid retrieval. Many take advantage of the organization's underlying knowledge taxonomy. Similarly, automated text summarization tools sift through references and other resources to capture the expert's knowledge. Document or content management systems can find knowledge resources (such as those mentioned by the expert being interviewed), but they also organize knowledge once it is codified.

Folksonomies and Social Tagging or Bookmarking

Metadata literally translates as "data about data" and refers to specific information about content contained in books, reports, articles, images, and other containers so the content can be organized and retrieved. Metadata is also referred to as tags or keywords. Taylor (2004) notes that metadata comes in three general flavors: administrative, structural, and descriptive.

1. 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). This is sometimes referred to as preservation metadata.
2. Structural metadata relates to the actual computer elements involved, such as tables, columns, and indexes—all the logical units of the information resource.
3. Descriptive metadata refers to the content or subject matter of the information resource to help users find it (e.g., cataloging records, finding aids, keywords). Descriptive metadata is of great concern in KM because we often need to greatly expand metadata in order to increase the usability (and reusability) of a given unit of knowledge.

Metadata is very formal, and the highest standard of metadata is created and updated by dedicated personnel such as catalogers and other library and information science professionals. This standard 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 exemplifies author-created metadata (Greenberg et al., 2001). Author-created metadata 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 grass-roots, approach is referred to as *social bookmarking*, *tagging*, or a *folksonomy*. 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 storing, organizing, searching, and managing of web resources. One way is by saving personal bookmarks on a publicly accessible website and then tagging these sites with your own metadata. Early sites were Delicious (del.icio.us), Furl, and Citeulike, a social citation site for scholarly publications. Today, the most popular sites are Facebook, Twitter, Pinterest, Google Plus, Tumblr, and Reddit. Other users can view the bookmarks by category or search by keyword or other attributes. Users make use of informal tags instead of more formal cataloging methods. Because all the tags originate from the intended end users, they are easier to understand than more standardized, or top-down, indexing terms. The major drawback is this very lack of standardization: there is no controlled vocabulary (i.e., list of standard keywords), therefore many errors can occur owing 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 cataloging 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 after a short learning period. 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 can include annotations on what others think of the best practice, testimonials, cautionary notes (when not to apply and why), and other contextual information that can greatly increase the successful use and reuse (application) of this knowledge. Social bookmarking is an excellent vehicle for peer-to-peer knowledge sharing and may play a greater role in future communities of practice (CoPs). Each CoP has, in addition to a shared purpose and a shared repository, a shared vocabulary. Because CoP members share 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, patterns are emerging with respect to the tags that are most used. This tag "cloud" resides on the right-hand side of web pages and under "related tags" on most social bookmarking sites. Tag clouds represent emergent or organically grown taxonomies—commonly referred to as *folksonomies*, a term coined by Thomas van der Wal in 2004 (Mathes, 2004) as a combination of "folk" and "taxonomy."

As with social bookmarking, folksonomies appear particularly well suited to CoPs, where a folksonomy augments peer-to-peer sharing. 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 knowledge creation tools (creation of tags), knowledge-sharing and knowledge-dissemination tools (peer-to-peer sharing, public posting of tags), and 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 be a needs analysis that permits users to make use of their own preferred vocabulary, and the designers link this to the more formal taxonomy through a thesaurus. This linkage personalizes the search-and-retrieval user interface.

Cloud Computing Technologies

Cloud computing is content storage and delivery using the Internet for accessing data storage, servers, databases, networking, and software. Cloud-based technologies offer an alternative to storing content locally on organizational hard drives. Content is instead stored in a remote database, in the cloud, or cyberspace, and users who have access to the Internet can access this content. Advantages include increased productivity, reduced costs, greater speed, and access from anywhere on most devices. The major drawbacks are security concerns, risk of failure because of natural disasters, and the learning curve. Public cloud services can be purchased as a subscription, whereas private cloud systems are only for the organization's employees. Most provide functions such as email, file storage and backup, retrieval, data analysis, multimedia content and streaming, and other specialized applications. Although still new, private clouds are growing in popularity and are beginning to integrate KM functions and began to be mentioned at KM World conferences in 2020.

The biggest advantage cloud computing offers to KM is the singe access point to all content. This allows knowledge to be stored, shared, and updated more quickly, and it allows people to connect not only to content but also to other people. Knowledge becomes, in theory, instantly shareable. The cloud also serves as a backup when hard drives fail, which in turn preserves valuable intellectual assets. American Productivity and Quality Center conferences began in 2020 to talk about the positive impact of cloud platforms such as Microsoft's Office 365 on KM. Many organizational leaders had testimonials on how cloud content management improved collaboration and all KM processes.

Office 365 has become the most widely used cloud service. Although Office 365 can empower employees, save time, and enable collaboration, it can also disrupt how organizations work. Hence, a lot of change comes with adoption of Office 365, including what tools to adopt, how to execute work, how it affects KM strategy and tactics, and how to roll it out with good change management and governance.

> As data continues to overwhelm companies, organizations are looking toward solutions to organize and share this information. Cloud-based information and knowledge management can provide powerful solutions for the business. With benefits like cost reduction, ease of use and access, and better knowledge sharing, using cloud-hosted KM and information management solutions can have a significant [return on investment]. (Simone, 2018)

Knowledge Sharing and Dissemination Tools

Rollet (2003) makes a distinction between communication technologies (such as telephone and email) and collaboration technologies (such as workflow management), yet it is difficult to draw a line between the two. Communication and collaboration are invariably intertwined, and establishing where one ends and the other begins is hard to do. Both types of tools have been put in the category of groupware or collaboration tools. Although all organizational members make use of communication and collaboration, including project teams and work units, CoPs in particular make use of many if not all the communication and collaboration technologies described in this section.

Agarwal and Islam (2014) list any form of collaborative physical workspace, CoPs (virtual and physical), expertise directories, social network analysis, and storytelling as major knowledge-sharing tools. In addition, there are file-sharing applications (e.g., DropBox), private group communication platforms (e.g., Yammer), instant messaging and chat, intranets and portals, and webinars. The COVID-19 pandemic, as already discussed, created widespread knowledge sharing and collaboration over web videoconferencing platforms such as Zoom and MS Teams.

Groupware represents a class of software that helps groups of colleagues (workgroups) attached to a communication network organize their activities.

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

1. Users of the groupware working together at the same time (real-time or synchronous groupware) or different times (asynchronous groupware)

Table 8.2
Classification of groupware technologies

	Same time, synchronous	Different time, asynchronous
Same place, colocated	Meeting, seminar	Zoom recording
Different place, distant	Remote meeting, webinar	Email, workflow

2. Users working together in the same place (colocated, or face-to-face) or in different places (noncolocated, or distant)

   Coleman's (1997) taxonomy of groupware lists twelve categories:

1. Electronic mail and messaging
2. Group calendaring and scheduling
3. Electronic meeting systems
4. Desktop video, real-time synchronous conferencing
5. Non-real-time asynchronous conferencing
6. Group document handing
7. Workflow
8. Workgroup utilities and development tools
9. Groupware services
10. Groupware and KM frameworks
11. Groupware applications
12. Collaborative Internet-based applications and products

Email is by far the most common groupware application (besides, of course, the traditional telephone). Whereas the basic technology was designed to pass simple messages between two people, today's relatively basic email systems forward messages, file messages, create mailing groups, and attach files to a message. Other features that have been explored include automatic sorting and processing of messages, automatic routing, and structured communication (messages requiring certain information). Some research shows that younger generations are now more email-averse, preferring to text over their phones or communicate via social media such as Instagram or SnapChat.

Workflow systems allow documents to be routed through organizations using a relatively fixed process. A simple example of a workflow application is an expense report in an organization: an employee enters an expense report and submits it, a copy is archived and then routed to the employee's manager for approval; the manager receives the document, electronically approves it, and sends it on; and the expense is registered to the group's account and forwarded to the accounting department for payment. Workflow systems may provide features such as routing, development of forms, and support for differing roles and privileges.

Group calendars allow scheduling, project management, and coordination among many people, and they may provide support for scheduling equipment as well. Group calendars detect when schedules conflict and find meeting times that work for everyone. They also help locate people. Typical concerns are privacy (users may feel that certain activities are not public matters), completeness, and accuracy (users may feel that the time it takes to enter schedule information is not justified by the benefits of the calendar).

Collaborative writing systems may provide both real-time support and non-real-time support. Word processors may provide asynchronous support by showing authorship and by allowing users to track changes and make annotations to documents. Authors collaborating on a document may also be given tools to 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 requires an additional communication channel for the authors as they work (video or chat).

Synchronous, or real-time, groupware can make use of shared whiteboards to allow two or more people to simultaneously view and sketch on a drawing surface, even from different locations. Most shared whiteboards are designed for informal conversation, but they may also structure communications or more sophisticated drawing tasks, such as collaborative graphic design, publishing, or engineering applications. Shared whiteboards can indicate where each person is drawing or pointing by showing telepointers, which are color coded or labeled to identify each person. An example is Mural (https://www.mural.co/). Other functions include real-time polling using applications such as Mentimeter (https://www.mentimeter.com/). Integrated chats permit many people to write messages in real time in a public space. The chat text and a transcription of the video meeting can have long-term value, because participants can refer to preceding speech during conversation, making it easier for people to enter an ongoing conversation and pick up on the discussion. These chats, transcripts, and video recordings can also be saved and shared in the future to preserve the knowledge content (e.g., questions and replies).

Social Media

Social networking is a part of everyday living and working. Social networks are dynamic people-to-people networks that represent relationships between participants. A social network delimits or identifies a CoP because it models the interactions between people. Wladawsky-Berger (2005) contends that social networks are “knowledge management done right” (p. 1) because they have similar aims: solve problems, increase efficiency, and better achieve goals.

Social network analysis (SNA; http://www.insna.org) is a social science research tool that dates to the 1970s and has become increasingly used in KM applications (Drucker, 1989; Durkheim, 1964; Granovetter, 1973; Lewin, 1951). Krebs (2008) defines SNA as the “mapping and measuring of relationships and flows between people, groups, organizations, computers, or other information/knowledge processing entities.” SNA can identify communities and informal networks and analyze the knowledge flows (i.e., knowledge sharing, communication, and other interaction) that occur within them (Brown & Duguid, 1991). SNA is one of the ways of identifying experts and expertise to develop an expertise locator system. The basic steps are to develop a survey tool (e.g., a questionnaire) to collect the data required to identify network members and their exchange patterns. Next, these data are analyzed using software such as Gephi (https://gephi.org/) or NetMiner (http://www.netminer.com/) to identify patterns of interaction and emergent relationships. The analyzed data then inform decision making based on the objectives (Scott, 2000)—for example, for change management, to establish a baseline to later assess the effects of a technology introduction, or to improve the knowledge flow and connections.

Social media are increasingly integrated into KM tool kits. Unlike traditional information and communication technologies, social media manage the content of the conversation or interaction as an information artifact in the online environment. For example, wikis are a social media in which coauthors collectively build textual and visual websites. Google Docs manages documents, spreadsheets, and other files in a cloud computing environment that allows registered users to upload and share documents and changes from anywhere with Internet access. Video- and photo-sharing websites such as YouTube and Flickr use videos and images (respectively) to create social interaction. Social network websites such as Facebook represent links and nodes in the network through conversation threads. Although these social media have been widely adopted publicly, organizations are only recently realizing their potential.

For example, during the 2010 earthquake in Haiti, the emergency response team consisted of the United Nations, the government of Haiti, and many other countries and nongovernmental organizations, all interacting with one another through a KM system. This system included social media such as wikis and collaborative workspaces as the main knowledge-sharing mechanisms (Yates & Paquette, 2010). IBM uses a decentralized social media approach to promote knowledge sharing and collaboration.

The company has a combination of internal and external blogs, offers SocialBlue (which is like a Facebook for IBM employees) and crowdsourcing jams, and is active on LinkedIn and Facebook.[2] IBM also held a large collaborative online brainstorming session called InnovationJam that included over 150,000 people (Dearstyne, 2007). Participants were employees and also customers and business partners. The event ran for three days, and different topics were addressed in moderated forums. The best ideas generated were acknowledged and rewarded. Companies are adopting a more people-centric approach to KM, an approach mostly based on a company's underlying culture and how well it promotes transparency. A surprising example is the Central Intelligence Agency (box 8.2).

Lee and Lan (2007) suggest that traditional KM based on knowledge repositories—the storing and preserving of knowledge but in a largely static fashion—has evolved into collaborative intelligence with such features as the following:

- Contribution—every user has the opportunity to freely provide their knowledge content to the relevant subject domains.
- Sharing—knowledge contents are freely available to others. Secured mechanisms may be enforced to enable the knowledge sharing among legitimate members within specific communities.
- Collaboration—knowledge providers collaboratively create and maintain knowledge content. Internet users participating in the knowledge content can have conversations as a kind of social interaction.
- Dynamic—knowledge contents are updated constantly to reflect the changing environment and situation.
- Reliance—knowledge contribution is based on trust between knowledge providers and domain experts.

Knowledge Repository

A knowledge repository differs from a data warehouse and an information repository primarily in the nature of the content that is stored. Knowledge content typically consists of contextual, subjective, and practical content. Content in knowledge repositories tends to be unstructured (e.g., works in progress, draft reports, presentations). Knowledge repositories also tend to be more dynamic than other types of architectures because the knowledge content is continually updated and splintered to serve a wide variety of users and user contexts. To this end, repositories typically end up being a series of linked miniportals distributed across an organization.

Box 8.2
An Example: Intellipedia at the CIA

KM enabled the CIA to share more information within the agency and with their intelligence counterparts (Wailgum, 2008). The events of September 11, 2001, catalyzed reforms in the intelligence community, especially to rectify the problem of key agencies having not been able to connect the dots. David Ignatius, associate editor at the *Washington Post*, remarked, “After 9/11, we asked ourselves: ‘why was no one able to connect the dots?’”

> Could 9/11 have been prevented? In four crucial cases, mishandled intelligence, bureaucratic tangles and legal hurdles blinded the CIA and the [Federal Bureau of Investigation] 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 aware of the post-9/11 analyses and reports that describe 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 KM to 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 because users log on and are authenticated each time they use Intellipedia. There is a form of expertise locator system integrated within this system for users to find out who has expertise on a particular topic, a particular country, and so forth. As of January 2014, Intellipedia contained around 269,000 articles, and the Top Secret Intellipedia counted 113,000 content pages with 255,000 users. The most prolific users of Intellipedia are employees preparing to retire, which indicates that such systems may also play a role in organizational memory and knowledge continuity (see chapters 11 and 12).

Previously, the content that is now within Intellipedia would have been shared with a limited number of people and most likely through email (which only added to employees’ information overload). Intellipedia defines and enables the US intelligence community and is a clear contrast to what prevailed before—knowledge shared on a need-to-know basis and according to status, hierarchical relationships, and formal authority. The major goal of Intellipedia is to enable collaboration across silos so participants can solve complex problems and connect all 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 changing individual mindsets and the collective mindset that prevails as the organizational culture.

Most repositories contain the following elements (adapted from Tiwana, 2002):

- 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, and so on—knowledge of *care-why*)

The knowledge repository is the one-stop shop for organizational users 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 experience with the content, and contribute content of their own. The interface to the repository should be user friendly, seamless, and transparent. Using a term such as *knowledge warehouse* is strongly discouraged—the knowledge repository should instead be visualized as a lens atop the data and information stores of the organization. The access and application of the content of a repository should link to professional practice and concrete actions as directly as possible.

The knowledge repository typically involves content management software tools such as a SharePoint platform and is run as an intranet within the organization, with appropriate privacy and security measures in place.

Knowledge portals provide access to diverse enterprise content, communities, expertise, and internal and external services and information (Collins, 2003; Firestone, 2003). Portals are a means of storing and disseminating organizational knowledge such as business processes, policies, procedures, documents, and other codified knowledge. They typically feature capabilities for searching through content and through the taxonomy (categorized content). The option to receive personalized content through push and pull technologies (intelligent agents) may exist. Communities can be accessed via the portal for communication and collaboration purposes. There may be several services that users can subscribe to and web-based learning modules on selected topics and professional practices. The critical content consists of the best practices and lessons learned that have accumulated over the years and to which many organizational members have added value.

A portal aggregates content from various 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 consider 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 supports knowledge workers. First-generation portals essentially broadcast information to all organizational members. Today, they have evolved into sophisticated shared workspaces where knowledge workers not only contribute and share content but also acquire and apply valuable organizational knowledge. Knowledge portals support knowledge creation, sharing, and use by allowing a high level of bidirectional interaction with users.

Portals 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 locator systems. CoPs typically have a dedicated space for their members on the organizational portal and their own membership locator system included in the virtual workspace. The portal organizes valuable knowledge content using taxonomies, or classification schemes, to store content that is structured (e.g., documents) or unstructured (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.

Knowledge Acquisition and Application Tools

Several technologies play an important role in the success knowledge workers have in acquiring (i.e., understanding) and applying (i.e., making use of) knowledge content that is made available to them by the organization. E-learning systems provide support for learning, comprehension, and better understanding of the new knowledge to be acquired. Databases of best practices, lessons learned, and stories help apply knowledge that was captured and codified from experts. Tools such as workflows and decision support systems help knowledge workers better apply the knowledge on the job. Adaptive technologies can 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 useful to acquire and apply. Knowledge maps and other visualization tools can better acquire and apply valuable knowledge, and several tools derived from AI can partially automate processes such as text summarization, content classification, and content selection. Visualization technologies and knowledge mapping synthesize large amounts of complex content and make acquiring and applying it easier for knowledge workers.

Databases remain the core KM technology. All knowledge processes require some form of storage system or repository, and these are almost always organized as databases to allow easy finding and retrieving. The tagging system, or taxonomy, associates key descriptive terms for each knowledge item, based on experts' input. Each tag can then serve as a search term (e.g., a lesson learned theme such as "lack of clear leadership") to a specific data range or specific business unit that was involved in the original event. Databases are of two major types: lessons learned and expertise locator systems (Becerra-Fernandez & Sabherwal, 2010). Lessons learned broadly encompasses best practices and lessons learned. Expertise locator systems contain profiles of employees (like a yellow pages) and their expertise, whereas databases contain short descriptions of recommended procedures (best practices), procedures to avoid in the future (lessons learned), and tacit knowledge that is often best conveyed in stories.

AI research addressed the challenges of capturing, representing, and applying knowledge long before KM became widely known. AI developed automated reasoning systems that could make use of explicit knowledge representations to provide expert-level advice, troubleshooting, and other 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 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.

Information overload continues to be a challenge. Information studies research has investigated information-seeking behavior for over five decades now and is an excellent theoretical basis for the study of the Internet as an information source and intelligent agents as mediators in this digital environment (e.g., Kulthau, 1991, 1993; Rasmussen et al., 1994; Spink, 1997; Wilson, 1981, 1994, 1999). In a case study, Detlor (2003) explored knowledge workers' 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 (2000) investigated how knowledge workers use the web to find information external to their organizations as part of their daily work life. A typology of complementary modes of using the web as an information source was identified and described (e.g., formal search, informal search).

Detlor (2004) adopts an information vantage point and views enterprise knowledge portals as more than tools to merely deliver content; they are 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 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 inform design of both online environments and mediators such as intelligent agents.

Personal KM

"Personal capital" was coined by Cope (2000) as a divergence from the traditional notion of capital, which is an asset owned by an organization. Future 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 been focused at the organizational level will filter down to be used by individuals managing their own personal capital.

PKM and traditional KM differ according to whether it is organizational or personal. Tools for personal information management are impressive and, if you think about email and portals, are already widely used. Blogs, news aggregators, instant messaging, and wikis represent a new tool set for PKM.

The personal portal, where once only enterprise portals existed, focuses on the needs of the individual—all a person's information and application needs harmoniously brought together and arranged to suit the person on his or her 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 and organizing paper and digital archives, emails, and bookmark collections.

Adaptive Technologies

Adaptive technologies target content to a specific knowledge worker or to a specific group of knowledge workers who share work needs. Knowledge workers can manually customize 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 email forum services.

Personalization, in contrast to customization, refers to automatically changing content and interfaces according to observed and analyzed behavior of the intended end user. For example, many MS Office applications offer the option of dynamically reordering drop-down menu items on the basis of frequency of usage (the ones used most often are displayed at the top). One way of automatically personalizing knowledge acquisition makes use of recommender systems. Recommendations for likely useful and relevant content for 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 to group individuals who appear to share the same interests. Amazon uses affinity groups—for example, after ordering a book, visitors to the site see books that others who have bought the same book have also purchased.

CoPs 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 can and be used in the same manner to better adapt content and interfaces to the community members.

Notes

1. See https://www.techopedia.com/definition/30296/analytics.
2. See http://www.socialmediaexaminer.com/how-ibm-uses-social-media-to-spur-employee-innovation.

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9 Knowledge Management Strategy and Planning

> You have to be fast on your feet and adaptive or else a strategy is useless.
> —Charles de Gaulle (1890–1970)

This chapter addresses building blocks for applying and gaining benefits from KM applications. The major steps in developing a KM strategy are presented: the knowledge audit, gap analysis, elicitation of KM objectives, short-term roadmap, and long-term KM strategy.

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. Describe the major strengths and weaknesses of different maturity models in terms of how they can be used to assess progress toward KM goals.
4. Discuss and evaluate the different approaches for achieving an optimal balance between creativity and organizational structure.
5. Identify critical success factors in KM governance and leadership.

Introduction

This chapter introduces the addition of a sound KM strategy that is linked to the overall business objectives of the organization by the integrated KM cycle (figure 9.1).

The KM objectives most frequently encountered are innovation and reuse. Innovation is closely linked to the generation of new knowledge or new linkages between

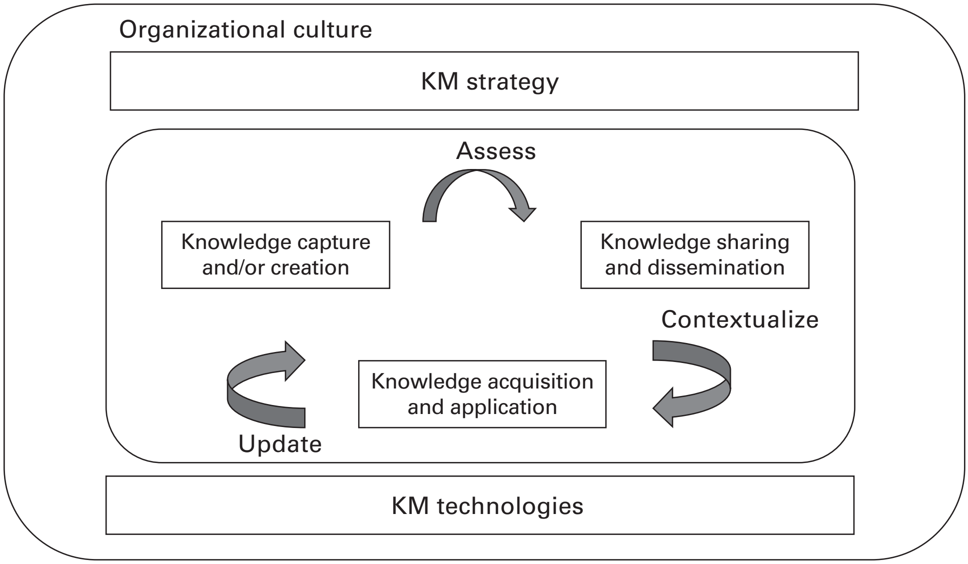

Figure 9.1
An integrated KM cycle

existing knowledge. Thinking that innovation occurs in isolation is a popular misconception—in fact, innovation rests firmly on a large body of accumulated experiences, both positive and negative, and 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. Reuse, however, forms the basis for organizational learning and should be viewed more as a dissemination of innovation.

The KM strategy provides the basic building blocks used to achieve this organizational learning and continuous improvement to not waste time repeating mistakes and to make everyone aware of new and better ways of thinking and doing. In addition, several important knowledge by-products should be recognized and inventoried as knowledge assets of the organization. These are familiar, tangible items such as patents and softer, more intangible assets such as core competencies. The sources of innovation and knowledge reuse consist of either internal or external discoveries or stem from business practices or from knowledge workers' competencies. Often, improvements result from some combination of these sources.

A KM strategy targets 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 identifies the key needs and issues within the organization and provides a framework for addressing these. A need for KM is triggered by different business needs. Common business drivers include the following:

- Imminent retirement of key personnel
- Need for innovation to compete in a dynamic, challenging business environment
- Need for internal efficiencies to reduce costs and effort (e.g., time to market of a new product)

The resources and skills required to develop a KM strategy depend on the size and complexity of the organizational unit and on the depth of information gathering and analysis. The ideal mix of resources and skills on the KM strategy team is a KM expert, access to people who are knowledgeable about the organization, and a KM advocate who sells the strategy to the senior member of management who mandated the strategy development (box 9.1).

Developing a KM Strategy

A KM strategy "aims at the creation of new value by considering knowledge as a strategic resource in decision-making for achieving competitive advantage" (Bolisani & Bratianu, 2017, p. 233). Knowledge strategy and planning should be part of the overall organizational strategy in order to recognize that organizational knowledge is a valuable asset. All strategies are long term and future focused. A KM strategy is even more critical today given the rapid pace at which organizations and their environments are changing. A strategy identifies how the organization can leverage its knowledge resources. Once this fundamental KM strategy is defined, baselining and technology options may be explored.

Bolisani and Bratianu (2017) explain that, much like the definition of KM, a definition of knowledge strategy also has no consensus. They list the following as generally required components: the KM strategy must be aligned with the overall organizational strategy (e.g., specific goals, such as a business becoming more competitive or a nonprofit working to improve environmental issues), intellectual assets and tangible assets must be addressed, tacit knowledge and explicit knowledge should be included, and the KM strategy comes before implementation of KM. Although the last component may seem common sense, many companies start acting on KM initiatives before the strategy is in place, thinking that KM initiatives are Lego pieces that can be built later into a KM strategy. This impedes successful KM implementation.

Box 9.1
An Example: The World Bank

The World Bank has distinguished itself as a KM leader owing to the swiftness with which it was able to transform into a "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 on the collective knowledge of the bank. In addition, the bank faced the challenges of multiple databases and repositories, different information technology groups and tools, inconsistent information, and poor documentation and control. The World Bank thus developed a KM mission statement: develop a world-class repository of development experience and cumulative knowledge.

A major factor behind this rapid transformation was an innovative technique, storytelling, which just happened to be developed by one of their own employees, their KM champion, Stephen Denning. After years of frustration from trying to explain KM to senior managers and why they needed it, Denning came up with the idea of a springboard story. His idea was that the audience—managers and decision makers—could use the story as a springboard to leap to an intuitive understanding of KM. Here is the story Denning used:

A health care worker in Zambia needed an antimalarial preparation using only materials on hand. He sent a query via the World Bank's website, and he had a workable solution within forty-eight 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 were the following:

- People: a focus on knowledge workers and connecting them via knowledge communities (communities of practice)
- Culture: shifting the culture from an individualistic focus to a team and knowledge-sharing culture
- accountability: Clear roles and responsibilities established for knowledge managers and coordinators
- technology: System to capture, organize, and disseminate knowledge to all stakeholders of the bank
- process: Implement small steps or quick hits and continuously promote awareness and buy-in through relentless repetition

To enhance learning, 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 (CoPs, or thematic groups), after-action reviews, peer learning, and field visits and site tours. The thematic groups form the backbone of the restructured bank. Today, about 123 thematic groups oversee key areas such as poverty, community development, and rural information technology infrastructures.

Box 9.1 (continued)

A small KM board comprising five people oversees all CoPs. This core KM team has overall coordination and facilitation responsibilities. They identify synergies or redundancies among CoPs, identify opportunities for cross community knowledge sharing, link the organizational learning and corporate memory systems, and assess the value of the outputs of each CoP. A KM council as governance body formulates overall KM policy and has KM responsibility at the corporate level. In addition, knowledge sharing is one of four key behaviors evaluated in performance evaluations. Usage and application of knowledge are behaviors that are rewarded—not numbers of hits or postings on the intranet site. This is the major contribution required from the human resources department. The World Bank spent roughly 3 percent of its total administrative budget on KM. Of this, less than 10 percent was on technology (web, telephone, email, and videoconferencing) and 2 percent was for the operating costs of the central KM unit. The rest went to financing the thematic groups and knowledge support offices.

Operational managers in the communities and the regions are responsible for implementing KM. Measurement, accountability, and budgets reside within the regions. Senior managers are required to support CoP leaders spending approximately 25 percent of their time on KM activities and knowledge support offices, or knowledge help desks, for CoPs.

Collison, Corney, and Eng (2019) outline eight high-level types of KM strategies:

1. Top down: traditional authority driven from senior management
2. Top down and bottom-up: decree from senior management combined with good practices from frontline knowledge workers
3. Pilot: short-term achievable KM initiatives such as a CoP and an expertise locator system launched, then scale-up to a full-blown KM strategy
4. Slipstream: KM linked to other transformational initiatives; KM is interdisciplinary enough that it should be easy to have it complement other projects such as Six Sigma projects and culture change projects
5. Stealth: knowledge workers in the organization start sharing and preserving knowledge without necessarily calling it KM; the KM strategy can then build on this existing history of success
6. Copycat: benchmark to identify successful KM in other comparable organizations and import these best practices
7. Buffet menu: work with the demand for KM that already exists within your organization and the existing information technology infrastructure and applications, and connect the different KM solutions to these needs such as lessons learned, access to experts, and existing data and knowledge bases

8. Phoenix-from-the-ashes: past attempts at KM have left less than positive memories; skeptics need to be reinfused with enthusiasm

A KM strategy addresses the following two 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 to identify and prioritize KM initiatives, tools, and approaches that support long-term business objectives. The strategy defines a plan of action by undertaking a gap analysis, which establishes the current and desired states of knowledge resources and KM levers. Specific projects are then defined to address specific gaps that were identified and agreed on as high-priority areas.

A good KM strategy comprises the following components:

- An articulated business strategy and objectives with a mission or vision statement
- A description of knowledge-based business issues such as the need for more innovation, collaboration, or less information overload
- An inventory (knowledge audit) of available knowledge resources, including intellectual assets (tacit and explicit knowledge), social capital (e.g., culture of trust), and physical assets such as information technology systems
- A gap analysis to compare existing KM in the organization with the desired KM state
- Recommendations on how to close the gap in the long term (a three- to five-year KM strategy) with short-term priorities (a one-year KM road map)

The major steps 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). How to get from the "as is" to the "to be" is the gap analysis and often represented by a 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 by using information gathered from 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). At this point existing KM initiatives such as a knowledge audit or inventory are also identified. The audit is particularly important because many decision makers are convinced they need KM initiatives but are unable to articulate why (see box 9.2).

Box 9.2
A Vignette: How Do We Know They Need KM?

Often, an organization is convinced it needs KM but cannot say why. In one organization's 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 prevented them from carrying out a major mandate, which was to assess the environmental health of a particularly sensitive landscape. The results of an organizational knowledge audit aggregated into a strong theme: information management. Most respondents felt that they were great at sharing knowledge, but they could not find the data and information they needed. Some data sets were more than fifty years old but still critical for trend analyses, but 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 were 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. The boxes had been in the scientist's basement, and his family contacted the company when he passed away, asking if the organization would like to have the boxes. The only drawback: the key to decode the data was nowhere to be found. A library and information studies intern fifteen years earlier had developed the key as a classification and finding aid, but no one had thought to make a backup of the key.

The knowledge audit results exposed problems at the information access, preservation, and retrieval levels. This organization did not have a good sense of where its immediate needs lay and needed to, as the adage says, "learn to walk before running a marathon." KM was relegated to a long-term strategy recommendation, and the action plan addressed more pressing information management concerns needed to provide a solid infrastructure for KM.

Knowledge Audit

The first step in developing a KM strategy is to understand what knowledge your organization has. A knowledge audit identifies critical knowledge assets. The focus should be on valuable, mission-critical knowledge that is essential for the organization to attain its goals. The knowledge audit is a systematic review of valuable tacit and explicit knowledge. This step typically involves interviews, questionnaires, focus groups, content and document analysis, observation of knowledge workers, and story elicitation. Lambe (2015) provides an excellent guide to knowledge audits. He notes that both individuals and groups can place their key knowledge assets on a knowledge map, posted on a wall or displayed via software that visualizes knowledge. In addition, the knowledge audit identifies not only what knowledge you have but also missing knowledge (gaps) and knowledge at risk of being lost (e.g., experts who will retire soon).

The results of the knowledge audit should include the following:

- 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

Of vital importance is that an organization's KM initiators or practitioners always assess the company's current KM health before proceeding to implement KM. The knowledge audit provides evidence-based information and knowledge of the audited units' current knowledge status, or health. This evidence-based knowledge is the launching pad for a new KM program. The knowledge audit is also extremely useful as a regular review and assessment of existing KM practices in the company. The audit also is a baseline for measuring improvements in KM.

Stakeholder interviews can help identify key knowledge needs to yield a knowledge map (Robertson, 2004). Questions typically include the following:

- What are 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 on during a normal working day? Where do you obtain it?
- If you have a question, where do you go to find the answer?
- Who asks you what types of questions?
- What 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 an online survey which can also serve as an interview guide. Table 9.1

Table 9.1
Sample knowledge audit questionnaire

1.	List the specific 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 you, who else might need this knowledge?
6.	How often do you and the others from 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 affecting this knowledge?
11.	What would help you identify, use, or transform this knowledge more effectively?
12.	Which parts of this knowledge do you consider to be (a) in excess/abundance? (b) sparse? (c) ancient/old/not useful?
Answer the remaining questions for knowledge you make use of in general:	
13.	How is knowledge currently being delivered? What would be a more effective method for delivering knowledge?
14.	Who are the experts in your organization housing the type of knowledge you need?
15.	In what form is the knowledge that you gained from the experts?
16.	What are the key documents and external resources that you use or would need to make your job easier?
17.	What are the types of knowledge that you will need as a daily part of your job (a) in the short term (1–2 years)? (b) in the long term (3–5 years)?
18.	What kinds of knowledge do you reuse? Can you think of examples where reuse would be beneficial but it is not being done?
19.	What types of questions can you not find the answers for? Are these questions related to your job performance or to administrative procedures?
20.	What kinds of questions do you ask repeatedly?
21.	Do you know whom you should direct your question to?
22.	What kinds of questions are you asked? What do you do if you don’t know the answer?
23.	What mechanisms might be helpful for encouraging knowledge sharing and transfer in your organization?

(*continued*)

Table 9.1
(Continued)

24.	What aspects of your organization seem to be barriers to effective KM? What constraints impede knowledge sharing and transfer?
25.	What are the main reasons why you could have made errors/mistakes on the job?
26.	If your organization has considered outsourcing in the last five years, (a) in what areas was outsourcing considered? (b) if outsourcing was rejected, why? (c) if outsourcing occurred, why?
27.	How much time do you spend looking for knowledge (a) in a given day? (b) in a given week?

Source: Adapted from Liebowitz et al. (2000, p. 6).

highlights some of the knowledge categories in a knowledge audit. Once the as-is portrait of the organization has been completed through information gathering and the knowledge audit, a gap analysis can be performed. One way of carrying out gap analyses is to use organization maturity models.

Organizational Maturity Models

Another type of knowledge audit looks at the overall maturity level, or organizational readiness for KM. A maturity level—an optimal point or threshold—should be reached before effective KM can be implemented.

Maturity models have their roots in software engineering. The Carnegie Mellon Software Engineering Institute defines a maturity model as a descriptive model of the stages through which organizations progress as they define, implement, evolve, and improve their processes. This model serves a guide for selecting process improvement strategies by facilitating the determination of the current process capabilities and the identification of issues most critical to quality and process improvement within a particular domain, such as software engineering or systems engineering.[1] Most organizational and KM maturity models derive from the Capability Maturity Model (CMM; Paulk et al., 1995). The CMM was developed to better describe the phases of software development processes and was subsequently updated as the Capability Maturity Model Integration (CMMI) in 2000 (CMMI Project Team, 2002). The CMM and CMMI are useful not only for software development but also for describing evolutionary levels of organizations.

The CMM is an organizational model that describes five evolutionary stages (levels) for an organization managing its processes. The model provides specific steps and activities to get from one level to the next of the five stages of the CMM:

1. *Initial*—processes are ad hoc, chaotic, or not well defined.
2. *Repeatable*—basic processes are established and there is a level of discipline to stick to these processes.
3. *Defined*—all processes are defined, documented, standardized, and integrated into each other.
4. *Managed*—processes are measured by collecting detailed data on the processes and their quality.
5. *Optimizing*—continuous process improvement occurs by quantitative feedback and from piloting new ideas and technologies.

The CMM and the CMMI can be extended to cover KM processes and assess the readiness of an organization for KM. For example, the maturity model shown in figure 9.2 is based on the CMM and shows the major phases that an organization has to complete to integrate a new way of doing things, a new technology, or a new process. This is relevant for KM initiatives because new processes and technologies will be introduced into the organization. These phases track how well KM has been accepted as a way of doing business within the organization.

Table 9.2 shows a maturity model based on CMM but adapted to organizational change and organizational cultural dimensions. It is a good organizational culture diagnostic in that it straightforwardly establishes the status quo of an organization. For example, if the organization exhibits multiple local cultures that do not, yet, have much in common, then selecting one or more of these microcultures as pilot sites for KM interventions is advisable. If the organizational maturity stage is closer to a managed phase, with more

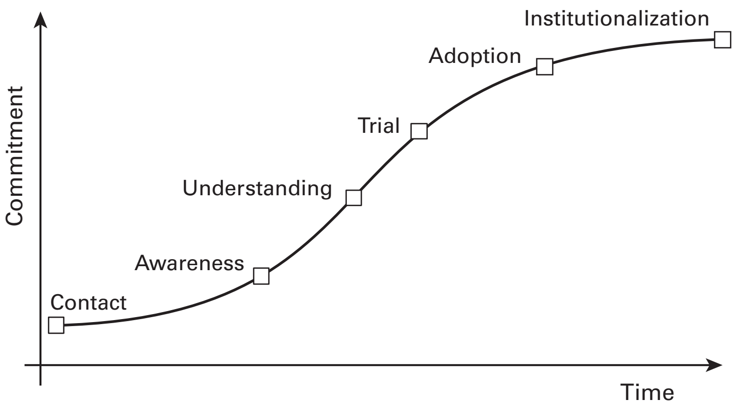

Figure 9.2
Organizational maturity model

Table 9.2
Stages of organizational maturity

Maturity phase	Description
1. Chaotic	• Noncohesive culture • In-flight decision making • Leadership structure vague • Operation model undefined • Employees evaporating
2. Ad hoc	• Multiple local cultures, leadership structures, and operation models • Local decision making • Employee turnover high except in preferred classes of employees
3. Organized	• Similar local cultures • Local decision making based on corporate strategy • Local leadership linked to corporate leadership team • Corporate operation model pushed down to local level • Stable employee base
4. Managed	• Cohesive corporate culture and operation model • Corporate strategy drives operational tactics • Corporate leadership team coaches and empowers local leaders • Employees recruited and retained based on strategic direction
5. Agile	• Culture adapts strategically • Operation model changes dynamically on the basis of environmental changes • Professionals compete to work for corporation

Source: Adapted from personal communication from Fujitsu Consulting.

pervasive and cohesive culture, then focusing on tightly aligning the KM strategy to the overall business strategy and objectives of the organization is advisable.

KM Maturity Models

Half a dozen or so KM maturity models are based on the CMM approach. The Infosys model (Kochikar, 2000), shown in table 9.3, has been implemented in several organizations. It 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 key results for each of the five levels.

Compared with other KM maturity models, 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 to establish the current status quo of an organization. For example, if it detects that most of the KM effort is devoted to capturing content, then KM initiatives aimed at promoting knowledge sharing would be premature at this stage. Instead, the KM objective targets reuse when the organization is at the reactive level of organizational

Table 9.3
The Infosys KM maturity model

Level	Organizational capability	Characteristics/key result areas
1. Default	Complete dependence on individual skills and abilities.	Unstructured on-the-job learning, accidental knowledge reuse, informal knowledge sharing, teamwork virtually nonexistent.
2. Reactive	Ability to perform tasks constituting the basic business of the organization repeatedly.	People are aware of knowledge as an asset through formal training and mentoring, some pockets of knowledge sharing, sporadic knowledge reuse, and some teamwork. Process focus is on basic content capture. Technology is information management.
3. Aware	Restricted ability for data-driven decision making. Restricted ability to leverage internal expertise. Ability to manage virtual teams well.	People are educated on KM, some environmental scanning and knowledge dissemination. Process of content structure management, taxonomy of knowledge. Knowledge technology infrastructure (e.g., portal). Dedicated KM group.
4. 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 (e.g., KM metrics such as percentage of content used, quality ratings). Knowledge infrastructure management for sustainable KM.
5. Sharing	Ability to manage organizational competence quantitatively. Strong ROI-driven decision making. Streamlined process for leveraging new ideas for business advantage. Ability to shape change in technology and business environment.	Expertise integration (content and expertise available organization-wide). Knowledge leverage through frictionless knowledge flows. Innovation management and cohesive teamwork.

capability. In time, as KM awareness increases and knowledge flows appear between disparate groups, 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 locator 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. Paulzen and Perc assume the validity of adapting software development models for KM because it is a knowledge-based activity. The KPQM is essentially a modification of the CCM (CMMI Project Team, 2002) to address the specific characteristics of knowledge processes and KM systems. The maturity model consists of five ordered phases: (1) initial, (2) aware, (3) established, (4) quantitatively managed, and (5) optimizing, as shown in table 9.4.

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, to achieve the desired end results of effective knowledge transfer, sharing, storing, and distributing of experiences, learning from past experiences, and so forth.

Table 9.5 shows the Forrester Group KM maturity model, which describes maturity stages in terms of how people are supported throughout the KM cycle. In the first phase, assisted, other people are needed for knowledge workers to find valuable content and connect with subject matter experts. In the second phase, self-service, employees can make use of KM systems such as knowledge repositories to find content and

Table 9.4
The KPQM of maturity

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

Table 9.5
Forrester Group KM maturity model

KM maturity model phase	Description	Typical KM initiatives
1. Assisted	• Culture adapts strategically • Operation model changes dynamically, based on environmental changes • Professionals compete to work for corporation • Employees find info with the help of librarians	• Knowledge support office • Yellow pages • CoPs
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: Adapted from Leggett, 2011).

link to experts by themselves. In the final phase, organic, KM has ceased to be an extra burden and has become part of how the knowledge work gets done every day.

The Forrester KM maturity model is useful in determining the level of knowledge support needed to establish KM within a given organization. For example, an organization that is at the assisted phase stands to benefit greatly from an expertise locator system and a knowledge support office, which is essentially an always-available help desk for knowledge content. A toll-free telephone number and an email address connect employees with the knowledge support office to obtain help in locating, accessing, and making use of valuable knowledge content.

Community of Practice Maturity Models

Maturity models have also been applied to the CoP life cycle. A community of practice (CoP) maturity model can be a road map showing steps to take to move communities to the next stage. The CoP life cycle model is diagnostic to assess whether informal networks exist within an organization and, if they do, whether they are recognized and supported by the organization. In the life cycle model (figure 9.3), a community needs to have attained the maturing and stewardship of knowledge levels before creating value for its members and for the organization as a whole. The life cycle model is particularly useful for aligning new KM roles and responsibilities needed to optimize KM efforts throughout the life cycle—for example, a knowledge journalist to help build, identify, and extract

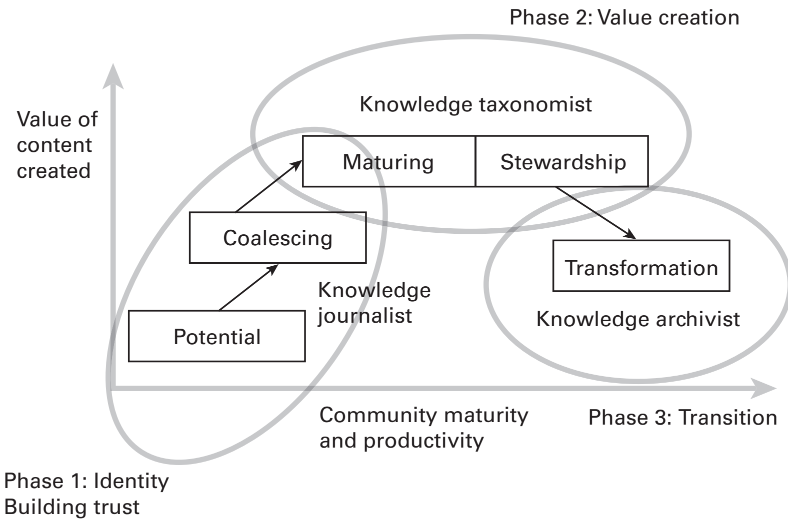

Figure 9.3
CoP maturity model

valuable content from community members; a knowledge taxonomist to organize content once it is being produced at a steady rate; and a knowledge archivist to distinguish active content and content that should be stored because it is no longer active.

Organizational and KM maturity models assess knowledge sharing and knowledge activities within an organization. Situating a company on a maturity model greatly facilitates organizational change because visualizing what is needed to step up to the next level becomes easier. A minimum level of maturity or readiness is required before KM can succeed.

The six maturity models presented are summarized in table 9.6. Each can serve as a good framework for understanding how change is introduced and eventually adopted within knowledge-based organizations. The current state of an organization can be diagnosed to better anticipate how both the organization and the individual knowledge workers within that organization will react to KM initiatives. A better understanding of the maturity level of the organization aids in identifying the potential enablers and obstacles to the organizational cultural changes required for KM to succeed.

Gap Analysis

Gap analysis finds the difference between the existing and desired KM state of the organization in terms of enablers of and barriers to KM implementation. A gap analysis addresses the following points (Skyrme, 2000; Zack, 1999):

Table 9.6
Major features of six maturity models

Maturity model	Key features
1. Paulk organizational maturity	Represents the adoption of a new technology or process within an organization, which is a very good match for the introduction of new KM functions.
2. Fujitsu organizational maturity	Provides a fast and easy way of assessing how cohesive or pervasive a culture is within a given organization, which can provide valuable guidance in selecting either pilot KM sites, if the organization is in the earlier stages, or focusing on closely aligning KM with the overall business strategy.
3. Infosys KM	Much more specific than other models, this model allows diagnosis of specific KM behaviors such as content capture, knowledge sharing, and KM metrics. Greater specificity allows more refined targeting of priority KM initiatives.
4. Paulzen and Perc KPQM	Quite similar to the Infosys KM model, the KPQM allows incremental introduction of KM initiatives into an organization on the basis of the phase of KM maturity.
5. Forrester Group KM maturity model	A model that focuses on how employees acquire relevant content that is particularly well suited for an incremental introduction of knowledge support services within an organization.
6. 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.

- Find the major differences between the current and desired KM states of the organization.
- List barriers to KM implementation (e.g., the culture is one 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 on).
- Identify opportunities to collaborate with other business initiatives (e.g., combine knowledge continuity goals with succession planning initiatives in HR).
- Conduct a risk analysis (e.g., knowledge that will soon walk out the door because of imminent retirements or knowledge that is at risk because only a few are competent in this area and little of their expertise exists in coded tacit or tangible explicit knowledge assets).

- Look for redundancies within the organization (e.g., the right hand not knowing what the left hand is doing).
- Determine whether there are knowledge silos (e.g., groups, departments, or individuals that hoard knowledge or block fluid knowledge flows to other groups, departments, or colleagues).
- Find the organization's rank with respect to others within the industry (e.g., early adopters of KM, emulated by others in KM, or only now becoming aware of KM needs).

A good approach is to once again survey or interview key stakeholders to find out what types of knowledge they would *like* to have in contrast to what they *actually* have. Next, the gap analysis will need a list of prioritized KM objectives to be addressed by the organization. This list is typically gathered through interviews with senior management and focus groups with the managers of all core business divisions. The sessions are a form of brainstorming in which participants are encouraged to think blue-sky thoughts—that is, ignore constraints and reality checks and envision a more utopian version of their company. Typical questions include If all were possible, what would your ideal day be like? What thorns in your side would you 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, paints a portrait of the status quo. 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, skilled resources, and above all, no constraints. After this brief respite, the stakeholders are brought back to earth by asking them to now think about the feasibility, the costs and benefits, and the priority of each of these desired objectives. This step helps everyone agree on what the key shorter-term priority areas should be (box 9.3).

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.

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 to benefit, and priority) and a longer-term KM strategy that will describe some of the longer, more complex initiatives.

Box 9.3

A Vignette: What Should KM Focus on within Our Organization?

The knowledge audit and gap analysis phases of the KM strategy determine the focus of KM efforts. For example, in a public utility company, an extensive audit revealed that, although explicit knowledge was formally shared quite extensively, there were few if any opportunities to meet to share knowledge informally. Also, documentation of lessons learned was edited so as to not cause alarm, and by the time lessons reached the eyes of the CEO, the reports all read something 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 emergencies, however, work teams no longer knew their roles; could not collaborate in more dynamic, tacit ways, preferring to follow manuals and rules; and often failed in carrying out their critical duties.

For this organization, an emphasis on tacit knowledge and informal ways of sharing it became a critical concern for the KM strategy. Employees were encouraged to meet and discuss project postmortems with peers before reporting more formally up the authority hierarchy. Additional recommendations included training teams through role-playing and simulations to better perform in crisis situations in the short term, and beginning the longer-term journey to cultural change by encouraging employees to send anonymous emails directly to the CEO and rewarding employees for taking risks.

Another organization, an international aid outfit, revealed quite a different focus for KM during its KM audit. This organization operates in a highly complex environment—multiple locations; multiple languages; multiple stakeholders, including funding agencies and partners in many countries—and has a high turnover rate because of two-year mandates. The audit revealed that tacit knowledge was well shared throughout the organization, primarily through informal contacts using Skype and occasional face-to-face meetings. Several bottom-up, or grassroots, CoPs had emerged on their own, further linking geographically dispersed workers around a common mandate.

The gap analysis showed that the critical KM missing in this organizational context was the formal capture and sharing of explicit knowledge. Meetings were often held without an agenda, attendees changed at the last minute, and the way of proceeding was chaotic to an outsider: the topics to be addressed were arbitrarily changed, priorities were suddenly announced, and discussions were difficult to follow. Attendees often interrupted one another, there was no set time for the meeting to end, and no one chaired the meeting or took minutes. Employees explained that this was the culture of the place—everyone was involved in everything, and every decision was made by consensus. There was little systematic documentation of meeting results, completed projects received little reflection, and what documentation did exist was often difficult to track down.

As a result, the organization decided to focus KM efforts on the knowledge capture and codification side of things in order to identify the types of knowledge they had and need to have and on how to render these more visible and therefore easier to access by others.

The KM Strategy Road Map

The final recommended strategy outlines key priorities for each year of a three- to five-year period, a road map:

- How the organization will manage its knowledge better for the benefit of the business
- Content (management of explicit knowledge) and communities (management of tacit knowledge) priorities
- Identification of high-priority knowledge levers: processes, people, products, services, organizational memory, relationships, and knowledge assets
- Determine the clear or direct link between KM levers and business objectives
- Selection of some quick wins (i.e., early, relatively inexpensive KM successes)
- How to sustain KM capability over the long term (e.g., defined KM roles)

A typical KM strategy document contains the results of the audit, an inventory of what exists, what KM initiatives were implemented or tried out, what types of knowledge exist, who uses this knowledge and how, and whether knowledge is shared and disseminated throughout the organization. Also important is assessing the status of the two key enablers of KM: the technological infrastructure and the type of prevailing culture (or microcultures within different units) (Gonzalez & Martins, 2014). All pieces of the audit can then be integrated to provide a snapshot of the organization at this point in time and a high-level diagnostic—for example, the level of organizational readiness for KM (based on KM maturity models), whether it has an intranet or other means for everyone to connect with everyone else and access existing knowledge, and potential obstacles to future KM implementations. The next phase develops a prioritized wish list that shows where the organization would like to be in the short term (one to three years) and long term (three to five years). The gaps are thus the differences (measured by the width of the gap) between what is and what should be, and the strategy recommendations outline how the company can close these gaps.

The table of contents of a KM strategy document is shown in table 9.7. The strategy contains both diagnostic and prescriptive content. In addition, the recommendations are not so generic or abstract that how to implement them is unclear. In other words, the recommendations should be packaged with the resources needed for each recommendation, such as cost and human resources; the required skill set and training (KM roles and responsibilities, discussed in chapter 12); and a way of assessing whether implementation was successful (KM metrics, discussed in chapter 10).

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,

Table 9.7
Recommended table of contents for a KM strategy

Section number	Section title	Comments
Metadata	Document history/ information	Include information about authors, contact person, date last revised, authority owners, and distribution limits (usually not a public document).
1.	Executive summary	Maximum of 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 wish list, based on stakeholder consensus, of 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–three years with cost-benefit analysis, resources, and metrics identified.
6b.	Long term	Strategic objectives with results projected in the next three–five years, clearly showing how this builds on the action plan.
7.	Conclusions	Identify next steps; include governance (e.g., who approves strategy, when it will be updated, assessed, and so forth).
8.	Appendixes	Include (as documents or links to the 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.

quantify, and capitalize on those intangibles. The value of intellectual assets will increase over time for most successful organizations. An organization's intellectual assets are computed several ways (none of them precise). The difference between a company's book value and the value of all its fixed assets is one measure. The Coca Cola Company (http://www.thecoca-colacompany.com) is often cited as a reference model for evaluating intellectual assets. Even after accounting for 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.

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 determines the obvious and nonobvious assets that a company owns. Often, as a company systematically inventories its known assets, it finds many surprises. For example, a company might start an inventory by listing its patents and patentable discoveries but then find that some of its most valuable intellectual assets are processes or know-how that are not patentable.

Examples of what to include in an inventory of intellectual assets are product formulas, manufacturing processes, new product plans, packaging specifications, product compositions, research direction, test methods, alliance relationships, business plans, strategic direction, vendor terms, competitive analysis, customer lists, marketing plans, sales projections, budgets, financial projections, pricing analysis, and employee lists.

Intellectual assets also come from widening the aperture of the lens used to see intellectual assets. For example, by looking to contractors and consultants who develop intellectual assets for the company, the company is likely to discover assets it had not yet considered. When identifying intellectual assets so as to extract them for profit, a company will often see opportunities to create intellectual assets. A company can cultivate creativity that yields assets, which can be identified and extracted for profit to the organization.

Intangibles are difficult to manage and 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. Competitors can copy or reengineer intellectual assets with relative ease, and we have limited ability to protect property rights from use by others. Cost accounting systems are not geared toward intangible assets and are even wholly inaccurate for corporations managing a lot of intangible assets. Intangibles cannot be owned (except legal property rights). Intangible investments are therefore typically riskier owing to intangibles playing the most dominant role in early stages of innovation. Proper management can deal with this—that is, research and development alliances and diversified innovation project portfolios.

Intangible assets are nonphysical and cannot directly be measured. They are not evidenced by financial transactions (as tangibles are) and are therefore inherently difficult to trade. Legal protection is weak. They have large sunk costs and low marginal costs. Open exchanges for intangibles are in their infancy.

The ISO 30401 KM Standard

As discussed in earlier chapters, the International Standards Organization (ISO) KM standard was published in 2018. This standard is a useful framework to develop a KM strategy and plan. This is perhaps the most valuable contribution of the standard, followed by its use in assessing the effectiveness of an organization's KM (discussed in more detail in chapter 10). At a minimum, the standard can serve as a checklist to ensure that the entirety of the holistic KM endeavor has been addressed, but beyond the checklist, accreditation to the standard is valuable to self-study and reflection. Adoption of the standard is voluntary, but its very existence attests to KM being increasingly recognized as a integral part of effective management.

Although KM has now been around for more than 40 years, Collison, Corney, and Eng (2019) point out that we still lack consensus on a definition of KM, and we don't have an agreed-on set of tools, methodologies, and processes. The boundaries of KM are less well defined than those of other management processes and professional practices. The introduction of a standard will help establish a common vocabulary and agreement on the essential KM pieces that need to be in place for knowledge to contribute to the success of the organization. There were objections to standards because there is no one-size-fits-all KM, yet KM is wholly concerned with best practices and lessons learned, which may be internal or external. The standard mostly covers what should be in place for KM, not so much how to implement KM, which leaves organizations with enough room to customize KM (and the KM strategy). Perhaps the greatest value of the new standard is that it provides internationally developed guidelines on how to assess KM efforts. The evaluation of KM return on investment has and continues to be a challenge for many organizations (discussed in more detail in chapter 10).

The KM standard follows the same structure and template of ISO 9001. The idea is to be able to show that the organization has certain practices in place and is working effectively in seven key areas:

1. Organizational context
2. Leadership
3. Planning

4. Support
5. Operations
6. Performance evaluation
7. Improvement

The organizational context refers to how KM interacts with the organization's culture and strategy. This context includes the major KM processes (see chapter 2) and major KM enablers such as the technology infrastructure and governance. The leadership parameter looks at the values of management committees, change leadership, behaviors of KM champions, the impacts of policies, and assigned KM roles. Planning and operation looks at how KM objectives are defined, how risks and opportunities are managed, and how planned and unplanned changes are reviewed and managed. Support outlines the KM resources required, such as education, competence, and training. Performance evaluation addresses the requirements for KM monitoring and assessment of effectiveness, such as conducting internal audits and management reviews. Finally, improvement looks at quality management, how nonconformance is dealt with, and organizational approaches to ensure continuous improvement.

Fifty-seven questions are addressed in the standard (ISO, 2018). These are summarized at a high level in table 9.8.

KM Governance and Leadership

Once the strategy has been developed, the next step is to implement the KM plans. A key component is the governance ensuring that KM is both efficient and effective in helping the organization meet its objectives. KM governance is often the missing piece of the KM puzzle and its absence the reason KM never achieves its potential.

What is governance? Van Kerkhoff (2014) defines knowledge governance as the formal and informal rules and conventions that shape the ways we conduct or engage in knowledge processes, such as creating new knowledge, sharing or protecting knowledge, accessing it, and applying or using it. This definition was further refined by Clark et al. (2016) as the suite of formal and informal rules that coordinate, guide, and regulate knowledge processes: production; whether it is shared and with whom (including who decides and on what normative basis); access (e.g., paywalls and professional reward systems); and use (the expectations around justification of decisions or actions).

A key challenge to good KM governance is that organizations often do not know what valuable knowledge they have. As a consequence, they suffer from what Kransdorff

Table 9.8
Key components of ISO KM 30401

Component	Requirement	ISO reference
1. Organizational context	Determine internal and external issues Understand stakeholder needs and expectations	4.1 4.2 4.3
2. Appropriate technology	Identify scope of KM system Establish, maintain, and continually improve KM system Demonstrate KM system covers all processing stages Should allow effective human interaction, e.g., CoP	4.4 4.4.1 4.4.2 4.4.3
3. Enabling culture	Demonstrate organizational culture supports KM	4.5
4. Committed leadership	Top management fosters values to increase trust Have a KM policy KM system requirements integrated into business processes KM resources are available	5.1
5. Documented policy	How to set, review, and achieve KM outcomes Meets regulatory requirements Sets expectations Protects knowledge without impeding knowledge sharing	5.2
6. Roles and responsibilities	Relevant KM roles are assigned Employees are engaged Performance is assessed	5.3
7. Planning	Risk mitigation addressed Continual improvement can be demonstrated Opportunities are systematically identified Plan to achieve KM objectives aligned to org. strategy Accountability identified	6.0
8. Support	Necessary resources have been provided KM competencies have been identified Awareness of KM has been created, e.g., KM policy Effective internal and external communications KM system well documented, preserved, retained, and disposed	7
9. Operation	KM processes have criteria Change management implemented effectively	8
10. Performance evaluation	Appropriate measures are in place Organization conducts regular internal audits Regular management reviews take place Evaluation is documented Evaluations contribute to improvements	9
11. Improvement	Learn from what did not work, what did not conform Changes made when necessary Demonstrates continual improvement	10

(1998) termed “corporate amnesia.” Another challenge is that organizations do not own tacit knowledge in the same way that they can have copyright on documents or patents for innovations. Valuable knowledge walks out the door every day when knowledgeable employees leave or when they retire. A knowledge audit, at a minimum, identifies valuable knowledge assets, including tacit knowledge.

Why is knowledge governance a critical KM success factor? Governance comprises authority, decision making, and accountability in an organization. This implies that there need to be clearly defined roles and responsibilities, policies, rules and guidelines, and expectation of consequences for not governing knowledge well. Governing knowledge means dealing with complexity because knowledge needs to be governed at three levels: individual, group, and organizational, which correspond to human, social, and structural capital. In addition, knowledge needs to be governed throughout all stages of the knowledge processing cycle: knowledge creation or capture, knowledge organization and storage, sharing and dissemination, use and reuse, and learning and improving (Evans et al., 2015; and see chapter 2). Finally, both informal and formal governance methods are needed for each of these stages (Dalkir, 2022). Table 9.9 summarizes the approach needed to govern the complexity of KM.

Aim for a balanced governance, a roughly equivalent emphasis on both formal and informal mechanisms. Formal governance tends to be linked to organizational governance, and structure such as hierarchical organizations with direct reporting relationships. The leadership model is usually top down and authoritative and gives attention to policies, rules, regulations, and job and task descriptions. KM incentives tend to be linked to extrinsic rewards such as performance reviews and promotions. Informal governance mechanisms tend to be linked to organizational culture. The focus is on how employees perceive collaboration and whether they have opportunities to network and share knowledge (e.g., time during the day, physical or virtual spaces to do so). The emphasis is on building trust and promoting peer-to-peer mentoring.

Table 9.9
Complex KM governance approach

KM process	Individual level	Group level	Organization-wide
Create/capture	Formal/informal	Formal/informal	Formal/informal
Organize/share	Formal/informal	Formal/informal	Formal/informal
Share/disseminate	Formal/informal	Formal/informal	Formal/informal
Use/reuse	Formal/informal	Formal/informal	Formal/informal
Learn/improve	Formal/informal	Formal/informal	Formal/informal

Leaders, although they do of course have authority, should also be strong KM role models.

Formal KM governance best practices include having a chief knowledge officer and a formal KM team. Knowledge (especially tacit knowledge) should be addressed in organizational policies on intellectual property. Informal KM governance best practices include having a clear charter for all knowledge networks or CoPs. The charter should clearly state membership eligibility criteria, roles such as moderators, and rules of conduct (what can be posted, how to share, and the like). In addition, there must also be intrinsic rewards for good KM behaviors, such as ensuring that there is always proper attribution and recognition of knowledge creators and sharers.

Balancing Innovation and Organizational Structure

Klein (1999) discusses the dynamic equilibrium between fluidity and institutionalization that should ideally exist between innovation and organizational structure. The fluid intellectual domain consists of individual intuition (ideas originating and growing from a given person), personal networks that form outside formal organizational charts (CoPs), chance encounters that occur between people, and improvisation that ignores standard procedures and discovers better ways of doing things. In contrast, the organization strives to structure work, control processes, and 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 between innovation and structure?

If the organization is too fluid, no solid connection of knowledge work to business goals exists and it is difficult to have clear accountability. If the balance shifts too much toward institutionalization, the organization risks becoming too formal, which can stifle innovation and the open communication necessary for creative work to take place (figure 9.4).

Some companies, such as Buckman Laboratories, 3M, Kao in Japan, and AES, have managed to strike the right balance (Klein, 1999). Critical success factors include the following:

- Consistency between core values, business strategy, and actual work environment
- Value conferred on personal freedom, cooperation, and community
- Top leaders serving as good role models—walking the talk

AES, an electric power distribution company, set up a task force to conduct a historical study of the company's ten biggest mistakes. It also provided physical meeting space and time for people from different parts of the company to meet and share what

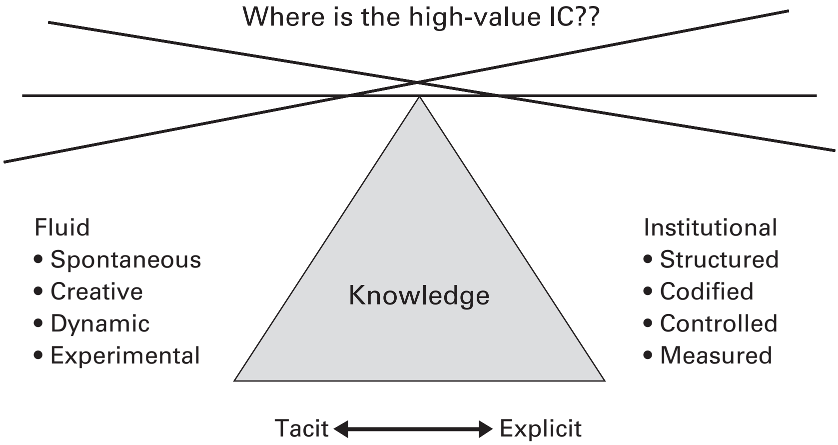

Figure 9.4
Balance between fluidity and institutionalization (adapted from Klein, 1999)

they were doing and to get advice on problems. The US multinational conglomerate 3M incorporated stories into its corporate training. It adopted the slogan "Conservatism with creativity." 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. A 15 percent rule was applied: 15 percent of employee time is set aside to pursue personal research interests. The company also instituted a storytelling culture (e.g., "Remember the time they tried to kill the Thinsulate idea . . .").

The Japanese chemical and cosmetics company Kao focused on organizational learning and based its approach on values derived from Buddhist principles. Continuous cross functional interactions are encouraged, and every meeting at Kao is open to all. Kao's digital memory is in a value-added network. The ECHO system adds customer-call information to the network, and it can receive about 250 calls per day. This preserves corporate experiences and makes them available for future customer interactions.

Buckman Laboratories developed a knowledge repository that is available in the ninety countries where it has offices. The users are the sales and technical workforces. The repository connects the Buckman CoPs. The KM application consists of email and forums residing in the knowledge repositories. Each forum has a message bulletin board, library, and virtual conference room.

In configuring for a balanced knowledge framework, successful companies such as these need to identify strategic business drivers: What is the business about? This is the logical starting point to decide how to organize and manage intellectual assets.

Companies need to identify products, services, cost, value, quality, and differentiating factors, and they need to characterize the environment in terms of competitive forces, regulations, and socioeconomic trends. The organization can then establish the knowledge core and interrelationships: What are the knowledge assets needed to maximize value for customers, shareholders, employees, and other stakeholders? Both tangible and intangible assets (e.g., values, culture, people, technology, business capabilities) need to be clearly identified, as do 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 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, or changes in performance. An organization is a complex adaptive system operating in a complex dynamic environment, and the goal is 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 the telephone game—in which the message becomes progressively more garbled with each repetition. Useful questions to ask are the following:

- 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 are the innovation support systems?

If knowledge assets are not part of the governance framework, then there is no systematic way of aligning knowledge with an organization's strategic priorities. An example is the 2018 ISO 30401 KM standard. Most organizations have a governance structure, but knowledge governance is more difficult to govern. How can we even assess compliance? The best approach is to always integrate knowledge into management and knowledge governance into the overall governance framework of the organization.

Donate and de Pablo (2015) claim that a new type of leadership, called knowledge-oriented leadership, may be required to address the two major goals of KM: efficiency and innovation. They note that leadership may foster KM or hinder it, depending on whether leaders, respectively, encourage knowledge sharing or knowledge hoarding and cooperation or competition. Some studies indicate that a participatory (less directive) style is more conducive to KM as are leaders who favor mentoring and facilitating roles (Singh, 2007; Yang, 2007). Knowledge-oriented leadership includes all the major KM processes: leaders play an active role in knowledge creation, sharing, dissemination, preservation, and application. A final component is that KM leadership not only tolerates errors but also taking risks, admitting errors, and being allowed to learn and improve. This type of leadership is much more likely to lead to both efficiency gains and innovative results.

Note

1. Grenier, personal communication.

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10 Evaluating Knowledge Management

Price is what you pay. Value is what you get.
—Warren Buffet (1930–)

This chapter addresses the chief ways to assess the value of KM. The major types of KM measurement frameworks are introduced: intangible asset assessments, benchmarking, balanced scorecard, house of quality, and results-based assessment. The approaches to the evaluation of intangible assets are described. In addition, how value is produced by communities of practice and knowledge networks is discussed.

Learning Objectives

1. Identify the major types of value that KM can create for organizations, groups, and individual employees.
2. Understand the major advantages and shortcomings of KM metrics.
3. Apply the benchmarking, house of quality, and balanced scorecard methods and the results-based assessment framework to KM performance measurement systems.

Introduction

This chapter discusses metrics for monitoring progress toward organizational goals. An additional dimension now part of the integrated KM cycle is that of measurement or assessment of KM value (as shown in figure 10.1).

Various methods assess how well KM is succeeding (milestones and formative evaluation) and how well KM has helped attain organizational goals (outcomes and summative evaluation). Progress and attainment can be measured for KM goals, such as increasing

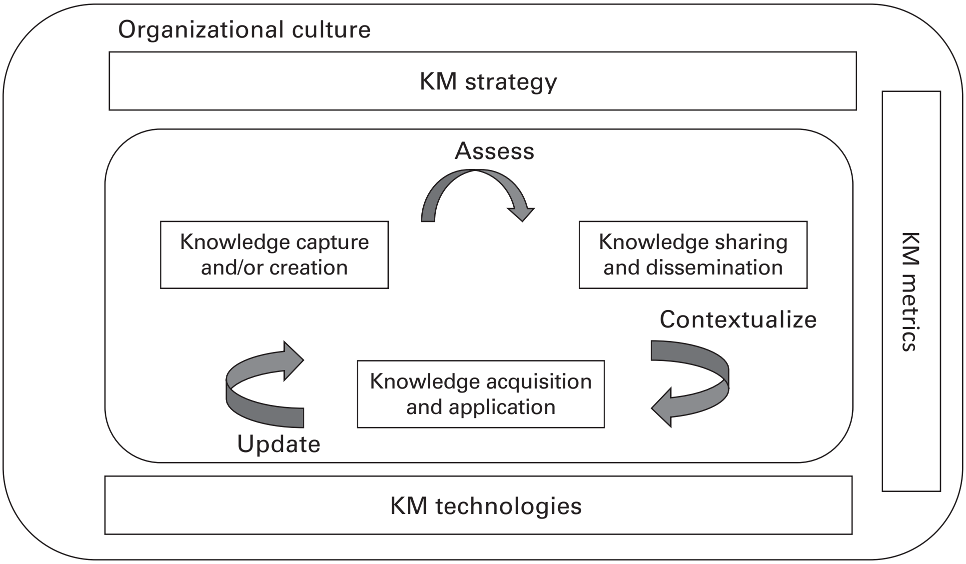

Figure 10.1
An integrated KM cycle

collaboration and innovating to create more new products each year. KM metrics include quantitative, qualitative, and anecdotal methods. Each method presents advantages and disadvantages, and often, a combination of measures may be called for.

The best place to start is with a KM measurement strategy that answers five basic questions:

1. Why are we measuring?
2. What are we measuring?
3. For whom are we measuring?
4. When are we measuring?
5. How are we measuring?

The justification for an assessment of how well KM has done is, often, to show the value added by 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, speeded up problem-solving, or complemented formal training to improve employees' skills. Note that KM is not a silver bullet that will solve all organizational woes—hence the phrase "contributing toward." Causality is extremely difficult to prove in a complex organizational environment, but although 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 for measuring KM is to convince management and stakeholders that KM is adding value to the organizational equation. This justification helps with resource allocation and budgeting—costs are unfortunately all too visible, whereas KM benefits tend to be opaque and long term. Finally, there are two general types of evaluations: formative (or in-progress feedback) and summative (which is provided upon completion). Formative KM assessment can help revise project plans and goals and identify areas that need to be improved while there is still time to effect changes. A summative evaluation is much like a report card—the work has been handed in and 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 on them. For example, a large organization wanted to know if the four communities of practice (CoPs) it had supported and invested in had resulted in benefits. They decided to measure member satisfaction. The adage "Be careful what you wish for" applies here. The assessment was that "97 percent of employees are highly or very satisfied with their membership in their CoP." This approach finds only that we know that people are happy being members. A better question to measure a more apt dimension is "Could you provide specific examples to illustrate how your participation in a CoP has helped you to do your job better?" A different organization did include this question and got answers 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 "Whom are we measuring for?" although at times obvious, deserves attention. We need to be aware of who is concerned with the success or failure of the KM initiatives and what their expectations are. Expectations can lend themselves to 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 does. Stakeholders typically fall into three main categories:

1. Program funders, who are interested primarily in financial measures, what the return was on the KM investment, and how long it took for the KM investment to be paid back (referred to as the breakeven or payback period)

2. Managers, who are mostly interested in how the KM tools and processes are working and how much they are being used by their staff (referred to as adoption rate)
3. Employees or participants, who are more concerned with practical and operational issues such as how KM improves (or makes worse) 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 a merger with another company is imminent, a major reorganization is planned, or a downsizing is coming, and employees are concerned about job security, then any one of these would be reason to wait for a KM assessment. Measuring KM when the organization is in crisis mode will yield unrepresentative results. For example, during a downsizing, one would not necessarily expect knowledge sharing to be at the top of an employee's list of priorities. The data collected will be skewed or biased because the organization is not in its natural state.

For stable organizations, assessment can occur four or more possible points. These four points refer to the general phases of a KM project (or really, any project):

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 provides a baseline measure: a starting point against which subsequent changes may be measured and compared. If we know where we started, then we have a better chance of measuring how far we got. In the start-up phase, we can track basic progress toward KM goals, and during a pilot project phase we can focus on measures that show how KM affects the business. During the final growth and expansion phase, we can apply more formal metrics to monitor KM health and progress. The final stage usually consists of a combination of metrics to show the value added across the organization and for its different stakeholders.

As to how to measure KM, there are quantitative methods (e.g., statistical, and mathematical analyses of large data sets such as a survey questionnaire administered to two hundred people) and qualitative measures (more in-depth interpretative approaches, such as interviewing ten people several times to gather narrative data that are then thematically organized). Quantitative measures assign a numerical value to an observable phenomenon and provide concrete evidence such as causality or financial metrics. Examples include usage metrics from the company intranet, the time spent accomplishing a task with and without KM (the latter being a baseline), and time saved (e.g., on product development or in answering client queries). Qualitative measures provide more context and details about the value (e.g., perceptions), which is often difficult to measure quantitatively. Qualitative measures augment quantitative ones by providing more interpretation and more meaning with respect to the data. Anecdotal data consists of stories—for example, interviewees describing a lesson they learned or an innovation they made use of. All stakeholders love stories, which often humanize a metrics report or presentation.

Intangible Assets, Return on Investment, and Metrics

Roche (2013) highlights several approaches to evaluating the return on investment (ROI) of KM. Each presents advantages and disadvantages, and a combination is often called for. Many businesses are finding that, to gain buy-in from senior management on implementing KM, they need to present a solid KM business case. Despite the difficulty in valuing intellectual capital, it remains one of the more important KM techniques to apply (Brown & Woodland, 1999). Traditional financial statements do not show the loss of intellectual capital, and the subsequent impact to the company, if a thousand employees suddenly left the company (Roos & Roos, 1998). However, research from the accounting firm KPMG indicates that, after losing key employees, 43 percent of organizations experienced damage to a main customer relationship, 50 percent lost knowledge of best practice information, and 10 percent lost significant income (Warren, 1999).

Most current approaches place a value on intellectual capital in the following way: for publicly traded companies, the value of intellectual capital is the difference between the market capitalization and the book value (summation of assets less depreciation) of the company (Chatzel, 2002; Roos & Roos, 1998; Skandia, 1998). For example, Intel's market capitalization in 1997 was $110 billion, and its financial book value was $17 billion. This hidden value of $93 billion is the value of Intel's intellectual capital (Sveiby, 1997). Roos and Roos (1998) made a similar comparison with Microsoft. A study by the Brookings Institution shows that missing value grew from 38 percent of a company's market capitalization in 1982 to 62 percent in 1995 (Dzinkowski, 1999). Employees and teams can develop their own frameworks to capture the value of their intangible assets. A holistic perspective must be adopted, one that includes collaboratively created assets as part of the knowledge audit or inventory.

The general approach to evaluating KM value consists of identifying the processes that knowledge goes through and assessing the value created at each step. The reuse of knowledge is a particularly important step to measure. When knowledge is captured, it is easier to share and preserve. When knowledge is coded, it is easier to find and reuse. When knowledge is shared and disseminated, all employees benefit from best practices and lessons learned to improve individual and organizational performance. When knowledge is preserved, it becomes possible to learn from the past and so improve and innovate. When knowledge is applied—then the greatest value is realized.

Skandia, a Swedish insurance company, has made strides in quantifying its intellectual capital. Using work that won the 1992 Nobel Prize in Economics, Skandia divides intellectual capital into subsets: customer capital, human capital, and organizational capital (Mouritsen et al., 2001; Roos & Roos, 1998). In Skandia's annual Intellectual Capital Prototype Report (1998), these terms are defined with supporting details regarding how calculations of value are made. Skandia's advancements, as well as efforts by KPMG (Andriesson, 2005), Buckman Laboratories, and McKinsey & Company (Davenport, De Long, & Beers, 1998), provide tools for determining a company's present intellectual capital value and foreseeing its future growth (or shrinkage). These tools are being used by Deutsche Bank to make loans with only intellectual capital as collateral (Henry & King, 1999).

The Skandia intellectual capital model is called the Skandia Navigator (Wall, Kirk, & Martin, 2004). Four key dimensions of business form the core of this model:

1. Financial focus, represented in monetary terms
2. Customer focus, a financial and nonfinancial measure of the value of customer capital
3. Process focus, addressing the effective use of technology within the organization
4. Renewal and development focus, which attempts to capture the innovative capabilities of the organization

Three popular methods, benchmarking, balanced scorecard, and house of quality, are presented next.

Benchmarking Method

In benchmarking, a company searches for industry-wide best practices that lead to superior performance (Camp, 1989). It usually consists of a study of similar companies to see how things are done and then adapting the methods for their own use. The Hindu proverb "Know the best to become the best" sums up the practice. Benchmarking, the term used in KM, is 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 United States. Xerox wanted to know why and whether it could emulate them. One of the first experiments in benchmarking was in production logistics (warehousing, picking, packing, and shipping); Xerox Business Services benchmarked L. L. Bean, a clothing manufacturer with one of the best logistics operations in the world.

Benchmarking is a straightforward KM metric that often represents a good starting point. There are two general types of benchmarking: internal benchmarking, which compares units within the same organization (box 10.1) or compares a single unit over different periods, and external benchmarking, which makes a comparison with other companies.

Spendolini (1992) further describes four types of benchmarking:

1. *Industry group measurements*: The measurement of various facets of your operation and comparing these to similar measurements. Often the measures have little to do with productivity, customer satisfaction, or best practice. Many industry groups publish comparative data privately (for only members of the group or service), publicly, or both.

Box 10.1

A Vignette: Benchmarking from Within

The senior management team of an engineering organization wanted to implement an after-action review (AAR) for completed projects. They were unsure 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 size and mandates similar to theirs, and internal, because 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. The subsidiary had templates and a process for conducting AAR meetings with a facilitator. It 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 commonalities. Once thirty projects were completed, the AARs were sent to the KM team to be further analyzed to extract lessons learned that could have organization-wide interest. The senior managers were impressed that their learning curve had all but disappeared. The organization adapted the existing subsidiary questionnaire and meeting process and requested a teleconference with colleagues overseas. This internal benchmark revealed existing best practices within the same organization that could be easily transferred and reused by others.

2. *Best practice studies*: The studies and lists of what works best. These are useful to benchmarking research, but they are not useful as metrics. What works best for an entity in its specific environment may not work the same way in another environment. These studies can be useful 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.
3. *Cooperative benchmarking*: The measurement of key production functions of inputs, outputs, and outcomes with the aim of improving them. An internal audit, for example, compares 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.
4. *Competitive benchmarking*: The study and measurement of a competitor without its cooperation for the purpose of process or product quality improvement. The latter is called reverse engineering. A version of competitive benchmarking is a third party studying a group of competitors and sharing the results with all. The third-party consultant is the only one who knows what data belong to which entity (you obviously know your own but not necessarily anyone else's).

In the long term, benchmarking 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, undertaken with key leaders in the industry, to identify best practices that a company can emulate to improve its organizational effectiveness. Carla O'Dell at the American Productivity and Quality Center (APQC, http://www.apqc.org) pioneered this technique. Companies using benchmarking avoid reinventing the wheel by looking at what has worked and not worked for other companies operating in comparable environments or industrial sectors. Benchmarking can help an organization evolve to higher maturity levels to become a learning organization by identifying where it stands with respect to KM in relation to the competition.

The first step in benchmarking is to identify the short list of companies for the comparison. Recent trends toward globalization suggest international companies should not be automatically excluded from your short list. In the end, it is a subjective decision as to which companies and which criteria you will be benchmarking against. Typical targets include innovation metrics (How fast are new products developed? How much is invested in research and development?), customer loyalty, KM integration, leveraging of information technology, and quality management.

Tiwana (2000) adapted Spendolini's (1992) key benchmarking steps to arrive at a better fit with KM:

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 because of the metrics obtained.
6. Repeat to measure progress when an appropriate amount of time has elapsed.

Benchmarking is of greatest value when a company has clearly identified its strategic objectives and has thought long and hard about which best practices might be transferable and effective for it, considering its own KM drivers and constraints.

Balanced Scorecard Method

The balanced scorecard method is a measurement and management system that enables organizations to clarify their vision and strategy and translate them into action. It provides feedback on both the internal business processes and the external outcomes to continuously improve strategic performance and results. It is a conceptual framework for translating an organization's vision into a set of performance indicators distributed along four dimensions: financial, customer, internal business processes, and learning and growth. The "balanced" in the method's name refers to the balance maintained among the following:

- 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.

With the balanced scorecard method, an organization monitors both its current performance (e.g., 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 categorization of perspectives (innovation and learning, or employees, in place of learning and growth, for example) and the number of perspectives (adding stakeholders as a separate, fifth perspective, for example). Balance is achieved through the four perspectives, through the decomposition of an organization's vision into business strategy and then into operations, and through the translation of strategy into the contribution each member of the organization must make to successfully meet its goals.

The financial dimension includes measures such as operating income, return on capital employed, and economic value added. The customer dimension 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, and skill sets.

The balanced scorecard metric applies five steps:

1. Translate the KM vision and strategy into measurable goals.

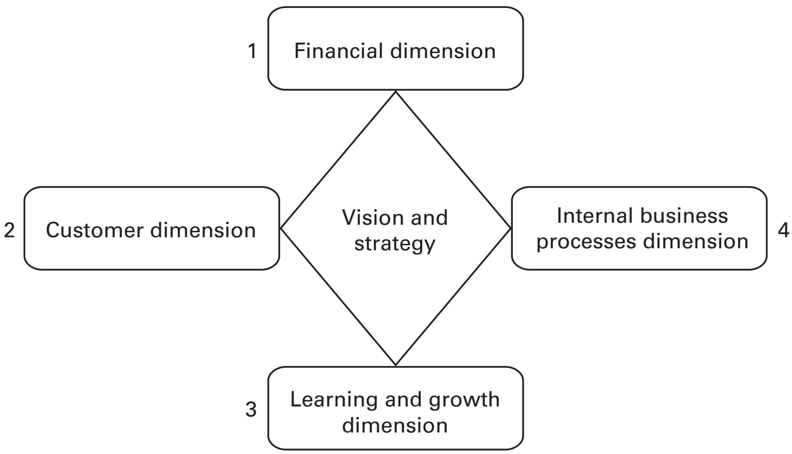

Figure 10.2
High-level balanced scorecard

2. Validate these through the establishment of a consensus on the concrete, short-term specific goals.
3. Communicate and link: measure as you go through the objectives and look at how well the reward system is linked to these objectives: are employees trained, motivated, and rewarded to use KM as part of their everyday work?
4. Do a reality check—be sure that you are being detailed enough that you can measure something to assess how well these objectives are being met.
5. Incorporate learning and feedback into your metrics—do a formative and a summative evaluation.

Each dimension of the balanced scorecard 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 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 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 (Kaplan & Norton, 1992, 1993, 1996). It is applicable to both for-profit and nonprofit organizations and to both private and public sector companies. The balanced scorecard method offers several significant advantages over other approaches, 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 it is a much more difficult technique to use than benchmarking. Each balanced scorecard must be developed from scratch because it is customized to individual organizations.

Table 10.1
Sample balanced scorecard

	Objectives	Metrics	Targets	Initiatives
Financial				
Customer				
Internal processes				
Learning and growth				

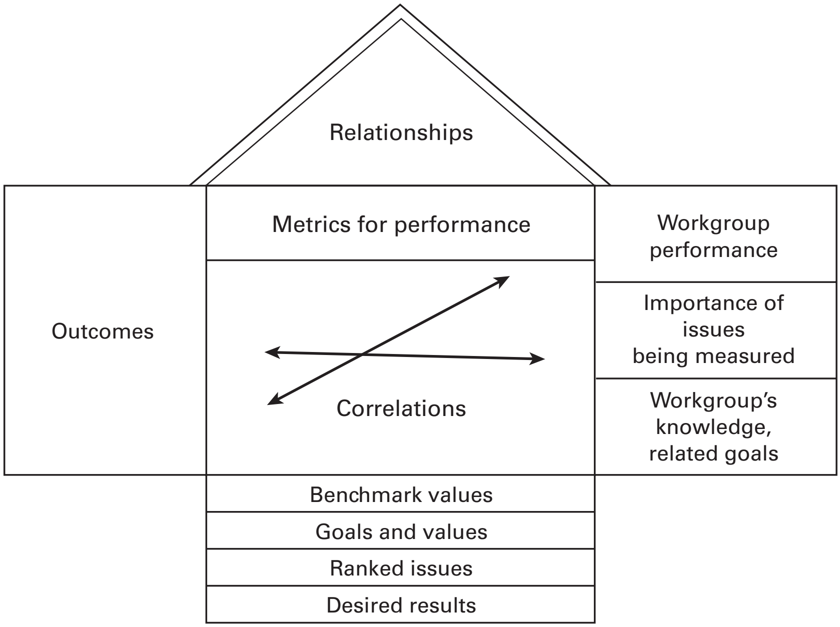

Figure 10.3
High-level house of quality matrix

House of Quality Method

The house of quality method 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 head 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 (Mazur, 1993) because it links the needs of the customer with marketing, design, development, engineering, manufacturing, and service functions (see also the Quality Function Deployment Institute, http://www.qfdi.org). It can be used for service and software products as well. The house of quality method has as its key elements desired outcomes, priorities attached to these outcomes, and appropriate metrics for each outcome. The overwhelming focus is on maximizing customer satisfaction as measured by metrics, such as repeat business and market share. It focuses on delivering value by seeking out both spoken and unspoken needs, translating these into design targets, and communicating these targets throughout the organization. Furthermore, it allows customers to prioritize their requirements, tells the company how it is doing compared with competitors, and then points to the features to optimize that will bring the greatest competitive advantage.

As with the balanced scorecard method, the desired outcomes need to be specific—concrete and detailed—to be measured. For example, a desired outcome of better collaboration is difficult to assess. A better statement of desired outcome would be "Improve knowledge sharing within the next three years so that at least 20 percent of an employee's work is based on existing knowledge provided by peers or the knowledge repository." This second statement can be measured more directly and compared with an existing baseline obtained from knowledge audit questionnaires for knowledge (as described in chapter 9) and from usage statistics for the repository.

These goals and objectives are placed to the left of the house. Ideally, these desired outcomes should be short- to midterm and observable (e.g., increase the number of CoPs by three, decrease the number of unsolved problems by 60 percent, and decrease the time to market for newly developed products and services by 40 percent). Priorities are 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 see the correlations 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.

Popular house of quality metrics used for KM projects include the following:

- The expense of reinventing solutions per year (or rework)
- The information- or 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 percentage of employees who are aware of what KM exists within their organization (e.g., a lessons learned database)

A blank house of quality template is available from MS Office online templates (https://support.office.com/en-us/article/Create-a-Six-Sigma-flowchart-or-House-of-Quality-diagram-26296A8F-F511-4A31-91E9-211D8EF304CE#bm3). Advice on interpreting, analyzing, and reiterating the house of quality design is provided in a checklist by Mazur (1993; http://www.mazur.net/works/9checks.pdf).

Results-Based Assessment Framework

The results-based management accountability framework is widely used in general performance assessment, particularly within the Canadian federal government. The Canadian Treasury Board (https://www.tbs-sct.canada.ca/cee/tools-outils/polrmaf-polcgrr-eng.asp) has published guidelines on its development and application that have led to a high degree of adoption and standardized use of this instrument. Several other organizations, such as United Nations agencies, US Agency for International Development, and Fujitsu Consulting, also implement this metrics framework. The framework is often called a results map or results chain. An easy adaptation can be made to apply this metric to KM. The advantage in doing so lies with the emphasis the metric 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 results-based management accountability framework.

The major attributes of a results chain are the following:

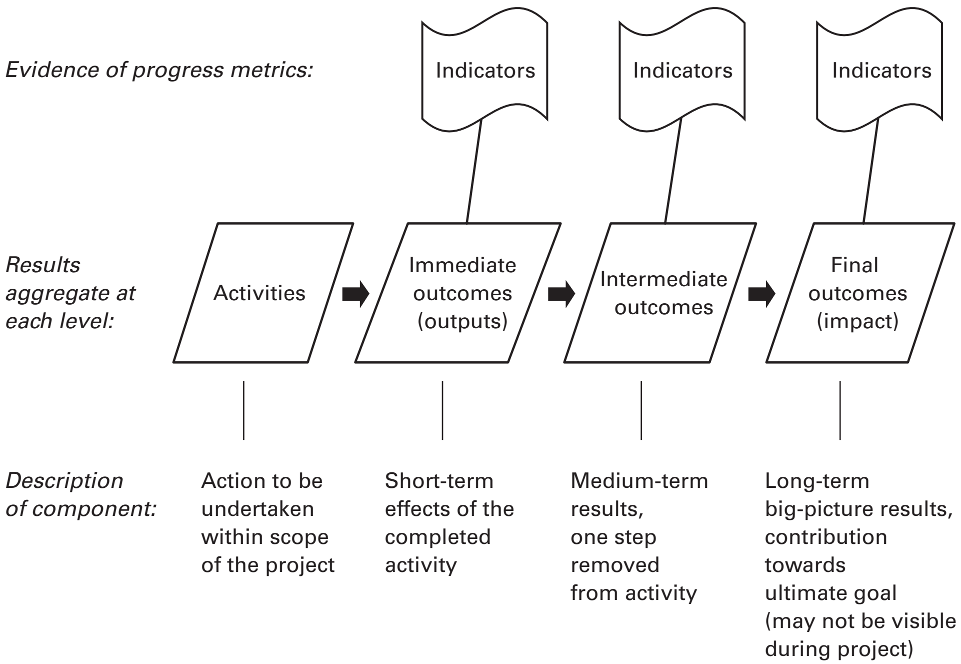

Figure 10.4
High-level results-based management accountability framework (adapted from Plan:net, 2003)

- *Results chain*: Explores how resources and activities connect with changes (flow type)
- *Activities*: Actions to be undertaken within the scope of the project; outcomes (or outputs) are the short-term effects of the completed activity
- *Intermediate outcomes*: Medium-term results, one step removed from activity
- *Final outcomes (or 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 desired impacts, outcomes, and outputs and then connecting these with existing and planned KM initiatives develops the results-based metric. The contributions expected from KM toward attaining organization goals can be easily visualized and progressively monitored via the indicators that are chosen. The impacts are often very long term, so the focus in this metric is 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, and stakeholders input the activities, outputs, outcomes, and impacts (long-term outcomes) directly on this template. Table 10.2 shows a sample template for a results map.

The results-based metric is easily adapted to include KM activities and outputs that can then in turn be connected to expected outcomes and impacts. This metric makes it almost impossible not to link or align the KM efforts with the overall organizational goals. There is a strong focus on ROI, and although causality still eludes us, the expected

Table 10.2
Sample template for data collection using the results map metric

Organization: Business unit: Project name:		Purpose: Date: Date last revised:		
How?		What?		Why?
Inputs	Activities	Outputs	Outcomes	Impacts
Indicators				
Assumptions and anticipated risks				

contributions of KM toward business goals are captured in a visual way. Metrics in general and KM metrics in particular are still a long way from being an exact science. However, the results map makes it much easier to define indicators and outcomes at the most useful level of detail. Results maps or chains work with clear and well-defined results that benefit the KM team and the organizational stakeholders. An example of this approach applied to the assessment of a KM program is described in Dalkir and McIntyre (2011).

Measuring the Success of Knowledge Networks

Finally, several metrics are particularly well suited to measuring the value created by CoPs and knowledge networks. In general, three types of value can result (Krebs, n.d.):

1. *Structural value*: The creation of connections in a network; the amount of time spent interacting with others; the flow of knowledge among network members (typically measured using social network analysis)
2. *Relational value*: The maintenance of connections; their longevity; the degree of reciprocity in network interactions (typically assessed through surveys and anecdotes)
3. *Cognitive value*: The commonality or cohesiveness of the network (which can be assessed through social network analysis and interviewing)

Stories illustrate the links between community activities, performance outcomes, and value. Sample questions to elicit such stories are the following:

- What would have not happened without this CoP in place?
- Did you save time because you had access to the community resources, including other people? Did you find the answer to a question more quickly, or did you solve a problem more rapidly?
- Has your decision-making confidence increased since you became a member of this CoP?

Social network analysis (SNA) maps 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 the interactions you expected present—e.g., people working on projects together—or not in evidence?). SNA is also 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) and identify hidden experts. Hidden experts are readily visible in a social network map because they appear as a node at the center of dense connections—like a traffic cop who maintains knowledge circulation throughout the community. These valuable nodes are the go-to people in an organization—people who can quickly connect you to other people or to valuable content because they know in whom and where the useful knowledge resides.

Time-use studies can 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 the time they spend solving problems, making decisions, searching for information, processing information, coordinating, and interacting with others. Participants are typically asked to keep this tabular checklist on their desks and jot down their answers every day for a set period (a week minimum to a month maximum). Time use should be measured either before and after a CoP has been implemented or at regular intervals to track changes over time.

A CoP can also be evaluated on its health, on its outcomes, and on the impact it has had on the organization (Fontaine & Millen, 2004; Lesser & Storck, 2001; McDermott, 2002). Health refers to the number of participants, the frequency and quality of knowledge sharing among them, and the level of community activity in general. For example, the number of community meetings held is an 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 held by other members. Outcomes are usually detectable when a community has reached a certain level of maturity or coalescence. The impact dimension measures the ROI; the return on time 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 operationalize this metric.

Table 10.3 summarizes some of the major CoP metrics used at the individual, group, and organizational benefit levels.

Best Practices in KM Metrics

KM continues to evolve and increase in scope, and metric strategies and specific indicators that can be used proliferate. However, best practices in KM metrics have not kept up. Many organizations are still grappling with showing significant, measurable returns on KM investments as outcomes, impact, and sustainability. KM is a never-ending endeavor, as has been discussed in previous chapters, and evaluating KM is also a never-ending process. One best practice is to see KM, not as additional to organizational assessment processes, but rather as an integral part of these processes. Outcome-based assessments such as the results-based approaches are a critical component of

Table 10.3
Benefits of a CoP

Type of benefit	Measurable value
An individual participating in a CoP benefits	Skills and know-how increased Increased personal productivity Increased job satisfaction Enhanced personal reputation Increased sense of belonging
The collective community benefits	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
The host organization benefits from the CoP	Improved operational efficiency Increased cost savings Increased ability to avoid problems Improved quality of service Increased speed of service Increased employee retention/decreased turnover

Source: Adapted from Fontaine and Millen (2004).

any KM assessment framework, but several complementary measures may be needed to evaluate the whole of KM in an organization, such as the ISO (2018) 30401 KM standard. A checklist derived from the standard, discussed in chapter 9, can establish a baseline, and revisiting it measures progress toward and attainment of KM objectives.

The traditional approach of measuring ROI remains relevant for KM. Adding a measure on return on time assesses the time saved by KM initiatives. The time spent looking for relevant content or finding someone with the required expertise costs a significant amount of money and ties up resources. The latter is often referred to as opportunity cost, or the cost of not being able to work on something more important because of spending time looking for content or people.

When measuring human, social, and organizational capital, social capital is the most difficult to assess. Metrics are required for all forms of intellectual capital, and there may be more than these three categories—for example, entrepreneurial capital, learning capital, innovation capital, creativity capital (e.g., Oliveira, Nascimento, & Dalkir, 2018). The metrics need to cover all the key KM components; namely, processes, culture, technology, leadership, and people. When creating a metrics plan, an important best practice, it should cover the key questions of why, when, where, for whom, and how to measure KM.

Another best practice is to include measures of return on expectations (ROE; e.g., Byrne, 2020). The ROE approach is derived from the Kirkpatrick model, which is extensively used in training (Byrne, 2020). KM always triggers and requires change. This means that KM always creates expectations. Assessing how well expectations were met is an additional measure of KM success (or failure). Trust is a critical success factor that permeates all KM initiatives, and if expectations are not met, trust may be permanently lost. Byrne (2020) discusses the Irish Defense Organization, which conducted semistructured interviews with the senior leadership. The expectations of leaders were then compared with those of employees, who completed an online survey. An international perspective was then gained from interviews with eight key KM experts. The results were compared with the organization's original KM program goals and with those in the new KM ISO standard.

Ensuring that you measure both gains in efficiency through reuse and gains in innovation is an important best practice in KM metrics; double-loop learning creates continuous organizational learning and improvement. Most organizations measure innovation using such metrics as the following:

- Annual research and development budget
- Number of patents filed annually
- Total research and development headcount or budget
- Number of ideas submitted by employees
- Number of products introduced in the past X years

Other best practices to include are the following:

- Culture of risk taking and failure tolerance
- Number of new ideas tried
- Percentage of new ideas that are used
- Time spent on trial and error
- Number of employee hours spent on independent research (e.g., 3M's 15 percent policy, in which employees can spend 15 percent of their time on personal projects)
- Number of innovative projects adopted as a result and their success (measured as ROI, impact)

Finally, leadership metrics can be included in innovation evaluations, such as the percentage of executives' time spent on strategic innovation versus day-to-day operations and the percentage of managers with training in the concepts and tools of innovation.

Are there too many KM measures? In a sense, yes, but conversely, they may not be enough. Best practices include focusing on a holistic, integrated, and comprehensive metrics plan and recognizing that different metrics are rarely if ever mutually exclusive. Finding the right combination is the key. Unfortunately, KM costs are immediate and visible, whereas some of the benefits require more time and are often less tangible. Traditional older metrics tend to focus on explicit knowledge content and sharing. Tacit knowledge is more difficult both to share online and to evaluate. Tacit knowledge sharing is also not the best way to preserve valuable knowledge. You can record sessions and save chats, but the result is not organized and rarely vetted or curated (e.g., few have summaries or a place for related documents).

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11 Organizational Learning and Organizational Memory

> Failure is just a resting place. It is an opportunity to begin again more intelligently.
> —Henry Ford (1863–1947)

This chapter addresses organizational learning, or how an organization continually improves over time by learning from its successes (best practices and innovations) and its failures (lessons learned). The major processes involved in organizational learning are outlined and a review of organizational memory models is undertaken. What lessons learned are, how they are processed, and most importantly, how they can be applied to create incremental and more global improvements in the organization are described.

Learning Objectives

1. Outline the major barriers to good organizational memory management.
2. Define corporate amnesia and reasons why this may occur.
3. Outline the key steps in the evolution of an innovative idea and the institutionalization of a best practice that forms the object of reuse.
4. Understand the key questions that need to be answered to elicit and document lessons learned.

Introduction

Organizational knowledge is being lost at an alarming rate as businesses continue to downsize, outsource, and 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 each industry, or it may even be intentional (e.g., rotations in the military or limited-term mandates for politicians). Knowledge is said to leave at the end of the day, and companies are said to lease knowledge, not own it. Knowledge in this case refers mostly to the tacit knowledge that resides in the knowledge workers themselves and has not been documented to any great extent. Uncaptured knowledge is therefore at risk of being lost to the organization. Organizational forgetting may be denoted as "corporate amnesia" (Kransdorff, 1998).

Many organizations have succession plans in place (see chapter 12). The process usually involves transferring know-how from the departing employee to the 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. For organizations to effectively manage their organizational memory, a proactive approach is needed 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.

The National Aeronautics 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 also ensures knowledge continuity—the effective transfer of know-how among peers and to future generations of knowledge workers. A better understanding of the nature of organizational memory, what it should include (content), how it can best be retained (technological containers), and how the accumulated lessons learned and best practices can be used by newcomers (connections) mitigates the cost of lost, forgotten, or untransferred knowledge and know-how.

How Do Organizations Learn and Remember?

Organizational learning is learning what worked and what did not work from the past and 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 workers do not begin from scratch, not realizing they are redoing work that has already been done. We can say that organizational learning 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., 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 his or her job.

The technological container represents organizational memory, a centralized technological system (often an intranet) where we can find all the by-products of organizational learning: primarily the best practices and the lessons learned. An organizational memory 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. Organizational memory is thus “the means by which organizational knowledge is transferred from the past to the present” (Stein & Zwass, 1995, p. 85).

The underlying assumption is that organizations capable of learning will be more efficient, more effective, more competitive, and more viable than those that cannot (Garvin, 1993; Senge, 1990). A learning organization is one that has successfully implemented the processes of organizational learning. For example, Senge (1990) lists five key attributes that a learning organization should have:

1. Mental models
2. Shared vision
3. Personal mastery
4. Team learning
5. Systems thinking

Mental models (refer to chapter 4) are a coherent set of understandings 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 everyone. 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. Sharing can and often does lead to a modification of existing models so that the individuals involved can come closer together with respect to a shared mental model of their organization. Personal mastery refers to a set of values and attitudes such that individuals are committed to lifelong learning—which in turn enables the organization to engage in lifelong learning. The implicit assumption behind this core competency is that the individuals' mental models are not so rigid as to prevent any new knowledge (i.e., learning) to be incorporated or added (which may trigger a change, or updating of the original mental model). Team learning is the organizational values and attitudes that actively foster individual learning such as investment in training. An organization that supports individual learning is much more likely to be capable of organizational learning. The fifth discipline, systems thinking, 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 one where all the parts are seamlessly connected to one another. Systems thinking is also an excellent way of viewing KM: as an intact system made up of processes, people, culture, technology, and so forth.

Argote (2013) notes that although learning can occur at several levels—individual, group, organizational, interorganizational—for organizational learning to take place, there has to be a memory. Acquired knowledge must be preserved in a repository so it can be remembered—found, accessed, retrieved—and reused in the future. Only when learning is embedded in the organization can the value of experiential knowledge be realized. Knowledge flows both into and out of the organization, which changes context and affects future learning. As organizational tasks are completed, experience is accumulated. Tasks do not necessarily need to be successfully completed for organizational learning to occur. In fact, it could be argued that failure leads to more learning. Organizational learning takes place within a context defined as the organization and its environment (e.g., competitors, governments, educational institutions) as shown in figure 11.1.

Organizational learning occurs when people, tasks, and the tools to perform these tasks interact with one another. Individual employees store knowledge, but they also interact with other employees to transfer knowledge across the organization. Knowledge may be embedded in specific products and services that can flow out to the environment. Finally, knowledge is also embedded in the culture of the organization. The arrows in figure 11.1 represent the organizational learning processes.

Management of Organizational Memory

Organizational memory is a facility for not just accumulating and preserving but also sharing knowledge. As knowledge is made explicit and managed, it augments the organizational intellect, becoming a basis for communication and learning. Organizational memory contributes to the overall governance and compliance with regulatory

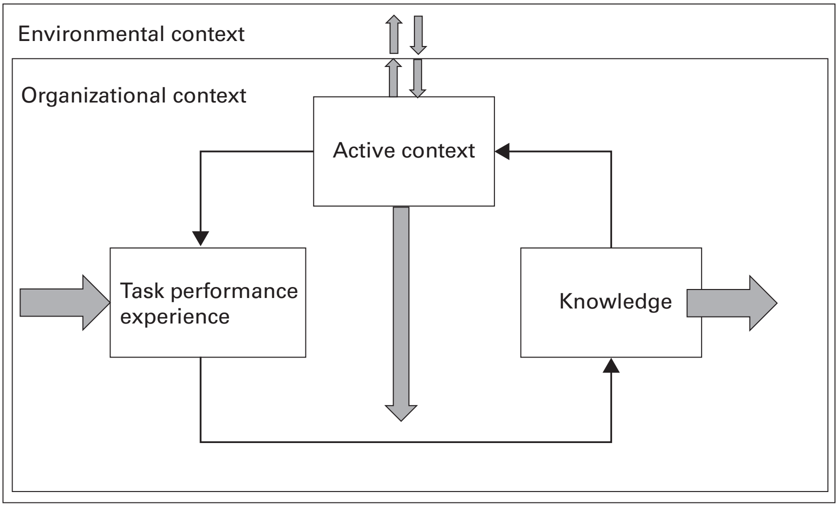

Figure 11.1
Argote (2013) model of organizational learning

guidelines. An organizational memory increases the transparency of the organization, which affects how knowledge workers perceive the organization. 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 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 sources of immediate health and long-term survival (McMaster, 1995, p. 113).

A frequent 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, because 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. Box 11.1 illustrates the challenge of capturing informal yet valuable organizational knowledge in the form of lessons learned and best practices.

However, most knowledge work addresses problems that have no clear and agreed-on definition and, indeed, are themselves apt to change over time. Decision making

Box 11.1

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 the high turnover among teachers employed by the school. The average stay was about two years, and most left because of burnout owing to demanding responsibilities. Several best practices and lessons learned were gathered and preserved. Templates were developed and used to facilitate this knowledge capture, 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 the accumulated successes and failures of the techniques tried out by previous teachers working with the same student.

is characterized by making lots of assumptions, educated guesses, and decisions under conditions of uncertainty. Decisions must frequently be revised or even retracted. Problem resolution requires both traditional linear techniques and a heavy dose of social interactions: conversations, meetings, presentations, phone calls, email, and so on. The primary goal is not to always find a right answer but to find a solution and an understanding of the problem that has broad ownership.

In this context, formal documents are simply not rich enough to support knowledge work. For example, a team may come together for many meetings while resolving a problem, but the practice of creating and circulating meeting minutes is a relatively laborious instrument for creating continuity and coherence among these meetings. Meeting minutes are summaries that often represent only one person's point of view, and they usually capture only a small part of the conversations that took place. Projects can often stretch into months and years, so some form of project memory will be needed. An explicit project memory provides more continuity among these sessions, allowing the group to pick up where it left off, with a minimum of repetition and loss of important issues. As team membership changes over time, or as the project is handed off to a completely new team, the project memory can in principle reduce the likelihood of false starts and duplication of previous work.

New team members must come up to speed on a large amount of information before becoming productive. Often, this occurs by exchanging tacit knowledge informally as other team members fill in the new member. The situation is even more challenging when teams are only temporary or when not everyone is located in the same place. An example is Doctors without Borders, a cohesive team in a given place but only for a limited time. Another example is distributed teams working on the same project but located in different countries. A group memory can complement informal interactions by aggregating important content in a repository of some sort—a project organizational memory.

A shared memory for the project team can create coherence within the mass of formal and informal project knowledge. The shared memory often takes the form of a 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 a web of information that includes facts, assumptions, constraints, decisions and their rationale, the meanings of key terms, and of course, the formal documents themselves.

Another challenge for an effective organizational memory system that includes informal knowledge is that informal knowledge tends to lose its relevance, and thus its value, over time. Informal knowledge, being more contextual, is even more dynamic in this way. An organizational memory system should therefore, like human memory, have the capacity to recall whatever is relevant and salient to the moment. Closely related to this is the problem of the sheer size of organizational memory. There will be ever-increasing volumes of corporate knowledge accessible online, which will make it even more difficult to pinpoint items 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 the following:

- Knowledge capture process is not easy or even transparent
- Retrieval and reuse are not easy or even transparent
- Relevance and intelligibility (i.e., through sufficient context) of retrieved knowledge is not ensured

Organizational Learning

The key processes required to both populate an organizational memory and retrieve valuable knowledge for reuse from the same memory consist of the same steps as in the KM processes (refer to chapter 2). The knowledge content, however, is defined much more narrowly as being 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. But aggregated results from a diverse set of projects 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) define a lesson learned as knowledge or understanding gained by experience. The experience may be positive, as in a successful test or mission, or negative, as in a mishap or failure. The Project Management Body of Knowledge (PMBOK) of the Project Management Institute defines lessons learned as the learning gained from performing the project. The Society for Effective Lessons Learned Sharing defines lessons learned as "the knowledge acquired from an innovation or an adverse experience that causes a worker or an organization to improve a process or activity to work safer, more efficiently, or with higher quality" (Kitimbo, 2015, p. 3).

These diverse definitions highlight some key attributes of lessons learned:

- They can be learned from both successful and unsuccessful events.
- They can be at the operational, tactical, or strategic levels.
- They need to be validated in some way.
- They need to be applied by people other than those involved in the original event.
- They must be significant enough to pass a cost-benefit analysis (in other words, the effort required to document them is warranted by their large impact on the organization).

In practice, a lesson learned must represent something new, something that was not encountered before, in either a positive way or a negative way. If everything went according to plan or was a routine operation, then there are no lessons to be learned. If something unanticipated occurred, however, the individuals, the team, and the organization can learn from the surprising event. By following the lesson learned process, it is possible to analyze what happened, why, and what we want to do differently the next time it happens.

In knowledge-intensive industries such as consulting firms and research and development units the lessons learned process is known as postproject review or project postmortem (Zedtwitz, 2002). Although reviews and postmortems can be done at several project phases, they are usually reserved for the final review upon project completion. The main objective is to capture lessons that can enhance future projects. Project lessons learned bridge individual and organizational learning because the analysis is on root cause or causal factors—the why in what went wrong.

What, then, is the difference between a lesson learned and a best practice? A 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 entails documentation of a critical mistake or failure to avoid repeating it (negative experiences). However, as the definitions given previously 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; they distill valuable employee experiences.

Lessons Learned Process

KM identifies, creates, acquires, disseminates, and reuses knowledge assets to provide a strategic advantage. The lessons learned process has a similar cycle of activities, although there is less agreement on what these specific stages should be:

1. Collection: Capture of lessons through structured or unstructured processes, such as after-action or project reviews, meetings, or training evaluations. Capture may be done at all levels: individual, community, and organization.
2. Verification: Lessons are verified before dissemination to ensure that they are valid and applicable. This may involve subject matter experts or additional research, and the lessons are typically verified to ensure that they meet or exceed a set of defined criteria outlined in established standards.
3. Storage: Once approved, lessons are stored in an accessible database in a format that allows easy search and retrieval of information. Storage involves categorization, indexing, formatting, and structure.
4. Dissemination: Active dissemination of lessons is essential for getting value out of a lessons learned program; lessons are of little benefit unless they are accessed and reused. Dissemination can be active (lessons are pushed to potential users) or passive (users access a repository to retrieve lessons).

Milton (2010) emphasizes that the first step is to have the time to reflect on what happened. This should ideally be done in a facilitated workshop where all participants feel they have a voice in a safe space. These sessions need to be carried out in a respectful manner and avoid any assignment of blame. The PMBOK focuses on the need to not only disseminate lessons learned but also preserve them. Lessons learned should be archived with historical project data. Finally, lessons need to be learned, not only documented. Ideally, they are integrated into onboarding, training, and community mentoring activities.

In her blog,[1] Nancy Dixon states that the "US Army Lessons Learned system has evolved over 40 years to become a model lesson learned system. What began as an AAR process in the 1970s has become a robust system of identifying, collecting, analyzing, transferring, and moving lessons learned at all levels of command." The key component in after-action reviews is the use of second-order analyses on lessons learned data. This means aggregating events and analyzing them as a whole to identify patterns. Data mining techniques find trends across units and across time to ultimately identify gaps in knowledge.

King (2009) notes that the lessons learned process is not as straightforward as it sounds, because the tacit knowledge is often sensitive (e.g., someone made a mistake or there was a conflict). The documentation has to be done in such a way as to avoid assigning blame or even clearly identifying the person or the event. The remaining steps involve preparing the lesson learned so that it is in an appropriate format (e.g., quick to read) and assessing whether it merits being added to the organizational memory.

Lessons learned are both a type of content and a process. As content, they represent the explicit codified knowledge that documents an event (such as a project) and what was learned from having participated in this event. As a process, lessons learned are part of a reflective activity that the organization makes time for and provides space for to encourage analyzing what was done well and what could have been done better. The overall objective is to improve organizational efficiency and effectiveness, but lessons learned can also lead to innovations.

The organizational learning literature and the KM literature have an interesting parallel. In KM, two major goals are identified for KM processes: efficiency through reuse and innovation through creativity. In organizational learning, exploitation and exploration describe intra- and interorganizational learning processes. "Exploitation is about creating reliability in experience and thrives on productivity and refinement. Exploration is concerned with creating variety in experience and thrives on experimentation and free association" (Holmqvist, 2004, p. 70). Because KM cannot occur without change and organizational improvement cannot occur without organizational learning, the two fields of study and practice are highly complementary. King (2009) explains that "organizational learning . . . is complementary to KM. . . . [It] has to do with embedding what has been learned into the fabric of the organization" (p. 3).

The overarching goal in organizational learning is to fully integrate what has been learned into the way things are now done in an organization. Leavitt and March (1988, in King, 2009, p. 18) note that, in order to learn, we need a way of "encoding inferences from history into routines that guide behavior." This is exactly what happens in organizations: new routines are established following lessons that were learned in order to introduce and solidify new ways of doing things; policy manuals are revised, training content is updated, information and communication technology systems are updated, and even reward systems, promotion criteria, and hiring priorities can be targeted. When done well, lessons learned can be continuously implemented to ensure continuous improvement in the organization.

Methods for Managing Lessons Learned

Kitimbo (2015) outlines several approaches to completing the steps in the life cycle of lessons learned processing. Major steps are after-action reviews (AARs), project postmortems, and reporting systems. The AAR was the original means of identifying lessons learned in the US Army (1993). AARs continue to be standard operating procedure and are typically initiated immediately after (or as soon as possible after) an important activity or mission. Project postmortems have also become a best practice in project management, and an analysis of each project upon completion is now a required component of the PMBOK.[2] Similar to AARs, project postmortems carry out an analysis whenever a project is completed. In some organizations, a group of projects is also analyzed to identify common themes. Reporting systems tend to be situated at the operational level and require participants to complete analytic reports after each activity they participated in. At least one field in this report asks about anything having gone wrong, or almost having gone wrong, and asks the person to think about why what happened transpired the way it did. A good example of this is the Near Miss Reporting System, in which US national fire fighters and law enforcement personnel can submit reports after calls they answer.[3]

In all approaches, basic questions need to be answered, and although they may vary in their formulation, the intent remains consistent:

- What was planned?
- What actually occurred?
- In cases where the two differed, did we do better (innovation or best practice) or worse (lesson learned) than expected? What are some possible reasons why?
- What should we do differently on the basis of this experience? What should we keep doing? What should we avoid repeating in the future?

These questions can be asked of individuals or in groups (or a combination of both). Individual interviews may be required if there was a lot of dissent and differing views or if people are simply no longer colocated. Group interviews typically involve interviewing the team that worked together on the event. In some cases, it may be a good practice to not have the direct authority present during the group interviews (e.g., the project manager or senior military officer) to allow people to speak more freely and without fear of reprisal. The PMBOK recommends obtaining feedback as soon as possible, before people begin to forget what happened.

Formal lessons learned sessions are traditionally held during project closeout, near the completion of the project. However, lessons learned may be identified and documented at any point during the project's life cycle. Darling, Parry, and Moore (2005) recommend viewing the lessons learned process as "an ongoing learning process rather than a onetime meeting, report, or postmortem." They suggest gradually implementing the process by collecting lessons learned from a subset of projects. The best way is to find the early adopters—those managers who are already convinced of the benefits of lessons learned and have already put in the time, effort, and attention to taking the lesson through all the processing stages. They also suggest breaking up the process into smaller chunks: instead of waiting until the very end of a project, collect lessons learned after each key milestone. In addition to making the analysis easier, being able to influence the project while it is still going on is another advantage.

Similarly, Schindler and Eppler (2003) recommend that lessons learned be a continuous process instead of a single review. Regular gathering of lessons learned will increase employees' motivation to participate because they will be able to see the benefits applied to their projects while still working on them. The events are more recent and therefore can be more easily remembered (as recommended by the PMBOK). The process will be less costly and less time consuming because all team members are still present and available. In this way, important lessons can be regularly captured after important project milestones. Figure 11.2 outlines the lessons learned process.

Lessons Learned Systems

Schindler and Eppler (2003) note that experiential learning is necessarily a personal experience of an individual. People solve problems during their work. Unfortunately, these are not usually part of the resultant documentation, such as a report. In fact, almost all formal documents omit any description of failures or errors that had to be corrected (except for journals kept by researchers). This type of individual learning is typically shared only through employees' informal networks. A lessons learned system is a central repository where these tacit experiences can be documented and made available to all employees in a more deliberate and systematic manner. Zedtwitz (2002) surveyed research-and-development-intensive companies and found that, although all

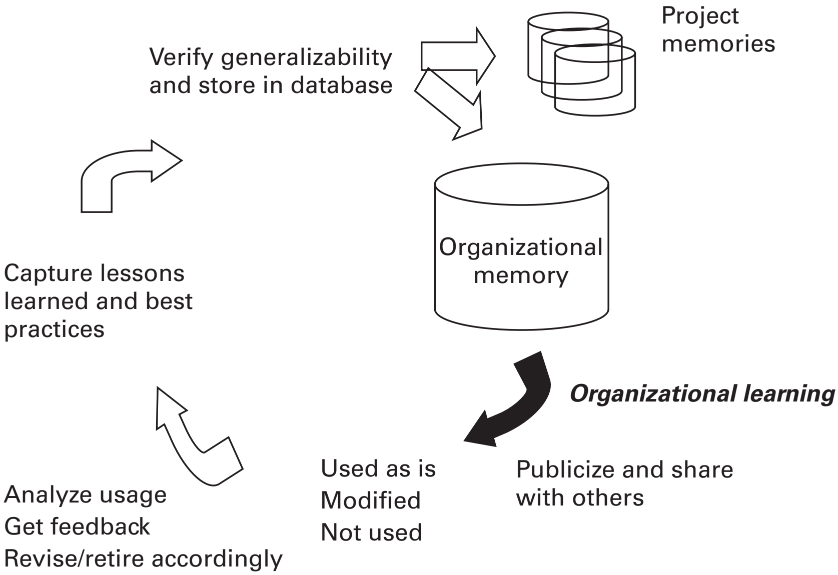

Figure 11.2
Lessons learned process

participating companies conducted lessons learned reviews, most did so on an ad hoc basis or after a particularly major project. Most lacked formal guidelines on how to conduct a lessons learned review. The most popular means of sharing knowledge from one project to another appeared to be through the movement of people—when team members were assigned to other projects—and through written documentation.

Weber, Aha, and Becerra-Fernandez (2001) surveyed lessons learned processes and systems to better understand their capabilities and limitations. They developed a classification system of lessons learned systems that can help in comparing their functionalities. Originally, lessons were simply documented as guidelines, but the process soon evolved to include validation of relevancy, accuracy, and importance. The goal of these systems is to preserve valuable knowledge that may be otherwise lost so that employees who encounter similar challenges will not have to start again from scratch. Instead, each employee will be able to leverage the experiential knowledge that has been gained by other employees over the years.

As with all KM, the basic technology is a database. Lessons learned, corporate memories, stories, best practices—these are all stored in some form of database. Typically, there is one entry (e.g., one lesson) per database entry to make it more easily searched. Weber, Aha, and Becerra-Fernandez (2001) found that most systems were built as standalone databases and most used basic hierarchical taxonomies with keyword search functionalities. Few made use of push technologies, remaining passive repositories that depend on people to think of using them. In general, the metadata (the description of the content) was not rich enough to permit easy finding, retrieving, and reusing of lessons. The more descriptive and extensive the metadata, the more likely people will find what they are looking for. For example, a lesson may be tagged with information about the type of problem, the root cause, the type of business unit involved, the time period covered, the type of media (e.g., a video or text), and so on. Each one of these tags can then be used to search for lessons.

Benefits of Lessons Learned

There is a benefit in making the time (and space) for reflective thinking. Most organizations are too busy doing to think about what they are doing. Reflective observation is an excellent practice for evaluating the efficiency (how well are we doing this?) and effectiveness (should we be doing this or something else?) of all organizational activities, whether they be routine operational tasks or a five-year strategic planning exercise.

Schindler and Eppler (2003) observe that "the systematic retention of project experiences enables a company to compare its various projects more systematically and document its most effective problem solving mechanisms" (p. 216). In the short term, project risks are decreased when lessons are learned. In the long term, an effective lessons learned process and system will lead to a more competent organization that has a greater chance of surviving and competing. Organizations can prevent the significant costs associated with losing knowledge when employees move to other mandates within the organization or go to another organization. Rework can be avoided, and mistakes will not be made again as long as lessons are learned.

Williams (2008, p. 249) outlines the benefits of lessons learned:

- Project managers learn how to manage experientially because they reflect on their projects and consult other projects' relevant lessons learned.
- Lessons learned can contribute to the feasibility and risk assessment of other projects and help managers plan them better.
- The project management process is improved.
- Management decision making is improved.
- Lessons learned can be used for benchmarking.
- Lessons learned can lead to innovations such as new products and services.
- The organization's strategic focus may be adjusted.

Some Challenges

Successfully implementing lessons learned can be difficult. One of the first barriers is at the lesson learned elicitation stage. This was discussed in chapter 4, but there are additional issues with lessons learned: we are asking people to publicly admit that everything did not go perfectly according to plan. No matter how much reassurance we provide, it is reasonable to expect participants to be defensive, mistrust the process, and expect to be judged. Trees (2014) contends that the way a lessons learned session is conducted is "hugely important and often overlooked." The environment should not be confrontational in any way, and participants should be made to feel comfortable, at ease, and, above all, safe. A good idea is to start with the positive—what went well, what went better than expected. When addressing what went wrong, the tone must again be positive even though we are discussing something negative. The goal is to improve, avoid costly mistakes, and change how things are done.

Another good practice is to prepare everyone for the session, the agenda, the time needed, what is expected of everyone, the goals of the session, and the roles of all participants. A neutral facilitator is often preferred, especially if the issues are particularly challenging. The facilitator is not a member of the team and may not even be an employee of the organization. Facilitators are therefore perceived as not having a stake in the outcome or as not being in a position of authority over the participants. A scribe may also be present to take notes and record the session. All participants should be aware of this and give their formal consent.

A second common problem is that lessons may be identified and documented but not applied, indicating a failure to institutionalize this valuable content. Organizations often lack the time or even the know-how to fully integrate lessons learned. The process is complex because integration can occur in multiple business units. For example, training materials and sessions may incorporate real-life lessons learned. In parallel, specific policies or procedures will need to be modified. If there is a best practice or lesson learned database, it will need to be updated and employees made aware that there is new content. And—the most difficult of all organizational changes—people will have to change not only their behavior (which is hard enough) but often also their attitude or mind-set (which is extremely difficult).

This was the problem encountered at NASA in a comprehensive review of the effectiveness of their lessons learned following multiple mission failures. It appeared that organizational learning was not taking place. The strongest recommendation was that their lessons learned on technical issues were strong, but they neglected soft factors such as management, communication, and cultural issues (US General Accounting Office, 2002).

Before the review, NASA's policy required project managers to review existing lessons learned, available in their Lessons Learned Information System, and apply these lessons to current and new projects as appropriate. There are over nine hundred lessons on topics ranging from program management to technical cause of failure. (The public can access the Lessons Learned Information System at https://llis.nasa.gov/.) NASA managers were also required to submit significant lessons learned that they identify and document to the system. Managers were provided with guidance for selecting a significant lesson learned: "[It has] a real or assumed impact on operations; [is] valid in that it is factually correct; and [is] 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" (US General Accounting Office, 2002). To foster applying lessons learned, NASA made employees aware of the lessons in its training, program reviews, and periodic policy revisions.

However, the review, performed by the US General Accounting Office, showed that this policy was not followed on an organization-wide basis. Responses to the review showed that employees were not aware of the Lessons Learned Information System. Project managers stated there was insufficient time to talk about let alone document lessons learned. NASA's culture appeared to obstruct sharing of the lessons learned that did get documented.

Zedtwitz (2002) identifies four categories of obstacles to successfully implementing lessons learned:

1. Psychological barriers
2. Team-based shortcomings
3. Epistemological constraints
4. Managerial problems

Psychological barriers refer to reluctance to look back into what happened in the past. Employees may not be motivated to talk about a project failure, especially if they were involved. We tend not to remember everything, and we prefer to remember positive events rather than negative ones. Also, some people may not see value in revisiting the past and prefer instead to just get on with their work.

Team-based shortcomings refer to how well the team worked together. Team members may not have gotten along well, they may have had incompatible working styles, communication may have been poor, or roles were not clearly defined. Team shortcomings could be due to factors such as teams being assigned so people could not choose who they worked with or team members not having complementary skill sets or being unfamiliar with other members' areas of expertise, thus creating a lack of credibility and making trust difficult to establish.

Epistemological constraints refer to cognitive challenges such as difficulty in abstracting or generalizing from a specific incident to a broader-scope lesson learned. People often get lost in the technical details of what happened and have difficulty seeing how anything from one project could possibly apply to another. In addition, the root causes may be tacit and therefore difficult to articulate. For example, there may be a consensus among team members that poor leadership was to blame. What does this mean in concrete terms? Unless it can be articulated, it cannot be documented, and there cannot be any learning from it.

Managerial problems have already been mentioned. They are mostly related to lack of time to reflect, lack of lessons learned guidelines, failure to comply with guidelines, and lack of managerial support. Managers need to be good role models and participate in the process themselves (although not always in the same session as their direct reports). Managers need to make the time and space available for identifying and documenting lessons learned, which in turn communicates clearly that they value the exercise, and they see it as part of the work employees do.

Schindler and Eppler (2003) find similar obstacles:

- Time pressure to complete the project and go on to new assignments.
- Unwillingness to learn from the mistakes of others.
- People may be overly modest and not talk about what they did well or fear reprisals when talking about what they did not do well.
- The process is not done well—the time needed is underestimated, there is little or no facilitation, and the session unravels and focuses on assigning blame.
- Employees find it difficult to contribute lessons to the system because of unclear instructions and because they receive no censure if they don't contribute (and no reward if they do).
- Participants don't see a personal benefit in the process.

Some Success Stories

KnowledgeForce Consulting (2019) asserts that

> a corporate culture of learning empowers all employees in the organization to continue to learn to build their knowledge base and skill sets, to innovate, create, and problem-solve for the benefits of themselves, the company, and their clients.

KnowledgeForce describes organizations that have implemented a strong organizational learning culture: Adobe, Google, Publix, and WD-40. Adobe's leadership encourages transparency and communication from all staff. They actively recruit underrepresented minorities to create a diverse workforce so that different ideas and expertise can be introduced. Success stories are shared on a blog so that everyone knows about them. Adobe invests in employee learning through e-learning, mentorships, reimbursements for educational costs, and leadership development programs. Finally, they developed Kickbox, which awards a $1,000 prepaid credit card to employees who want to explore in order to encourage thinking outside the box and risk taking. Out of a thousand proposals, the company has invested in twenty-three innovations (KnowledgeForce 2019).

Google spent time and effort to better understand what makes some managers more successful than others. They looked at employees' comments on their managers in their 360-degree performance reviews and identified ten successful attributes. They then interviewed the highest-rated and the worst-rated managers to analyze their differences. From this, they compiled ten attributes of a successful manager:

1. Is a good coach
2. Empowers the team and does not micromanage
3. Creates an inclusive team environment, showing concern for success and well-being
4. Is productive and results-oriented
5. Is a good communicator—one who listens and shares information
6. Supports career development and discusses performance
7. Has a clear vision or strategy for the team
8. Has key technical skills to help advise and direct the team
9. Collaborates across the organization
10. Is a strong decision maker

This is an excellent example of learning from the past, as well as how to integrate actual evidence from data analysis in KM.

Publix demonstrates strong engagement because employees become shareholders after one year. The company publicly acknowledges that its core values are collaboration and communication. Everyone is encouraged to work with their colleagues, ask them questions, and answer their questions in return. Employees move around among company divisions to better understand how things work, acquire new skills and knowledge, and increase their network of peers. Everyone is expected to innovate, take risks, and above all, not be afraid of failure.

Cordero (2020) highlights Apple, Google, and Pixar as examples of organizational learning success. Pixar encourages employees to learn even if the subject is not entirely within their area. Google followed the pioneering example of 3M and allows employees one day a week to spend on personal projects. At Apple, the creation of Apple Inc. made it possible to provide employees with continuous training (e.g., Binesh, 2013). At the organizational level, the company collects product ideas from employees, benchmarking data from competitors, new developments from its research and development department, and more. Everyone can then access and discuss these ideas. The interactions are facilitated so that everyone, regardless of status, has a voice and can critique the ideas.

What do these success stories have in common? In a word, failure. Put another way, it is what they do when they fail: they learn. The most successful companies are also the ones that have experienced frequent and substantial failures. For example, James Dyson had more than five thousand prototypes fail over five years before he came up with his now revolutionary vacuum cleaner (Dyson, 2014). That is a lesson learned. Failure is not the end but only the beginning of the organizational learning journey. The only final failure is not learning from the lessons of the past, both what worked and what didn't.

Assessment Frameworks

Frameworks can assess organizational learning in much the same way as maturity models can assess the state of KM within an organization (discussed in chapter 9). Organizational learning frameworks evaluate the readiness or baseline state of an organization with respect to learning processes, memory containers, and enablers of these, such as technology and culture.

A framework proposed by Probst and Buchel (1997) looks at the following organizational factors:

- Knowledge—the number of organizational learning instruments
    - Number of techniques for facilitating learning
    - Number of techniques for breaking down barriers
    - Process-oriented use of techniques
- Ability—the learning level
    - Ability to cooperate and participate
    - Ability to communicate and achieve transparency
    - Ability to analyze problems and solve complex issues
    - Ability to store knowledge

- Intention—the willingness to learn
  - Creation of a structure that imparts meaning
  - Building on an ethical basis
  - Desire to create a shared value system

Marquardt (2002) proposes three dimensions to consider in building the learning capacity of an organization:

1. Speed of learning: how quickly the organization can complete each learning cycle (planning, implementing, and reflecting)
2. Depth of learning: degree of learning the organization achieves at the end of each cycle, by questioning assumptions and improving its capacity to learn in the future
3. Breadth of learning: how extensively the organization can 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 characteristics of a learning organization and associated best practices.

Zedtwitz (2002) assessed the maturity level of an organization, as reviewed in chapter 9. Maturity models can also assess the organizational readiness for implementing a complete lessons learned cycle. If the key success factors are not there, then the priority is to make sure they become fully functional. Otherwise, as described in the longitudinal analysis of NASA's lessons learned system, there will be repeated failure to learn from the valuable lessons. Any one of the maturity models can be used to assess where the organization is with respect to a lessons learned process. For example, I use the standard Carnegie Mellon University Capability Maturity Model with five levels: initial, repeatable, defined, managed, and optimized (Paulk et al., 1995).

In the process's initial phases, lessons learned are identified in an ad hoc manner, and their quality depends mostly on the skills and motivation of the individuals identifying them. The process tends to be reactive, triggered when a major problem occurs, rather than proactive or planned. Most organizations appear to be at this level (McIntyre et al., 2015). In the initial level, most learning occurs in the individual. In the repeatable level, the lessons learned process is more standardized and there are policies and procedures in place for conducting them. At this point, team or group learning begins to take place. In the defined level, the lessons learned process is well documented, standardized, and fully integrated in project management practice (e.g., as prescribed in the PMBOK). Training, maintenance, and supervision responsibilities are identified and assigned. At this level, we see the benefits of lessons learned as they begin to contribute to organization improvement. Organizational learning begins to be possible at this third level.

Table 11.1
Key characteristics and associated best practices of learning organizations

Characteristic	Definition	Associated best practices	Positive by-products
Self mastery—individual	The ability to honestly and openly see reality as it exists; ability to clarify one's personal vision	• Positive reinforcement from role models/managers • Sharing experiences • More interaction time between supervisory levels • Emphasis on feedback • Balance work/nonwork life	Greater commitment to the organization and 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	• Time for learning • Reflective openness • Habit of inquiry • 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	• Participative openness • Trust • Empathy toward others • Habit of dissemination • 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
Team learning—group	The ability of a group of individuals to suspend personal assumptions about each other and engage in dialogue rather than discussion	• Participative openness • Consensus building • Top-down and bottom-up communication flows • Support over blame • 5. Creative thinking	Group self-awareness; heightened collective learning; learning occurs up and down the hierarchy; greater cohesiveness; enhanced creativity
Systems thinking—group	The ability to see interrelationships rather than linear cause and effect; to think in context and appreciate the consequences of actions on other parts of the system	• Practicing self-mastery • Possessing consistent mental models • Possessing a shared vision • 4. Emphasis on team learning	Long-term improvement; decreased organizational conflict; continuous learning by group members; revolutionary over evolutionary change

Source: Adapted from Argyris and Schon (1996); Senge et al. (1994).

The managed level is where both a lessons learned process (including policies, procedures, and compliance) and a lessons learned system (i.e., a repository of lessons learned available to everyone in the organization) are implemented. At this level, lessons learned are company-wide, and any needed cultural change has been made: the attitude is that failure is acceptable, it happens, and we don't need to assign blame, but we need to understand why it happened and what we can learn from the event. This means the organization has the appropriate rewards and censures in place. There cannot be repercussions to admitting that things did not go according to plan. Some companies even reward such admissions. Honda, for example, gives out an award to teams whose projects failed but who learned from the failure and shared what they learned with others in the company (Zedtwitz, 2002).

Reaching the final, optimized level indicates that lessons learned are organization-wide and they are conducted in a proactive and consistent manner. The organization has embraced a learning culture and there is plenty of time allocated for reflective activities. Clearly tracing the impact of lessons learned on quantitative and qualitative organizational improvements is now possible.

As with all maturity models, a lessons learned maturity model can situate a given organization at a particular level, say, the first level, and then identify what needs to be in place to advance to the next level. For an organization at the first level, the priority would be to clearly define a lessons learned process and provide guidelines on conducting it. The key word in lessons learned is *learned*. The goal is not to amass a large volume of lessons learned in a repository but to ensure that each lesson learned that is produced (as an output) is an input to projects or procedures and improves them. The effect of applying a lesson learned is the best assessment of any lesson learned. It is not the number of lessons that counts but how the organization learned from the lesson.

Notes

1. See http://www.nancydixonblog.com/2011/02/a-model-lessons-learned-system-the-us-army.html.
2. See http://www.pmi.org/learning/library/lessons-learned-project-lessons-6993.
3. See http://www.nationalnearmiss.org.

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12 Knowledge Continuity Management

> Great things do not just happen by impulse, but as a succession of small things linked together.
> —Vincent van Gogh (1853–1890)

Knowledge continuity management is a specific application of KM whose goal is identifying valuable knowledge at risk of being lost owing to the departure of one of more employees. Knowledge continuity management identifies vulnerable knowledge, who has this knowledge, and how to transfer it to a successor so as to preserve it in organizational memory for future reuse. Several frameworks address the potential risk of losing hard-earned valuable organizational knowledge through employee departures, whether due to an anticipated retirement or other, unexpected resignations.

Learning Objectives

1. Define what knowledge continuity management (KCM) is and why all managers need to add this to their toolbox of required management roles and responsibilities.
2. Describe the key steps in completing a KCM project.
3. Explain how KCM processes can become institutionalized.
4. List the different characteristics (individual, group, and organizational) that must be taken into account when designing an optimal KCM approach.
5. Match each potential obstacle to knowledge sharing with an appropriate mitigation strategy.

Introduction

Knowledge loss and a break in knowledge continuity can be due to retirements, unexpected departures, reorganization that leads to some positions being eliminated, internal turnover (employees change jobs but stay within the organization), seasonal or supply-demand fluctuations (e.g., layoffs when there are not enough projects), and temporary leaves (e.g., sabbaticals, family or health leaves). When employees leave the organization, they take some of the organizational knowledge with them when they go (e.g., Davis, 2018; Monte, 2020). For the most part, this lost knowledge consists primarily of tacit knowledge that has not been documented (or in some cases, not even identified, so people don't know that it exists or that it exists within specific people).

Different business units have different perspectives on the major causes of unintentional knowledge loss:

- A human resources department tends to view knowledge loss as employee turnover; the major types are resignations, retirements, and layoffs.
- Information technology tends to view knowledge loss as system errors such as crashes and failure of backups.
- Organizational learning views knowledge loss as owing to ineffective organizational routines and organizational memory.
- KM views knowledge loss as the inability to share and preserve knowledge.

Companies today are concerned with not only preventing knowledge loss due to employee attrition but also transferring 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). KCM refers to the transfer of specific critical knowledge from existing employees to those who replace them. The imminent turnover signals a potential for the loss of valuable accumulated knowledge and know-how in the form of the competence and expertise possessed by the departing individuals. This valuable knowledge and know-how exist in both formal and tangible forms (explicit knowledge), such as documents, but also in less visible forms, such as tacit or difficult-to-articulate knowledge. Particular emphasis must be placed on the tacit form because this often resides within a given individual or group and is therefore more easily and completely lost when people leave an organization (Labarre, 1998).

Paulin and Suneson (2012) note that there has been a fair amount of conceptual confusion when discussing knowledge sharing and knowledge transfer. Often, *knowledge sharing* and *knowledge transfer* are used synonymously, but these have important distinctions. In general, knowledge sharing refers to voluntary, bidirectional interactions between people who want to share knowledge with one another. An example is the exchanges in peer networks. Knowledge transfer refers to the deliberate, unidirectional conveying of knowledge from one individual to another (or to a group of individuals). An example is retiring employees providing their knowledge and an explanation on how to apply it to the workers tasked with doing their job in the future.

KCM has two distinct timelines: The first is to ensure that present-day employees can continue to benefit from the knowledge of those leaving the organization. The second is to ensure that existing employees can reuse this knowledge in the future and, in addition, that newly hired employees can benefit from this cumulative knowledge base (Beazley, Boenisch, & Harden, 2003). Hana (2012) explains that KCM "also incorporates the continuity of an organization's development, the quality of managerial positions, and the continuity of decision making" (p. 46). Loss of expertise and experience could cause significant problems, such as more mistakes, more costly mistakes, diminished quality of products or services, and inability to continuously operate.

Joe, Yoong, and Patel (2013) warn that the risk of knowledge loss is particularly elevated in small- to medium-sized businesses, which typically have fewer than five hundred employees. These are less likely to have overlap in experience and skill sets of employees, and the departure of older, more senior employees can lead to unrecoverable knowledge loss. Smaller organizations tend to rely more on technology and documentation as KCM strategies and less on network diffusion of knowledge, which makes for a less effective KCM outcome. However, all organizations are at risk of knowledge loss, as was evidenced during the COVID-19 pandemic.

Alderton (2015) found that only half of global organizations have a formal knowledge transfer process or plan in place. This means that there are many lost opportunities for less-experienced personnel to learn from more senior colleagues. KCM is an integral part of organizational learning and also contributes to learning from the past, avoiding repeating the same mistakes, and replicating successful practices. KCM can be short term and temporary, as when teams are disbanded, or long term and permanent, as when employees leave the organization because of a planned retirement or other, unanticipated reasons. Reacting to a departure simply by hiring someone else is not as easy as it sounds. Alderton (2015) notes that "in 2014, 36 percent of employers indicated they had trouble filling jobs—the highest percentage since 2007" (p. 33). That is because we are talking about knowledge, experience, and knowledge workers. If it is possible to hire someone else, then there is no need for KCM. Continuity becomes an issue when the person leaving has acquired years of valuable experience, developed evaluation and judgment skills, and developed valuable knowledge that can be applied to that specific organizational context. A good KCM plan should therefore be formalized and institutionalized.

Davis (2018) found that in today's workplace, almost everyone is a knowledge worker and a subject matter expert in something. This includes even junior staff, who are likely to be much more proficient with newer technologies (e.g., social media). Davis estimates that approximately 42 percent of each knowledge worker's skills can be categorized as unique. This reflects the explicit-tacit divide in which roughly 60 percent of a knowledge worker's knowledge is standard and the remainder is unique. This means that when workers leave, their colleagues will not be able to do 42 percent of their job, and their successor will need to learn 42 percent of their job:

> The average new hire will spend almost 200 hours working inefficiently (asking for information and waiting for responses, forging ahead by trial and error, and/or "reinventing the wheel" to duplicate the work of his or her predecessor). (Davis, 2018)

There is potential for loss of time, efficiency, effectiveness—all the measures of the organization are negatively affected, and the employees are frustrated by this lack of productivity. When employees were surveyed, they replied that they spent an average of five hours a week trying to get in touch with people who possess the unique knowledge they need. The pandemic also resulted in increased knowledge loss because many were laid off or retired (Weldon, 2020). Weldon notes that much valuable knowledge has never been documented, such as historical knowledge of a worker, in-depth knowledge of how best to interact with that worker, or problems that were solved via email exchanges that no one would be able to easily find.

The best way to prevent knowledge loss is to have a KCM plan in place, not wait to create one when valuable knowledge workers announce they are leaving. In parallel, knowledge sharing and transfer should be clearly presented as how everyone works from day one: it should be part of onboarding and training to ensure that "everyone will document and share their expertise" throughout their employment (Davis, 2018).

KCM Process

KCM is necessarily a top-down process, one that begins with senior management deciding to implement a formal program (Alderton, 2015). In addition to implementing a clear communication plan to get all employees on the same page and have them understand what will be done and why and how everyone will benefit, management needs to ensure that adequate resources are assigned to KCM activities. This includes a team, whether dedicated or not. In addition, management needs to make sure that time spent on KCM activities is authorized and valued as real work. In unionized environments, union representatives need to be involved in the dialogue to ensure workload and scheduling are equitable. Finally, management needs to ensure there is time and space to carry out KCM.

The major steps in a KCM cycle are as follow:

1. Identify knowledge at risk (e.g., possessed by very few employees, is difficult to hire someone for the role, or is difficult or time consuming to train someone for the role).
2. Identify location or containers of this knowledge—what percentage is explicit and what percentage is tacit? (Tacit refers to people with this knowledge, whereas explicit knowledge refers to containers such as documents or databases.)
3. Identify the recipients of this knowledge. (Are they known? If not, derive a general profile and identify characteristics.)
4. Select the best knowledge transfer mechanism or channel (e.g., high-bandwidth channels such as video stories for tacit knowledge, a procedural manual for some explicit knowledge).
5. Design a knowledge transfer schedule.
6. Develop metrics to assess how well knowledge was transferred.
7. Brief participants (train team if necessary).
8. Conduct knowledge transfer.
9. Validate knowledge elicited.
10. Ensure recipients can apply knowledge (where possible, because having the successor meet with the person leaving the organization is not always feasible).
11. Measure or assess effectiveness of knowledge transfer (e.g., increased project completion success, problems solved faster, and fewer questions asked of experts).
12. Preserve the elicited knowledge in organizational memory in such a way that it is easy to reuse in the future.

Identifying Critical Knowledge

As discussed earlier, the point is not to capture, transfer, and preserve all knowledge. The first step in identification is to define what each organization means by *critical knowledge*. For knowledge to qualify for KCM, several criteria need to be met—in other words, a cost-benefit analysis should be done. KCM involves a great deal of time, effort, and expense. It should not be carried out for knowledge that is easy to document, transfer, or acquire (e.g., how to fix the photocopy machine when paper jams). Critical knowledge is knowledge that is of strategic importance to the organization and at an elevated risk at being lost (usually because only one or a few individuals possess this knowledge). Joe et al. (2013) identify five types of critical knowledge: subject matter expertise; knowledge about business relationships and social networks; organizational knowledge and institutional memory; knowledge of business systems, processes, and value chains; and knowledge of governance.

Most organizations have some variation of a formula to determine the value of knowledge and the risk of that knowledge being lost. This is usually a combination of knowledge characteristics, individual characteristics, and job position characteristics. This risk assessment prioritizes which key employees to approach first: those who have unique and critical knowledge and skills who are expected to retire in the next few years and whose positions would be difficult to quickly fill. Human resource departments are already responsible for establishing retirement projections and identifying position gaps, even core competency gaps. They can provide a map of areas with potential for loss of a critical mass of workers because they all become eligible for retirement around the same time.

Critical knowledge characteristics include how many people can apply this knowledge, how mission critical it is, and how long it would take to train someone to do this. Several existing KCM guides have some combination of these characteristics.[1] From my experience with a large number of private and governmental organizations, I define nine criteria to assess whether knowledge is critical enough to warrant a KCM approach:

1. How specific is it to the organization?
2. How localized is it? Does it have a sole source?
3. How much has it already been documented?
4. How complex is it?
5. How often does the knowledge change?
6. How hard is it to learn?
7. How hard is hiring people with this knowledge?
8. Is it possible to subcontract?
9. What are the consequences of not being able to access and apply this knowledge?

Organizational specificity refers to how specialized or contextual this expertise is. Can it be found throughout the industry, or is it specific to this company? For example, legal expertise tends to be highly country specific: US law differs from Canadian and other countries' laws. Even within Canada there are differences, because the Quebec legal system differs from the rest of Canada and has more in common with France (both are based on the Napoleonic Code). Legal expertise would therefore be an example of a highly organization-specific form of expertise. The more specific the knowledge is, the harder it is to replace, making the organization more vulnerable to permanent knowledge loss.

The degree to which expertise is localized refers to the number of people who can apply this type of expertise who work within the organization. The most extreme case of vulnerable knowledge is when there is a sole source of expertise (i.e., one person can apply this knowledge). The more people who share the expertise, the less elevated is the risk of the organization losing this knowledge. Another way of looking at this parameter is to assess the uniqueness of the knowledge in question. What is the level of diffusion or extent to which this expertise is shared within the organization? How many people have the same type of expertise and can perform at the same level (e.g., possess mastery or advanced skill set)? If only one, then it is unique and it is at the greatest risk. If shared by other similar professionals (e.g., within a network of professionals), then the risk is much less.

How well documented is this expertise? Estimating the ratio of tacit to explicit knowledge for each type of expertise is always useful. If manuals, job aids, FAQs, demos, how-to guides, or event training already exist, then the ratio is low and the organization is less vulnerable with respect to losing this knowledge. Another useful ratio is the percentage of procedural knowledge that makes up the expertise, compared with more abstract knowledge such as reasoning, judgment, analogical analysis, and problem-solving. The more procedural the know-how, the easier it is to document and the more likely that it has already been documented to some extent. The less procedural the expertise, the more vulnerable the organization is.

If expertise is not extensively documented, the next question to ask is How easy would it be to document? How long would it take? In other words, a cost-benefit estimate will be needed. A useful heuristic is whether it be explained to someone in twenty minutes over the phone, or whether it requires two full days observing the experienced employee. The answer will give some idea of the scope and effort of the documentation effort needed.

The next criterion concerns the complexity of the expertise in question. For example, does it involve multiple interrelated steps? Does it require prerequisite knowledge? Does it depend on others to complete different steps in the process? Know-how that is easy to transfer is typically something that you could teach or show someone else to do in less than two days and consists of independent, self-contained tasks. The more complex the knowledge, the more at risk of being lost.

Another useful parameter is to estimate the predicted useful lifespan of this knowledge. How stable or enduring is the type of expertise? Alternatively, how dynamic or changeable is the demand for this know-how? Has it changed much in the past five years? Past decade? Past decades? For example, a specialist in the year 2000 (Y2K) bug in software possesses expertise of a limited lifespan (or one that has an expiry date). The know-how of a specialist in mediating conflicts in teams and helping them work well together probably has a longer useful lifespan than the Y2K specialist's. The shorter the useful lifespan of knowledge, the more likely it is to be lost.

How the experienced person came to acquire this knowledge is important to consider. Was it something learned in school or picked up on the job? Most expertise is a blend of the two. A question to ask is How difficult is it to learn or acquire this knowledge? How difficult to train someone to do these tasks? What type of training is available, such as vocational training, university-level programs, or internal or external formal professional development (e.g., continuing education)? Can peer mentoring be an option to help others acquire this expertise? The easier it is to train someone to assume these responsibilities, the less the risk of this expertise being lost.

Another way of addressing potential future knowledge gaps is to hire someone else for that job position. This requires an assessment of the job market. Is it difficult to recruit someone with this knowledge and know-how? How easy or hard is it to find and hire people with this type of expertise? How many graduates are there on average every year? How competitive is the market? In other words, will you have to compete with other companies to try to recruit these graduates? You should also consider the ability of the organization to retain talented individuals once they have been recruited. What are the industry turnover rates? What is your organization's turnover rate? For example, some sectors have difficulty attracting younger workers such as Generation X and millennials because of their less-than-rich information technology environment or less-than-evolved organizational culture. The easier it is to hire well-qualified candidates and keep them as employees, the less likely this knowledge will be lost.

In a related vein, the possibility of subcontracting this type of knowledge work should be evaluated. How easy is it to find a person or a company to subcontract some or all of these tasks? In other words, how available is this type of expertise outside the organization? Diffused throughout an industry? A service provided by consultants? Remember, expertise consists of not just technical skills but soft skills, strategic expertise. The easier it is to subcontract, the less vulnerable the organization is with respect to potential knowledge loss.

Finally, the potential consequences of not doing this work need to be considered and, ideally, measured. What are the consequences of not doing these tasks well? Is the knowledge mission critical? Life threatening? What if the tasks are done but not done well—suboptimal performance? What is the potential impact on reputation (e.g., through media coverage)? The greater the potential consequences, the higher the priority that should be given to this expertise in the KCM strategy.

Levy (2011) recommends representing each expert's knowledge as a tree whose branches are where knowledge is to be transferred from a retiring employee to other employees and to the organization. A description can then be added to each of these branches to justify why this knowledge is critical (e.g., doesn't exist anywhere else, saves money, improves reputation, increases ability of the organization to renovate) Ultimately, a priority can be assigned to each branch. When the manager signs off on this knowledge tree, the scoping phase is done.

Documented knowledge needs to be easy to find, retrieve, and reuse. Undocumented (tacit) knowledge will need to be codified. Levy (2011) recommends using standard templates to codify tacit knowledge. This helps the knowledge capture process because the retiring expert quickly understands what type of knowledge he or she needs to provide and because having knowledge presented in a structured fashion helps the ultimate recipient understand it. This phase can easily require a minimum of three to six months to complete. Knowledge capture interviews for the KCM process should be spaced out over time (employees still need time to do their work and will be better able to recall missed details later, and the KM team needs time to analyze and digest the knowledge they have elicited.

Selecting the KCM Strategy

Once the critical knowledge has been identified, the next decision is which knowledge transfer and retention strategy to use. The decision depends on whether the knowledge is tacit or explicit and the amount of time the KCM activities will take. Table 12.1 outlines the major approaches that can be used for KCM for tacit knowledge.[2]

Most of these approaches were described in chapter 4. Some that are more specific to KCM are described here. At the individual level is the knowledge exit interview. Traditionally, the exit interview is a formal interview of staff members leaving an organization that asks about their reasons for leaving; KCM exit interviews add the capture and storage of valuable knowledge of the departing employee. Thinking that all a person's knowledge could be captured in one or even several interviews is of course not realistic. The interview instead asks employees the following:[3]

- Can they identify who in the organization would benefit from their knowledge?
- Who currently comes to them for help? What types of questions are they asked, or what problems do they help solve?

Table 12.1
KCM for tacit knowledge

Individual	Group
Exit interviews	After-action review, project postmortem, lessons learned workshops
Mentoring, coaching, peer assists	Codesign, codevelopment groups
Job rotation, job shadowing	CoPs, knowledge networks
Knowledge mapping, knowledge elicitation, knowledge codification	Formal classroom training with experienced employee as trainer (critical incidents, case studies)
Special development mandates (e.g., sent to work in other units, other teams); targeted secondment	Group problem-solving (complex problems/cases)
Learning histories	Social network analysis
Yellow pages, expertise locator systems	Storytelling workshops

- How much of their knowledge is already documented, and where can it be found?
- How are key tasks undertaken, what inputs and outputs are needed, and what obstacles, bottlenecks, and sensitive parameters are involved?
- Ask them to map out their informal network (their formal one should already be documented).
- Ask them to clean up and organize their files, documents, and shared folders and to leave notes to guide their successor (physical sticky notes and electronic markups).

Additional questions to ask include Are there specific types of expertise that would take someone else a long time to master? In your experience here, what tends not to be done well (the major challenges in your area)? Would you recommend any specialized training to help your successor prepare for this job (e.g., technology or tool training?) Finally, ask about relationships with peers (both within and outside the organization) and with partners, vendors, suppliers, and so on (Monte, 2020).

The knowledge interview is almost always with a single individual who is leaving. The goal is to, at a minimum, identify the key types of skills and knowledge the person possesses that are both critical knowledge for the organization and at risk of being lost when he or she leaves (e.g., because few other people have these capabilities). Some of this can be documented (e.g., in a job aid, a video demonstration), some can be transferred to others (e.g., through mentoring before the person leaves), and some will remain with the person leaving. For the latter, inquire whether the person would be interested in remaining as a paid resource (e.g., a contract, a monthly retainer) to ensure continued access to expertise.

In addition to the knowledge exit interview, and if there is time, departing experts can be asked to recommend resources for the knowledge repository and write in a blog or wiki some mini case studies of tough problems or challenges they faced and how they addressed them. They could also give presentations and webinars or be interviewed, and these videos could form part of training and onboarding activities. They could spend some time mentoring potential successors.

At the group level, before conducting a postproject review, meet with project managers to get their perspective:

- What went as expected (routine)?
- What was unexpected?
- What went well? Better than expected (innovations)?
- What did not go as well as expected, and how can we ensure we do better next time (lessons learned)?

Next, have a facilitated session with the project team and ask the same questions. The facilitator should be neutral and ensure that everyone has a voice and feels safe during discussion. Finally, document the best practices and lessons learned, including categorizing and assessing them for their scope, or the degree of generalization possible. Their metadata should include information on who could benefit from implementing these best practices and learning from the lessons learned. This content can then be diffused using collaboration or repository tools.

Daghfous, Belkhodja, & Angell (2013) declare that social networks are another good group approach. The network of relationships through which work gets done is "an efficient mechanism for sharing both tacit and explicit knowledge between actors and groups of actors to generate organizational and collective learning" (p. 643).

Table 12.2 lists techniques for explicit knowledge transfer.[4]

Table 12.2
KCM for explicit knowledge

Individual	Group
Blogs	Wikis
Podcasts	Onboarding, training
Competency profile, job aids, manuals, checklists	Simulation
E-learning	Role-playing
Knowledge repositories	Taxonomy building

If the knowledge is rare, the focus should be on increasing its diffusion to more people. The best techniques to use in the KCM strategy would be the following:

- Apprenticeship (e.g., interns) and mentoring by experts
- Training seminars, lectures, and presentations by the experts
- A knowledge dictionary produced by the experts
- A peer network set up around the experts
- Job shadowing

The rarer the knowledge, the more time needed for KCM activities. Ideally, one to three years should be dedicated to knowledge transfer and retention.

If you don't have a lot of time before the experienced employee leaves, then you need to use the emergency or rescue archaeology method. Many European countries halt work on a residential or commercial construction site if archeological remains are found. An archeology team then has a limited time (e.g., twenty-four to forty-eight hours) to get onsite and rescue what they can before work resumes. They save what is the most valuable and what is at the same time easiest to recover. Emergency or rescue KCM operates in much the same manner. If someone is leaving in two weeks, focus on mapping their professional networks (e.g., use social network analysis). Ideally, the incumbent introduces the successor (in person or virtually) to the key people in his or her network to ensure continuity in how work is done. The successor will thus have access to valuable sources of information, help, and support in carrying out professional duties. The key questions to ask the departing expert are Who do you ask for help? Who asks you for what type of help? A map is often the best way to document the network, with contact information for each person identified. Where possible, include the expert if he or agrees to stay in contact. Some organizations provide a laptop to the expert and preserve the person's company email address; others pay a fee per question answered or a monthly retainer so that the experienced employee remains connected and part of the network.

As a strategy for the long term, KCM plans need occasional revising. Develop a KCM strategy for five years, including a one-year road map for key priorities. As you gain more insight into the approaches that work best for your organization, include specific recommendations and guidelines on how to deal with valuable and vulnerable knowledge that is both tacit and explicit.

In developing a KCM strategy, you need to think about roles and responsibilities. These need not necessarily be dedicated KCM roles. You will also need information technology and HR departments on board. Next, think about policies and guidelines.

The legal department often needs to be included because intellectual property, patent, and other copyright issues may be involved. The Creative Commons,[5] or "copyleft," agreement may be used, if all agree to it, to facilitate knowledge sharing.

Handover procedures, or the transfer of relevant knowledge so that the new person can efficiently and effectively assume new duties, need to be institutionalized as explicit policies: What are the obligations of the leaving employee with respect to surrendering passes, books, and the like and to turning knowledge over to successors? Handover procedures are particularly useful when employees frequently change jobs. For example, the military has frequent, formal rotation of jobs, and servicemembers expect to be posted to a different location, unit, and role. Handovers often rely on a checklist or structured notes. Ideally, several face-to-face meetings take place to ensure effective knowledge transfer, but this may not always be possible (Catignani, 2014). A good handover procedure includes the following:

- What strategically important processes are being dealt with at present?
- What time-sensitive processes will your successor need to address soon?
- What tips and advice can you offer about the most important aspects of your job?
- What are the major constraints you have to deal with, and what can be done about them?
- What sources of information and references are useful (people and content management systems)? Include contact information, and recommend specific resources. Share your web browser bookmarks with the successor.
- How can you give your successor access to your informal knowledge network? (Knowledge elicitation often results in a social network map.) Introduce your successor to the network. Whenever possible, personally introduce your successor to your most important contacts.

Joe et al. (2013) observe that older workers have more contacts than younger ones, especially in smaller organizations. This knowledge can be easily lost when the older employee leaves. Capturing this knowledge, typically in the form of a social network or map, should also include who younger, less experienced workers can go to for what type of help. Refer to chapter 4 for more details on knowledge elicitation and organization techniques. Recall that questions for experienced workers include what their major responsibilities are, who they call on for help, and who asks them for what type of help. Interviews should ideally take place during their career and not just before they leave. These can be short texts or video clips on specific topics, and they can be classified and organized on the organizational portal or repository for future reuse.

A Three-Tiered Approach to Knowledge Continuity

The traditional response to potential knowledge loss has been to pair the person leaving with a successor and use mentoring, coaching, or job shadowing to transfer knowledge. This is fine as far as it goes, but it addresses only the short-term problem: the organization will still have only one person with a very high percentage of the tacit knowledge. That person will eventually leave or retire at some point, too. The problem of continuity has not been solved but has been treated with a Band-Aid. KCM must look beyond the short-term individual-to-individual level of knowledge transfer and also address the group or team level and the organizational level. Knowledge must be more diffused throughout the organization, shared with more than one other employee, and this knowledge must be preserved in organizational memory for future reuse. A good KCM plan is therefore one that addresses knowledge transfer at these three levels—individual, group, and organizational—to ensure that tangible legacy materials are continually and seamlessly produced, shared, and fed into the corporate storehouse of intellectual capital.

The approaches for individual-to-individual knowledge transfer include structured interviews with the subject matter expert and knowledge mapping of the expert's key knowledge areas together with task-support-system prototyping and mentoring. Individual structured interviews typically focus on past success stories, disasters, problems that were not handled well, the history of why processes were put in place, the evolution of competencies, and so forth. The key roles and responsibilities of the expert serve as a starting point. Several key case studies are reviewed 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 for capturing the tacit culture surrounding intellectual assets, then using it to catalyze the cultural changes that need to occur before an organization becomes effective at knowledge sharing.

Bahman (2015) notes that mentoring is a required complement to any formal knowledge base. Even when employees know the knowledge is documented in the system, they almost always prefer to talk to a peer who will direct them to the best resources, vouch for the best practices, and help them understand and apply the knowledge. Mentoring requires time, largely because knowledge is transferred and acquired by the successor in a contextual manner. It is not a transfer of just simple units of knowledge but of knowledge in situ with all its accompanying history, background, and so on. Most mentoring is more effective when it is face-to-face, but technology-mediated sessions could also be used. Gadomska-Lila (2020) advocates comentoring (sometimes called reverse mentoring), or junior employees mentoring more senior ones in such areas as new technologies. The result is greater motivation and trust.

At the group level, knowledge is often circulated within project teams, organizational units, and more informal peer networks. Such groups have been around for quite a long time, ever since people realized they could benefit from sharing their knowledge, insights, and experience with others of similar interests and goals. These groups are described in greater detail in chapter 5. Surveys such as the one by Bartlett and Ghoshal (1998) have shown that even in a company with an effective KM infrastructure, people rely on other people as sources of knowledge and help, so much so that company knowledge bases are ranked fourth among five choices. For the most part, peer networks are voluntary informal gatherings where synergies from sharing of expertise 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 challenges lie in conveying what needs to be understood or what employees need to know for business results. This can encompass a company's values, work climate, commitment, and culture—in short, a communal mental model of the company, how it works, and the environment in which it works.

Several other techniques can be used to share knowledge with the larger peer group. These include peer presentations, which can be in person or conducted remotely (Alderton, 2015). These can be formal (scheduled seminar or talk) or informal (lunch-and-learn sessions). Warmington (2015) outlines how groups can be encouraged to reflect on their lessons learned (described more fully in chapter 11). The organization should value the time spent in reflection. The team can learn collectively and benefit from open conversations, or discussions with open questions and in which everyone is free to express their opinion.

To foster its learning capabilities and transfer knowledge at the organizational level, an organization must first be aware of its core competencies and its associated knowledge. These knowledge assets must be made explicit to become a real or practical asset. *Organizational learning* and *corporate memory* are often used to describe the transfer of knowledge from individuals and communities of practice (CoPs) to the organization as a whole. These are usually encapsulated in the form of lessons learned, best practices, the organization's way of doing things, anecdotes, myths, and case studies.

Table 12.3 summarizes the three-tiered approach to knowledge capture and transfer and the types of knowledge best addressed by each tier and the types of tangible legacy products that can be produced for individual, group, and organizational knowledge transfer processes.

Table 12.3
Knowledge capture and transfer for knowledge continuity

Knowledge transfer (KT) approaches	Types of knowledge	Tangible by-products
KT at individual level: individual structured interviews with experts	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
KT at group level: facilitated workshops with CoP members	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
KT at executive level: storytelling workshops and individual interviews with key executives	Strategic consensus re key intellectual assets Criteria for evaluation of intellectual assets' business value	Map of key intellectual assets of the organization Organizational lexicon of key concepts Springboard stories Historical knowledge (organizational saga)

Source: Adapted from Dalkir (2003).

There is not one specific approach that should be used with each of the three tiers. Rather, a wide range of knowledge retention and transfer approaches should be used at all three levels 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 identifies critical intellectual assets at the individual, community, and organizational levels. By capturing intellectual assets at the three levels explicitly in the form of a map, the organization can use the map to create and sustain competitive advantage, eliminate barriers to entry, and ensure continued innovation and learning (Senge, 1990). The map of the organization's intellectual assets will also make it much easier to identify knowledge areas at risk (such as the imminent retirement of an expert, a CoP disbanding, or few or no tangible by-products left behind as an organizational legacy).

The overriding initial emphasis should be on knowledge capture—the creation of concrete, tangible knowledge containers to transform tacit knowledge into explicit knowledge. Ideally, this should be done before retirees depart and be done for knowledge and know-how that is of high business value to the organization. Always keep in mind that the point is to document valuable knowledge, not everything.

Next, given the highly collaborative nature of knowledge work and knowledge workers today, a shared virtual workspace should be put into place to enable members to quickly access key information and easily contact key members of their community. A virtual workspace will reduce the risks associated with the high employee turnover expected for a few years following the pandemic but only if supported by organizational processes, procedures, rules, rewards, and censures 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.

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 related to attrition. This approach was first tried by Transport Canada and has subsequently become a best practice for the Canadian government, as described in the next section.

Success Factors for KCM

McNichols (2010) advocates several strategies that improve the chances of completing successful KCM activities:

- Building a knowledge-sharing culture
- Establishing mentoring programs
- Initiating teamwork

Employees are more likely to share knowledge willingly if they buy into the organization's mission and vision. If they see management is actively supporting KCM, they will feel they are contributing to something valuable and that their contributions are valued. The greater the level of trust, empathy, altruism, tolerance for errors, and collectivism, the easier it will be to conduct KCM. It is important that everyone sees a personal, team, and organizational benefit to KCM. The more they clearly identify how they will benefit from the collective experience of their colleagues in the future, the easier it will be to sell KCM.

Mentoring is one of the most effective ways of transferring knowledge. Mentoring involves having the mentor and the protégé work together to develop the knowledge, skills, and abilities of the protégé. The mentor is a teacher, coach, and advisor who shares his or her experience, insights, and perspectives along with the more standard core knowledge (Shea, 2002). The major benefit of mentoring is that both explicit and more elusive tacit knowledge can be transferred. Although effective, mentoring requires a great deal of time, so it should not be left to the last minute (e.g., it should not start when an experienced employee hands in two weeks' notice). Pair up newer employees as early as possible in their careers so that knowledge transfer can take the time it needs and occur over the course of their careers.

Storytelling is a good complement to mentoring because it both captures and transfers tacit complex and subjective knowledge particularly well (Dalkir, 2015). Storytelling uses examples to illustrate how decisions were made or problems solved while the experienced employee carried out his or her job responsibilities. Stories capture context, and they tend to be more compelling and easier to remember because they are enjoyable. They can help you put yourself in someone else's shoes and adopt a different perspective. Stories are easily elicited from experts and easily digested by those less experienced, making them an effective knowledge transfer tool for KCM (Denning, 2001).

Finally, teamwork, also initiated sooner rather than later, goes a long way toward ensuring that valuable knowledge remains distributed throughout a knowledge network rather than concentrated in the heads of only a few employees or even just one. Wherever possible, teams should be intergenerational to seed KCM as early and broadly as possible throughout the organization. The more employees work together, the more likely they are to develop trust, share knowledge, make mistakes, learn from one another, improve their work practices, and even innovate (McNichols, 2010). "The result is a collective knowledge greater than any single individual could produce" (p. 34). Alderton (2015) concurs and notes that "in addition to fueling a collaborative culture, organizations must also create intergenerational teams to maximize the value of knowledge transfer programs" (p. 33). He goes on to say these teams should be formed in a deliberate fashion to address anticipated knowledge gaps in the near future (three to five years).

Another great practice (again, where feasible) is to institute a phased-in retirement. For example, the government of Canada implemented a program for senior scientists and researchers that allows them to begin knowledge transfer three years before their anticipated retirement date. In the first year, they spend one-third of their time doing knowledge transfer activities. In the second year, this increases to two-thirds of their time, and in the final year before retirement, they are engaged 100 percent in knowledge transfer for KCM.[6]

KCM has a definite business value, and this should be measured and made tangible. For example, metrics could include the following:

- The development of competency in new hires has accelerated.
- The number of employees with this valuable knowledge has increased.
- There are fewer errors, and decision making is faster because it is based on historical empirical evidence.

- Reusable documentation of the knowledge required in certain jobs or roles increases.
- Succession planning is more effective.

DeLong (2004) strongly recommends that KCM processes be embedded into daily work practices so that budget cuts that seriously affect the successful outcome of the KCM program are difficult to make.

As with all KM initiatives, the more that the management team models good KCM behavior and is seen to be actively engaged in knowledge transfer activities itself, the more likely it is that the KCM program will succeed.

Challenges for KCM

Barriers to successful knowledge transfer have been identified (Davenport & Prusak, 2000; O'Dell, Grayson, & Essaides, 1998; Szulanski, 1996):

- High level of difficulty, complexity, and time needed (could take up to two years to complete)
- Lack of sufficient absorptive capacity
- Lack of trust (no preexisting relationship), rapport, and motivation
- Incompatible cultures, languages, work values, and frames of reference
- Knowledge transfer activities are not viewed as productive, valuable work
- Little incentive, reward, or status boost
- Knowledge to be transferred not valued or knowledge owner not perceived as credible or important
- Difficulty tolerating mistakes, asking for help, admitting not knowing something (loss of face)
- Inability to articulate knowledge to be transferred
- Lack of methods, tools, and support to transfer the knowledge

Many of these obstacles are discussed in previous chapters in relation to the core framework for successful KM. They are amplified in KCM because the sheer volume and complexity of the knowledge to be transferred is overwhelming. Someone may have worked at an organization for over thirty years and gained a great deal of experiential knowledge. Where to begin? The first step is to realize that the goal is not to document all this accumulated knowledge. A systematic process will go a long way to help identify who should be involved, what knowledge should be transferred (and preserved), and how to do it.

Alderton (2015) remarks that "some senior employees avoid participating in knowledge transfer programs for fear of being diminished or replaced by new colleagues and technologies" (p. 33). He also notes that a shortage of time, resources, and executive sponsorship hinders KCM efforts. Warmington (2015) has found that "in organizations with siloed departments and challenging communications, knowledge transfer can be difficult" (p. 44).

Schmitt, Borzillo, and Probst (2012) contend that, although interviews and documentation are common approaches to knowledge capture and retention, these usually fail. This is because "(a) documentation does not guarantee the retrieval, correct interpretation, and application of the knowledge; (b) not all tacit knowledge can be captured and stored in a database; and (c) these approaches ignore the context that embeds the individual's knowledge in a social network of coworkers and external parties" (pp. 67–68). Social network analysis can help identify the experienced employees' informal peer networks, and their analysis can identify the key internal and external relationships experts use to perform their job well.

Concluding Thought

KCM should be part of every organization's managerial tool kit. There is always flux in an organization's human resources and there have always been ways of ensuring that positions are filled as they are vacated. We now need to look beyond the container labeled "job" and instead look inside the container marked "valuable experiential knowledge." There does not have to be a one-to-one mapping of valuable knowledge to one job position or even to one employee. KCM requires a different perspective, one based on identifying the critical expertise needed for the company to continue to operate and, even more, to continue to operate at the same level of excellence.

Notes

1. For an example of a guide, see the APQC guide (https://www.apqc.org/resource-library/resource-listing/getting-started-knowledge-retention-and-transfer).
2. Some of these are from a KM master class conducted by Professor Réal Jacob and me.
3. See http://wiki.km4dev.org/Job_handover.
4. Some of these are from the KM master class conducted by Professor Jacob and me.
5. See https://creativecommons.org.
6. See Treasury Board of Canada, https://www.tbs-sct.gc.ca/gui/spgr/spg-gpgr-eng.asp?for=execs.

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13 The Knowledge Management Team

> He is wise who knows the sources of knowledge—where it is written and where it is to be found.
>
> —A. A. Hodge (1823–1886)

This chapter provides an overview of the professionals who form part of the KM team. The key skill set required to carry out KM responsibilities is described using various frameworks. The roles of chief knowledge officer and chief learning officer are introduced and their evolution from the more traditional role of chief information officer are discussed. The different types of KM jobs and 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 roles on a KM team and list the key responsibilities of each.
3. Understand how a chief information officer (CIO) role can evolve into the role of a chief knowledge officer (CKO) role or even a chief learning officer.
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 to make recommendations on how to prevent and correct any morally challenging hurdles to KM implementations. Outline the key tenets to include 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 (figure 13.1). All KM team members become KM champions, and if they come from different parts of the organization and different geographic regions, that spreads the KM message farther. They also need to be comfortable working with different levels in the organization—from the senior management team to newly hired interns (the valuable knowledge they create is often not shared or preserved). The size of the KM team depends on the size of the organization, ranging from one to five for small- to medium-sized organizations to more than thirty in larger organizations.

One approach to forming an effective KM team is to define the different types of KM professionals and the skills, attributes, and background they should ideally possess. The ultimate goal is to develop a list of cognitive, affective, and psychomotor skills together with the required competency levels for each skill. TFPL (http://www.tfpl.com) is a specialist recruitment, advisory, training, and research services company with offices in London focusing on KM, library and information management, records management, and web and content management. TFPL (2000) created a clear and practical guide for

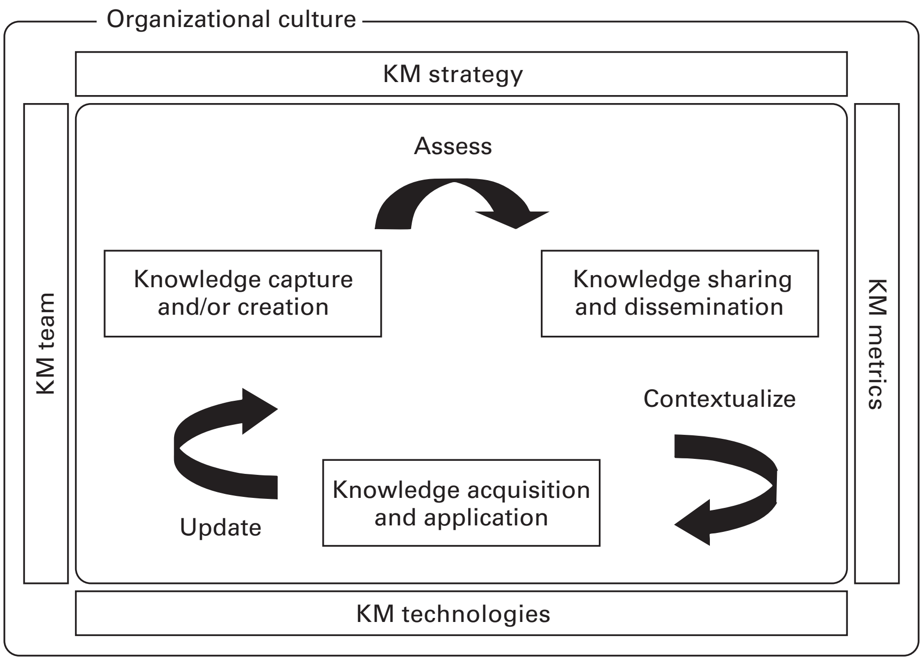

Figure 13.1
An integrated KM cycle

KM skills and competencies that draws on the practical experience of organizations in a wide range of sectors and with varying approaches to KM as shown in table 13.1.

KM skills include the following:

- Time management: using time and energy to acquire knowledge
- Learning techniques: use the most appropriate technique to absorb key knowledge and learning quickly
- Advocacy and inquiry: skilled in gathering knowledge and presenting knowledge
- Informal networking: skilled in gaining access to people with knowledge
- Resource investigation
- Information technology: skilled in recording and disseminating information
- Cooperative problem-solving
- Open dialogue
- Flexibility and willingness to try new things and take educated risks
- Active review of learning from mistakes, risks, opportunities, and successes

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, be autonomous, wait to be told, be a collaborative team player, see the big picture, make connections, learn from mistakes, and think and do with a focus on outcome and an appreciation of information management techniques.

Table 13.1
Excerpt from the TFPL KM skills map

Business awareness/experience	Management skills	Intellectual and learning skills
Business planning	Change management	Ability to deal with ambiguity
Entrepreneurial	Coordination	Analytic
Forward thinking	Cost control	Bigger picture view
Globalization issues	Financial management	Conceptual thinking
Industry/sector knowledge	Leadership	Emotional intelligence
Leadership	Measure performance impact, value	Self-awareness, self-motivation, persistence, read emotion in others
Organizational design	People management	Innovation
Organizational skills	Project management	Lateral thinking
Risk management	Quality assurance	Organizational skills
Strategic thinking	Team building	Original thinking
Strategic planning	Time management	Perspective
Understanding value chain	Training and development	Problem-solving
Visioning	Needs analysis	Positive thinking

A KM dream team is one that collectively possesses the following skills: communication; leadership; expertise in KM methodology, processes, and tools; negotiation; and strategic planning. Team members would also know the organization, remain connected to the top, adopt a systems view, and be intuitive risk takers.

Goad (2002) groups key KM skills into seven categories:

1. Retrieving information
2. Evaluating and assessing information
3. Organizing information
4. Analyzing information
5. Presenting information
6. Securing information
7. Collaborating around information

Retrieving information incorporates everything from the low-tech skills of asking questions, listening, and following up to the more complex skills of searching for information. Evaluating information entails being able to not only judge the quality of information but determine its relevance to the question or problem at hand. Organizing information entails using tools to draw connections between items of information. Knowledge taxonomists create naming conventions and group content into coherent categories. The taxonomy is used to organize the knowledge of the company in such a way that it is easy to find, understand, and use (and reuse). Knowledge taxonomists facilitate workshop groups so that consensus is reached on what to call knowledge and how to organize it. They are often called on to present the business case for the taxonomy, maintain the taxonomy as knowledge changes, and collaborate with subject matter experts, information technology (IT) people, and policy analysts to contribute to the organization's information policy (Lambe, 2014). Analyzing information entails tweaking meaning out of data, and the key to presenting it is to tailor your approach to your audience. Securing information is a different kind of KM skill than the other six KM skills, but it is no less important. Securing information involves developing and implementing practices that ensure the confidentiality, quality, and actual existence of information.

Major Categories of KM Roles

Most organizations are still defining their KM roles, and some are repurposing or extending existing roles to better accommodate knowledge work. Although KM in every organization is unique and necessarily tailor made, several generic KM roles can be identified:

- **KM champions**, or sponsors, promote the benefits of KM through out the organization.
- **Knowledge managers** are responsible for frontline KM workers engaged in all knowledge processing steps. They are usually part of or report to an executive-level senior management group.
- **Knowledge brokers or librarians** are the go-to people for help in finding valuable content, knowledgeable experts, and relevant communities of practice (CoPs) that can help them do their jobs.
- **Knowledge journalists** document valuable tacit knowledge so that it can be better shared by present-day employees and preserved for future reusers of it.
- **Knowledge taxonomists** facilitate workshops to name and structure valuable knowledge content so that it can be found and used.
- **KM Specialists** identify valuable knowledge, ensure it is contributed to the KM system, update and maintain this knowledge, implement KM initiatives, create greater awareness through workshops, for example, and contribute to e-learning and KM communications.
- **Knowledge owners or workers** represent all employees who have subject matter experience and expertise.

KM team members work closely with other organizational units such as communications, IT, HR, and archives to make everyone aware of KM in the organization and the roles that all workers play in both contributing to and using knowledge in the KM system. Knoco, an international KM consulting firm, outlines some of these collaborations:

◦ Work with HR to provide training and support in using the KM systems
◦ Work with IT to ensure that the technologies used for KM have the required functionality
◦ Work with business units to ensure they reach consensus on nomenclature and taxonomy to be used for their knowledge content
◦ Work with archives to ensure appropriate knowledge content is preserved, such as best or proven practices and lessons learned

Different organizations will necessarily have different approaches to describing KM roles. Sample KM job descriptions can be found on websites such as LinkedIn's, for organizations such as the United Nations (https://unjobs.org/themes/knowledge-management), from professionals in KM such as Careers in Knowledge Management (http://www.knowledge-management-tools.net/careers.html), and general job search sites such as Glassdoor.com and Indeed.com.

Senior Management Roles

The roles of a chief executive officer (CEO), chief operating officer (COO), and chief financial officer (CFO) are familiar. There are also chief technology officers (CTOs) and chief information officers, positions typically reserved for heads of IT. An analogous role exists for a KM executive, sometimes referred to as the chief knowledge officer (CKO) or chief learning officer (CLO). The KM executive heads the KM team and is primarily responsible for the following:

- Formulating a KM strategy
- Handling the KM operations
- Influencing change in the organization
- Managing KM staff (Rusonow, 2003)

The KM executive must decide how information is evaluated, created, processed, inventoried, retrieved, and archived, so that KM activities are aligned with the business goals of the organization. There are huge ramifications when an organization creates records, installs a new online catalog or a firewall, designs a website, creates virtual workplaces, copyrights information, and creates policies and procedures on how one department communicates information to another (or too many times, doesn't), and the head of KM must be present for all these events. This executive KM role often also incorporates change management.

Potentially, the most important part of the job is promoting a corporate culture that encourages knowledge sharing. The CKO works over the long term as a change agent to build a cultural climate that rewards sharing behavior (Earl & Scott, 2000). Because of the power associated with expertise, employees may be reluctant to share their knowledge and skills. One type of power in organizations is expert power, wielded by an individual who has extensive expertise such as subject matter expertise or the ability to perform unique tasks. Typically, experts possess rare expertise that few (or no one else) in the organization share. This unique knowledge or skill set can be used to increase personal power by influencing others. This type of power differs from positional power, in which individuals have authority and power as a direct result of their position on the organizational hierarchy (e.g., Gordon, 2002).

Like CKOs, most CLOs are first-generation incumbents, and the position is 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.[1]

Unlike CKOs, most CLO positions are in human resources, organizational development, or sales and marketing (Bonner, 2000). Most 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. Their primary objective often is changing their organizations' mindsets from training (usually a classroom-based delivery system) to continuous learning and human performance improvement and installing a wider variety of delivery methods, such as virtual learning options, corporate universities, and self-directed learning.

Willis and May (2000) describe the CLO as the following:

- One who is a strategic lead player in the organization
- One who makes sure that learning across an entire system is leveraged, not sacrificed
- One who is accountable to the whole system and has broad discretionary power
- One who uses knowledge about how adults learn, how learning affects work, how value systems operate, and how social and technical systems in an enterprise or in its environment may either support or counteract each other

KM executives, whether a CKO or CLO, are primarily responsible for ensuring that KM goals are in line with organizational strategies and objectives. Nonaka and Takeuchi (2019) outline some of the characteristics successful KM leaders should have. They looked at leaders in "wise companies" from around the world to identify key abilities such as being able to judge what is good for their companies and being able to make decisions in a context that is constantly changing. Successful KM leaders need to be able to construct new meaning through human interactions. The more diverse the people they interact with, the better they understand what is happening in their organization. This approach can then be extended to stakeholders who are external to the company.

For those aspiring to be both wise and practical leaders, they recommend the following:

- Use your "head" and your "hands."
- Value "attention to detail" and "the Big Picture."
- Be persistent and quick.
- Seek "universality" and the "particulars."
- Combine "subjective intuition" and "objective knowledge."
- Deal with "simplicity" and "complex situations."
- Stick to the "basics" and "adapt to change."

- Expend "inspiration" and "perspiration."
- Find solutions for the "known unknowns" and the "unknown unknowns."
- See both the "trees" and "the forest." (Nonaka and Takeuchi, 2019, p. 141)

KM Team Roles and Responsibilities within Organizations

KM is never a one-size-fits-all undertaking, but some elements are common to all KM work. The frontline team is one. It collects knowledge and ensures it is shared and also preserved in organizational memory. The frontline team includes content organizers such as knowledge taxonomists. KM practitioners support all the knowledge workers in the organization across all units and CoPs. Everyone in the organization is a knowledge worker who both contributes knowledge and finds and uses organizational knowledge.

The KM team will work with almost everyone in the organization and often also with external stakeholders. The team collects knowledge from all employees, project teams, and business units. In addition, it works closely with most other major organizational functions and services. The main types of KM roles in private and public sector organizations are the following:

- In conjunction with the information management or IT group, designing information systems (designing, evaluating, or choosing information content, database structures, indexing and knowledge representation, interfaces, networking, and technology)
- Collaborating with the enterprise content management team to manage information systems (maintaining the integrity, quality, and currency of the data; updating, modifying, and improving the system; and operating the system)
- Collaborating with the library and information services group in managing organizational information resources to support organizational missions and for competitive advantage
- Coordinating with the recordkeeping and archives group to identify what to preserve in order to militate against potential knowledge loss
- In conjunction with HR or the training group, participating in training, coaching, mentoring, and CoP start-up and life cycle training support and feeding back lessons learned and best practices into training content
- Acting as information consultants or guides for clients (advising, training, and guiding on information, information sources, and information use); acting as an agent on behalf of the client (gathering, evaluating, analyzing, synthesizing, and summarizing information for clients)
- Gathering and analyzing intelligence, in collaboration with the business intelligence unit if one exists, to inform decision making

- Designing and producing publications on information services and products (databases, information systems, multimedia products, and stories from storytelling workshops) in collaboration with the technical writing group or communications group
- Gathering organizational stories and coding tacit knowledge (knowledge journalist)
- Designing access to corporate organizational information and KM policies, quality control, maintaining proprietary information and KM, and mapping corporate intellectual assets

KM Job Titles

Along with the now prevalent CIO and CKO job designations, there are a bewildering number of possible job titles for KM professionals—and some of these are quite exotic. David Skyrme lists the following:

- Knowledge harvester—a person who has the skills to elicit tacit knowledge from experts and to codify it into a form that is more readily shared.
- Knowledge analyst—typically a person who links the needs of users with that of knowledge provision; they translate user needs into knowledge requirements and interpret new knowledge into the business context.
- Knowledge editor—a person who refines explicit knowledge, converting it into language and formats that are user-oriented; they also synthesize the essence and nuggets from the vast amounts of unstructured information in emails, discussion forums, and other unstructured sources.
- Knowledge navigator—someone who knows their way around the various knowledge repositories within your organization, whether they are in databases or pockets of expertise.
- Knowledge broker—connects people who need knowledge with those who have it; they usually have a good network of knowledgeable contacts.
- Knowledge gatekeeper—a person who keeps tab on external sources of knowledge and directs it to where it might be useful; more proactive than the [knowledge] broker who handles specific user requests.
- Knowledge steward—a custodian of knowledge resources; they ensure that knowledge is properly managed and kept up to date.
- Knowledge facilitator—a person who is active in encouraging sharing of knowledge, whether it be through structured conversation, workshop sessions or creating other mechanisms for people to interact. (Skyrme, 2011)

The KM Profession

In 2003, Al-Hawamdeh referred to KM as an emerging profession. The field of KM has slowly evolved from a consulting service to an internal business function, to become an academic discipline that is taught in universities worldwide. At the same time, many organizations are still defining their KM roles. There are a wide range of job titles and an even wider diversity in the backgrounds of KM practitioners. These factors all contribute to the emergence of the KM profession. Although the KM field is fairly young compared with professions such as law, medicine, or engineering, it has matured since about 2010. The COVID-19 pandemic and artificial intelligence advances have both brought the focus to bear on KM again. The 2020 Technology and Services Industry Association (TSIA) annual survey shows that,

> while many organizations still lag in their KM practices, there are signs of steady improvement. According to the TSIA, KM programs are maturing, with a rise in dedicated staffing and program management, and more executives including KM metrics in operational reviews. The TSIA says search strategies are also becoming more sophisticated. There is a rise in unified search—everything from content repositories and product documentation to learning content and community discussions. (Burley, 2020)

As the KM skill set continues to grow and show valuable contributions to organizational goals, the profession will also continue to mature and coalesce as a distinct field of professional activity. Several certification initiatives are underway that will help solidify KM's position as a bona fide field of professional practice (e.g., the KMCI Certificate in Knowledge and Information Management, http://www.kmci.org). At the same time, university programs in KM are proliferating and new classes of KM graduates are entering the KM job market. As KM becomes both an academic discipline and a professional field of practice, awareness grows of the need to incorporate ethics into the job description of each KM team member.

Garcia-Perez et al. (2019) suggest that organizations find it challenging to describe KM jobs, define job titles, and even form the KM team. This is also an issue for job seekers because many KM jobs don't even use the term *knowledge management* in their postings, using instead titles such as information architect, community manager, or content manager. Garcia-Perez and colleagues searched posted KM jobs and found that *collaboration*, *community development*, and *knowledge manager* were the terms most often used in job descriptions. Garcia-Perez et al. (2019) found that entry-level positions focused on the management of knowledge assets and often involved non-KM responsibilities such as website management.

Where Does KM Belong in the Organization?

KM teams can be found in disparate business units including IT, information management, HR management, training, and strategy units. So where does it belong? David Skyrme notes that

> in practice, the focus of KM in an organization is found within many different management functions—human resources, IT, information management (library), marketing and R&D, to name but a few. However, in an organization-wide KM programme its tentacles should reach out into all parts of the organization. This is best achieved through some kind of networked organization structure. Various terms such as "spider's web," lattice organization, hypertext organization, clustered webs, federation of business units, [and] TeamNets have been used. Whatever their name, these are the recurring characteristics:
>
> - There is more emphasis on informal human networking than formal reporting structures
> - Leadership is distributed—thus a KM specialist in one business unit may lead on one aspect of KM, while responsibility for another aspect of KM resides elsewhere
> - A clear vision and set of plans/priorities provides a unifying factor across the network
> - Individual contributors are independent, yet interdependent
> - "Boundary busting" (i.e., overcoming organizational "silos") is achieved through conscious attention to bridging mechanisms
> - Communities of Practice provide an effective way of knowledge networking across an organization
> - Virtual teams are often the organizational unit where the core work takes place. (Skyrme, 2011)

In practice, structure goes hand-in-hand with the organizational culture, because it is a knowledge-enriching culture that will largely determine how well the structure works.

Maier (2013) notes that some organizations have a separate KM business unit. In many cases, KM units were spinoffs of existing units such as the library, document management, or IT units. Other KM units had employees from all key business units serving as members. Most consulting firms have a centralized KM team headed by a CKO that provides support for all tools, techniques, policies, processes, training, and evaluation of KM activities. The team networks with key people in different business units (and possibly different countries) to support the implementation of KM and gather user feedback to improve its functioning. In smaller organizations, there may be more informal networks of knowledge managers and facilitators than actual KM teams (e.g., Webb, 2017).

A similar situation exists within the academic home of the KM discipline. KM is taught in university departments such as management, computer science, information and library sciences, communications, media, education, and public policy.

Knoco makes an excellent argument that, for KM to create value on a sustainable basis, it needs to be fully supported by the organization. Resources need to be allocated to leverage value from knowledge assets over the long term:

> Every other form of asset management has dedicated support. Financial management is supported by the accounts department, people management by HR, brand management by

> Marketing, and so on. Even if your company is too small to have an entire department to cover these functions, there will be someone who's [*sic*] job it is to keep an eye on that area of business. The same is true for Knowledge Management. Even after implementation is over, and the KM system is designed and rolled out, you need a person, or a small group, to keep up the momentum. Their main tasks will be keeping the system maintained (updating technology, training people in the processes, coaching individuals with KM roles), running the monitoring and measurement activities, crafting the longer term KM strategy, and making any interventions needed to sustain KM. Part of the successful longevity of KM within [British Petroleum] drilling is due to the presence of a KM support team for the past 10 years. (Knoco, n.d.)

The Ethics of KM

Ethics establishes a framework for making decisions based on values, a determination of what is right and wrong. 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.

McElroy (2002) points out that KM generates a greater sense of openness in managerial decision making. KM promotes ethics by enhancing transparency in management, where transparency is defined as openness with respect to knowledge and knowledge processes. This makes it possible to identify dysfunctional knowledge processes and bad practices or ideas. KM deals explicitly with the way organizational knowledge is produced and integrated into practice. Openness should contribute not only to more ethical business practices but also to innovation.

Much of ethics can be distilled down to boundaries—boundaries that help employees of an organization stay on the correct side of organizational policy and help clarify ethical issues (Groff & Jones, 2003). Examples of ethical boundaries in organizations are landmarks, fences, and DMZs (demilitarized zones). A landmark is a high-level ethical guideline often built on the company's culture (e.g., values the demonstration of social responsibility among employees, promotes recycling, donates to local charities, pays employees to work on community events). Landmarks 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 are ubiquitous because policies define the fence and the procedures define operating within the limits of the ethical fence. DMZs are concerned with active compliance monitoring (e.g., monitoring of software licenses). They define exactly where the ethical line is and prevent employees from crossing the ethical line.

The challenge is, once again, 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. KM as a profession needs to develop a code of ethical practice, similar to the code of ethics developed for health science librarians (Medical Library Association, n.d.), as shown in table 13.2. Ethical decision making emerges when we embrace inclusion over self-centeredness. 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. Remember the Golden Rule: treat others the way you would want to be treated in their place. The code of ethics from the Medical Library Association (n.d.) states,

> The health sciences librarian believes that knowledge is the *sine qua non* of informed decisions in health care, education, and research, and the health sciences librarian serves society, clients, and the institution by working to ensure that informed decisions can be made.

KM Values and Professionalism

The most important KM value is to always put people first. This means respecting people (for example, asking them to voluntarily contribute their experience and expertise) and ensuring that everyone has a voice (for example, holding facilitated meetings for knowledge work). KM teams should, of course, always strive to do the right thing, even if this is not asked of them. At a minimum, there should be attribution to ensure everyone knows who created the knowledge content (individuals or teams). Acknowledgments are proven practices and most knowledge workers prefer acknowledgment

Table 13.2
Code of ethics of the Medical Library Association

Society	The health sciences librarian promotes access to health information for all and creates and maintains conditions of freedom of inquiry, thought, and expression that facilitate informed health care decisions.
Clients	The health sciences librarian works without prejudice to meet the client's information needs, . . . respects the privacy of clients and protects the confidentiality of the client relationship . . . 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, . . . maintains high standards of professional integrity.

Source: Medical Library Association (n.d.).

as opposed to more extrinsic rewards. For example, a cash reward for every contribution made to the knowledge repository will not necessarily result in valuable content, just a large volume of content. Another important value is to make sure the KM team does not unintentionally create second-class experts by identifying only a subset of knowledge workers as experts or community gurus. Everyone has valuable experiential knowledge to contribute. Protecting the intellectual capital of individuals and corporate intelligence of the organization is important through out the KM life cycle. It is also important to include values on social and cultural sensitivity—keeping in mind that KM is never one size fits all—and transparency for combating knowledge hoarding, or knowledge black holes. The latter are identified typically through social network analysis that exposes where knowledge goes in but no knowledge comes back out.

In the so-called utopian view, or KM nirvana, KM is perceived as a profession that

> enables organisations to capture essential knowledge and processes and make them available where needed, under the assumption that it will be collected and distributed accurately, appropriately and with good intentions, leading to efficiency, improved decision-making and protection of intellectual property. (Evans & McKinley, 2011, p. 58)

The corollary to the utopian view is the dark side of KM, which is characterized as

> the underlying motives for the use and impact of KM systems on individuals, the organisation and society. . . . Knowledge is distorted, suppressed or misappropriated due to personal or organisational motive. . . . The paradox of ethical issues such as freedom of information, privacy of data, the protection of intellectual property and the intellectual capital of organisations. (Evans & McKinley, 2011, p. 58)

The KM profession should always aim to be on the realistic or pragmatic side of these two extremes on the spectrum of KM values and professionalism. All processes and outcomes will not be perfect. The objective is to approach all KM activities without hidden agendas or motives other than helping knowledge workers learn from the accumulated experience and expertise of the organization.

Is the KM profession for you? Here is some food for thought to help you decide if KM is a good professional fit. As discussed earlier, KM jobs have different levels. At the very top is the strategic KM team and a CKO who is tasked with aligning KM to help the organization meet its goals. The KM implementation team requires project management skills for showing tangible value for KM activities and setting up collaborations with other units such as HR and IT. Junior- and entry-level KM professionals need to have excellent people skills, high emotional intelligence, excellent interpersonal and teamwork skills, and persuasive powers. They should also have tech skills and be able to carry out analytics, design workflows based on business processes, and interact with knowledge repositories, archives, and enterprise content managements and other organizational systems. Above all, they need to be able to communicate, learn continuously, and be comfortable in an environment of constant change (new people, different cultures and microcultures, and new tools).

KM professionals need to be comfortable with persuading people to agree despite not having formal authority. They are change agents. Not everyone in the organization will be comfortable with change, so KM professionals need to be good at communicating, coaching, and generally supporting knowledge workers through these changes. KM requires people who have the unusual combination of loving to work with people and with data, analytics, and systems. They also need to be comfortable being prescriptive: KM needs a strong voice to share proven practices and recommendations from benchmarking or evidence-based analytics. They cannot be neutral and simply summarize what might be useful. There will always be enormous quantities of content, so they should love reading, learning about new subjects, and being able to synthesize all this content. In addition, they need to be comfortable with presenting analyses, recommendations, and syntheses in presentations, videos, workshops, and elsewhere.

KM practitioners are good researchers and good learners. They need to be able to understand what the organization is trying to do, what they know, what they don't know, and what they need to know. They need to identify where expertise exists, including in subject matter experts, tools, and archives. The other key skill is analysis: for example, analyzing how well the organization learns from the past, how well its workers collaborate and share knowledge, and how they learn from external sources. In addition, they will assess such things as how much new knowledge is being created (innovation metrics), how much content is being reused (efficiency), how easy is it to find content and knowledgeable people (accessibility), and how much valuable knowledge is being preserved (organizational memory). Last, they periodically assess how KM friendly the culture is and compare with the baseline to see how well KM is being implemented (impact).

In summary, KM will never be a routine job given its complex environment. KM professionals will never be bored; they are always challenged and never know what to expect next!

Note

1. A website is dedicated to this role. See http://www.clomedia.com.

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14 Future of Knowledge Management and Concluding Thought

The gem cannot be polished without friction.

—Chinese proverb

What lies ahead for KM? It continues to evolve both as an academic discipline and as a field of practice. As KM continues to mature, it becomes more seamlessly integrated in peoples' mindsets, the organizational culture, business processes, and the technological tool kit. This chapter discusses promising trends, such as artificial intelligence (AI), and remaining gaps in KM education, practice, and research.

According to the Technology and Services Industry Association (TSIA), dedicated KM team members grow in number, more executives are involved in assessing the value of KM, KM strategies are becoming more sophisticated, and more applications use unified search (Burley, 2020). Unified search refers to a single interface and query for searching all content—documents, web pages, and community discussions—regardless of where it is physically stored.

The COVID-19 pandemic led to significant losses in collective organizational knowledge in the form of experience and expertise. Some refer to this as the Great Resignation or Great Retirement. Layoffs and retirements combined to create a break in knowledge continuity in all sectors of the economy, particularly with respect to tacit knowledge that is, by definition, at greater risk of being lost. Some evidence indicates that job mobility will continue to increase with younger knowledge workers, so the knowledge preservation and continuity challenges will continue to be significant in the future (Burley, 2020).

Behme and Becker (2021) declare that a clear majority of organizations expect work to continue in a hybrid mode, which will "require new ways of collaborating and knowledge sharing." They also note that organizations "said that creating and preserving knowledge across evolving workforces is important to their success over the next 12–18 months." Knowledge sharing will continue to be a high priority for all organizations in the future, and knowledge sharing will need to be adequately incentivized, transparent, and supported by technologies, training, and culture. Clark (2020) observes that the "future of knowledge management is going to be the [remote] digital workplace."

The future focus of KM professional practice is expected to be on better knowledge search and findability, improved expertise locator systems, digitally enabled communities of practice, and AI and other innovative technologies. AI and KM are expected to continue to provide integrated KM functionalities in the future (Dalkir, 2021). For example, IBM's Watson is an AI application that uses natural language processing to understand user questions and retrieve accurate responses to them (IBM, 2020). Applications such as Watson can be used to mine the buried knowledge in an organization's legacy documents, web content, and large volumes of data (big data). At UW Health, "AI helps with automatic synonym detection and understanding the provider's context so that the most relevant information appears highest in the search results" (Burley, 2020). Another example is AI chatbots that provide more humanlike interactions with online users to understand what they need (Clark, 2020). They make use of behavioral and sentiment analysis to continuously learn, adapt, and better interact with their users.

Garfield (2018) recognizes the following KM trends: despite strong resistance on the part of leadership, organizations will integrate social media in the workplace; folksonomies will increase because all knowledge workers can tag relevant content for their peers; and the major role for the KM group will continue to be "filtering out the noise and delivering just what is most needed." For example, KM can be added to AI tools to better detect evidence-based content versus fake content. Additional predictions for the next "big new things" in KM include better evidence-based KM, an international professional KM association, a Chartered Knowledge Manager certification, more open knowledge and open KM, more knowledge integration and cocreation across domains and business units, and the decolonization of KM (Boyes, 2019). The key challenge for KM will be intelligently filtering the massive volume of content to deliver value to individuals, teams, and organizations (e.g., Behme & Becker, 2021). Another expectation is an increased focus on managing multimedia content such as images and videos (e.g., Fallman, 2020) and adding multimedia interfaces to KM. For example,

> Many consumers have become well-acquainted with AI-powered assistants such as Alexa, in which information is retrieved and assembled, in near real time, in response to a spoken query—on just about any topic. (KM World, 2020)

> The field of knowledge management (KM) is constantly changing, and adding to its arsenal of tools, technologies and objectives. (Clark, 2020)

In terms of KM education and training, there is great potential to include some of the ISO 30401 KM standard guidelines. There should be more emphasis on KM governance and KM leadership (e.g., Johannessen, 2017).

In terms of KM research, gaps remain. Ahmad and Karim (2019) contend that more research is needed on knowledge sharing, the negative as well as the positive outcomes of sharing; more qualitative and more longitudinal research studies on KM are needed; and more multilevel KM research needs to be carried out (i.e., on all three levels—individuals, groups, and organization—and the interrelationships among them). KM is a complex phenomenon, and more complex research studies are needed to better understand both internal and external KM. The latter refers to, for example, interorganizational KM in multinationals but also in distributed stakeholder communities such as international development (e.g., the World Bank). Interorganizational collaboration can be defined as the

> enduring transactions, flows, and linkages that occur between two or among different organizations. The nature of [an] inter-organizational network lies in the sustained legal connection, common or complementary goals, and common bonds or social relationships among collaborative partners. (IGI Global, n.d.)

Creswell et al. (2021) looked at mechanisms that support or inhibit exchange of interorganizational knowledge on digital transformations to create a digital health-learning ecosystem across a national health service in England. The study found that formal processes put into place to initiate and reinforce knowledge transfer and learning accelerated the growth of informal knowledge networking and helped establish the foundations of a learning ecosystem. Formal networks were most effective when supported by informal networking. Interorganizational knowledge sharing was also enhanced by geographic proximity, shared culture and context, common technological functionality, regional and strategic alignments, and professional agendas. Creswell et al. (2021) remark that policy interventions are needed to promote informal knowledge sharing. One of the major challenges lies in finding ways to bridge the flows of knowledge between different stakeholders, especially sticky knowledge that is hard to acquire because it is strongly linked to its context of use. The study showed that intermediaries helped extract and collate lessons from particular implementations and applied them to broader applications throughout the ecosystem. Intermediaries such as knowledge brokers or KM team members connected key people across networks, which in turn led to increased social learning.

More theoretical and empirical research is needed on how to promote effective KM in interorganizational knowledge creation, sharing, preservation, and application processes. Al-Busaidi and Olfman (2017) studied interorganizational knowledge sharing in the education and health sectors. Key factors in sharing were knowledge workers' intentions to share, trust in their peers, ease with information and communication technologies to share knowledge, and legislation that supported interorganizational sharing. Knowledge repositories were useful tools for sharing knowledge between organizations. The study's findings indicate the important role played by individual and organizational factors but also by social, technical, and political interorganizational factors. Finding that most investigations are empirical studies of vertically linked supply chain organizations, Al-Busaidi and Olfman (2017) remark,

> Little is empirically known about the enablers of knowledge sharing in systems that connect organizations in horizontal linkages in a specific industry or sector. (p. 110)

Meier (2011) agrees: "This topic continues to gain momentum but there is still considerable room to advance our comprehension in this field" (p. 2). Loebbecke, Van Fenema, and Powell (2016) also uncover a need for more theoretical and empirical investigations into interorganizational knowledge sharing. To better understand how to manage these interactions, they call for studies that look at intentional knowledge sharing between organizations: sharing tacit and explicit knowledge and sharing uni- and bidirectional knowledge. They view interorganizational KM as an extension of the resource-based view of the firm because much value can be gained in sharing knowledge resources with external partners (horizontal sharing) and with supply chains (vertical sharing).

In 2019, Agostini et al. advocated for a better understanding of interorganizational KM to help both researchers and practitioners reach a more nuanced understanding and theory of KM and a better understanding of how to foster knowledge processing across partnerships and networks. Interorganizational KM is complex because of the many types of interorganizational relationships, such as alliances, mergers and acquisitions, franchising, networks, and ecosystems. Managing a supply chain is vastly different from managing an open innovation partnership. Trust, a necessary ingredient in successful knowledge sharing, is expected to play a significant role in interorganizational knowledge sharing, much as it does in intrafirm sharing. But trust is not enough, and critical research gaps in the following areas still remain:

- Sharing of different types of knowledge (degree of tacitness, managerial vs. technological knowledge)
- Sharing across different types of interorganizational relationships (innovation-oriented vs. marketing-oriented)
- Size of the organizations involved (small- and medium-sized enterprise, multinational)

- Risk of knowledge-leakage opportunism, copoiesis (joint creation of knowledge by different entities)
- Institutional context, role of intermediaries
- Role of geographic proximity, colocation
- Longitudinal studies

In 2020, Agostini et al. conducted a bibliometric analysis to look at the evolution of research in this area to address some of these research gaps. Publications from 1998 to 2019 showed a steady growth in the number of publications on KM in interorganizational contexts. Key topics included coopetition, open innovation, and strategic alliances. Agostini et al. (2020) call for further research in this area given the growing importance of interorganizational relationships with partners as sources of valuable knowledge and innovation. For example,

> profiting from partnerships requires significant resources and efforts to develop routines that foster interaction, especially when coopetitive [between competing organizations] relations are in play because the collaboration partners are simultaneously competitors. (p. 465)

Interorganizational sharing that involves competing organizations is sometimes termed *coopetition*, or collaboration among competitors (Spender & Grant, 1996). A study by Spender and Grant (1996) found that most research focused on a specific set of organizations or a specific context such as joint ventures, so broader studies are needed. Many studies focus on innovation as the goal of interorganizational collaboration. Studies should be extended to other objectives such as international growth or marketing. Also needed are studies that look at organizations of different sizes and studies that look at more than a single relationship to include interorganizational knowledge sharing across multiple groups of interconnected organizations. Spender and Grant (1996) also reveal an overemphasis on positivist studies. There is therefore a need for more studies using the social constructivist lens of knowledge and knowledge sharing. These should include more case study and ethnographic research to arrive at more nuanced theoretical understanding of this phenomenon. Incorporating social network perspectives will also be important. Social processes, or soft KM factors, are particularly important in practitioner literature.

Some of these research gaps are general gaps in the discipline and practice of KM. Examples include the role of work-task interdependence on knowledge-sharing effectiveness; a critical assessment of knowledge sharing because it can lead to both positive and negative outcomes (for example, sharing fake news and misinformation); and more qualitative research on knowledge sharing practices to better understand why some are successful and others are not. Ahmad and Karim (2019) note that most studies to date have been quantitative and point out the limited number of longitudinal studies in KM. Many phenomena, such as cultural change, require a significant amount of time, and multiyear studies are needed to better understand these transformations. Finally, they identify the need for multilevel KM research, in which all three levels—the individual, the group, and the organization—are addressed. Most studies have looked at only one level, but this provides only a glimpse into part of the KM processes that are taking place.

KM objectives are ambitious and almost always involve change—in the individual, the group, and the organization. As a result, they are almost never easy or straightforward.

Finally, more research is needed on how KM can contribute to more organizational innovation. For example, Pugh and Stewart (2013) make the case that KM needs to be better integrated with innovation management, just as closely as it has been with change management. KM practitioners are well positioned to be great innovation conveners" because they often move across silos, are experienced facilitators of groups, and have a knack for reflecting on the past with an analytic eye (and help others to do so). They are often the first to spot potential synergies (generalization of practices to other areas), they know how to visualize and how to mine content, and they are often the bridge between individuals and groups and the larger organizational structures. KM people are adept at recognizing and managing tacit knowledge, which obviously plays a significant role in creative processes. KM processes can be easily harnessed to address creativity and innovation goals. For example, the KM maturity processes that delineate different maturity phases can be readily applied to the generation of an idea, the vetting of that idea with peers, and ultimately the patenting of an invention. KM with innovation management can lead to smarter innovation and ultimately create societal value.

The future will likely see an ever-increasing information overload. Organizations cannot be efficient or effective when they have so much content in so many different systems—and no way of preventing this content from proliferating. Knowledge workers have increasing difficulty in locating specific items needed for their work, let alone analyzing this content for patterns and insights. Knowledge has never been so far removed from actions and decisions—which is what KM is all about. Valuable knowledge is located in just too many places, and it is simply not possible to search and find it all. KM—and information management—will need that ideal environment where access is personalized, customized, and packaged so that users can make use of it to get their jobs done. It is possible to continue to make tools smarter, so that they "know" who we are, what we are working on, and what we are trying to do—all, ideally, in real time. KM needs something like a GPS to get us to the knowledge sites we need (and suggest others we might want to visit). Ideally, smart tools will aggregate and even mine the content we need and help us apply and share it with our peers. This includes aggregating tacit knowledge as well (e.g., by pointing to people you should contact).

Information management and information technologies will continue to integrate big data and predictive analytic tools to create and manage knowledge. KM practitioners are collaborating more with data aggregators and data analysts, as well as other knowledge workers, on the creation of data and metadata. There is also more focus on standardization of KM processes, KM content, governance, and team development. The KM program at Columbia University combines not only information management and KM but also collaboration. The key focus is to drive growth, productivity, and societal impact. This encompasses the two major dimensions of KM: intellectual asset management and collaboration management (through feedback loops and collaborative behaviors). This is compatible with two major goals of KM—operational efficiency through reuse and building of innovation capacity. There is further resonance with the two major KM processes: sharing knowledge among peers today and preserving knowledge for future reuse by future, unknown employees of the organization. Finally, another duality: KM needs to not only leverage internal knowledge (such as best practices and lessons learned) but also look outward to the extended networks of knowledge workers and organizations to learn, innovate, and ultimately contribute to the broader societal KM goals.[1]

In the short term, KM will improve the use of information and knowledge resources available to a company. In the longer term, KM will succeed when it becomes invisible: when it has become part of all knowledge workers' jobs.

Note

1. K. Pugh, personal communication.

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