Chapter 5

Knowledge Management

Learning Objectives

Upon completing this chapter, you should be able to:

- Define knowledge and knowledge management within a business context.
- Explain the importance of knowledge management in contemporary enterprises.
- Identify technologies that are most useful for capturing, organizing, distributing, and sharing knowledge within an enterprise.
- Discuss the impact of Intranets and groupware on knowledge management.
- Explain how to formulate a knowledge management strategy.
- Identify major requirements and issues for designing an enterprise knowledge architecture.
- List and describe the steps for implementing knowledge management projects.
- Identify common pitfalls for enterprises seeking to implement knowledge management and explain how to avoid them.

5.1 INTRODUCTION

Knowledge management (KM) is an emerging but important area of study and practice. The past decade has witnessed the rapid evolution of concepts such as the knowledge worker, knowledge economy, intellectual capital, and knowledge as a tangible asset. More and more, business leaders and consultants talk about knowledge as the chief asset of organizations and the key to a sustainable competitive advantage. Knowledge management programs have been launched at countless companies. The growing interest in this movement has even spawned new executive titles such as Chief Knowledge Officer (CKO), Director of Knowledge Networking, Corporate Knowledge Strategist, Vice President for Strategic Technology and Knowledge Management, Knowledge Management Initiative Leader, and Chairman for Knowledge Sharing. Additional details about emerging KM jobs are provided in Figures 5-1 and 5-2.

The worldwide market for KM software is forecast to grow from $515 million in 2000 to $3.5 billion by 2004, according to a report by the market research firm Ovum. Most major software vendors recently have made major commitments to this market,

EMERGING JOB TITLES

Chief Knowledge Officer (CKO)
Director, Knowledge Networking
Consultant, Corporate Quality
Head of Knowledge and Differentiation Program (IBM United Kingdom Limited)
Knowledge Management Initiative Leader (Hewlett-Packard Consulting)
Chairman for Knowledge Sharing (Buckman Laboratories)
Director, Collaboration and Knowledge Sharing (Texas Instruments)
Corporate Knowledge Strategist (National Security Agency)
Senior Technical Associate—Knowledge Management (Shell Chemicals)
Program Director, Knowledge Management (World Bank)
Vice President, Strategic Technology and Knowledge Management
Information Technology Analyst

Figure 5-1 Emerging job titles

including IBM/Lotus Development and Microsoft. U.S. businesses paid $1.5 billion to consultants for KM advice in 1999 and are forecast to pay $5 billion a year for it by 2001, according to the Gartner Group marketing research firm. In a 2000 survey by Ernst & Young's Center for Business Innovation and Business Intelligence, 94 percent of respondents said they believe that they could leverage the knowledge of their organizations more effectively through deliberate management. In the same survey, more than 40 percent said they already had started or completed KM projects; another 25 percent said they planned to do so within the next year.

How are enterprises using knowledge management? What are the most common applications? Figure 5-3 shows objectives of knowledge management cited by major corporations in a recent benchmarking study conducted by the American Productivity and Quality Center.[1] The most common objective in this survey was transferring best practices, followed by increasing employee capabilities, providing customer/market information, supporting business process improvement, and leveraging intellectual capital.

Some of the major corporations that have adopted knowledge management include British Petroleum, Monsanto, Hewlett Packard, PricewaterhouseCoopers, Andersen Consulting, Chevron, and Texas Instruments. Chevron calculates that it has saved more than $650 million since 1991 by sharing best practices among managers in charge of energy use at its oil refineries. General Motors has created an electronic performance support system (EPSS) that captures knowledge that is created when employees are working. Mechanics use notebook-sized computers that deliver learning materials and job aids when and where they are needed. When mechanics complete their repair work, they describe the problem and its resolution using voice recognition to relay information into the computer. This information is reviewed by technicians back at headquarters, and new competencies and experience get turned into new knowledge for the EPSS system. The system is changing
not only the way the mechanics learn but also how they work. Mechanics can work on a wider variety of vehicles because the knowledge they need is built into the EPSS.

A Taxonomy of K-Careers

Based on more than a decade of knowledge work, Debra Amidon, founder of Entovation International, and Clint Ackerman, CEO of the Network Connection and Knowledge Jobs, have devised a classification system that divides knowledge professionals into eight categories based on skill sets and backgrounds. They use the classification system to help candidates determine what positions are appropriate for their skills and to help companies determine what kinds of professionals they need.

Knowledge and innovation professionals:

Individuals have strong backgrounds in shaping and formulating knowledge-based programs. Many have developed best practices for global Fortune 1000 companies. Most are highly skilled in a variety of disciplines, including business process improvement, innovation, performance measurement and modeling, case history, facilitation, strategic integration, and developing best practices. Chief knowledge officers are part of this group, as are consultants.

Knowledge management professionals:

KM professionals have expertise in implementation. They ensure that a company gains from management of knowledge. They are involved in all phases of innovation (knowledge creation, knowledge acquisition, knowledge sharing, knowledge conversion, and knowledge commercialization). Their career background could be in any of a number of functions, including finance, human resources, quality. IT, R&D, manufacturing, sales, or customer service.

Knowledge catalogers, researchers, and media specialists:

These are Web site, Internet and intranet developers, librarians, catalogue specialists, content developers, communicators, software designers and developers, middle managers, and others who create the knowledge networks and links.

Knowledge and competitive intelligence professionals:

The emphasis for these professionals is on competitive intelligence. They are heavy on research and have the ability to create and develop solid analyses. They have online research savvy mixed with the ability to cogently and concisely present ideas. Their writing and presentation skills are strong.

Knowledge and strategic integration professionals:

Composed of top strategists, thinkers, planners, marketers, and individuals with senior management experience, these workers make planning and strategy the engine for business improvement and growth.

Knowledge academicians, theorists, and visionaries:

This group focuses primarily on discussion within an academic setting and developing and testing models and applications. Visionaries are thought leaders who are frequently well in front of the practice. These individuals make outstanding speakers and can stimulate your organization's thinking.

Knowledge facilitators, trainers, and corporate educators:

These individuals focus on learning and education ma corporate setting. Many have created outstanding models and programs for linking external and internal audiences, designing and developing curriculums, implementing distance learning, and creating custom-tailored courses for executives and senior managers.

Knowledge and expert systems professionals:

One facet of knowledge and knowledge management is expert systems and how to institutionalize corporate knowledge. Individuals in this area include systems specialists, technologists, chief information officers, technology transfer specialists, expert systems engineers, project managers, and others who primarily focus on information technology.—E.J.

Figure 5-2 A taxonomy of K-careers

Source: Ellie Jones, "Fast-Track Knowledge Careers: Managers Who Combine Technical, Business and Social
Skills Will Be the Winners in the KM Career Game." *Knowledge Management Magazine* 2 (September 1999): 40.

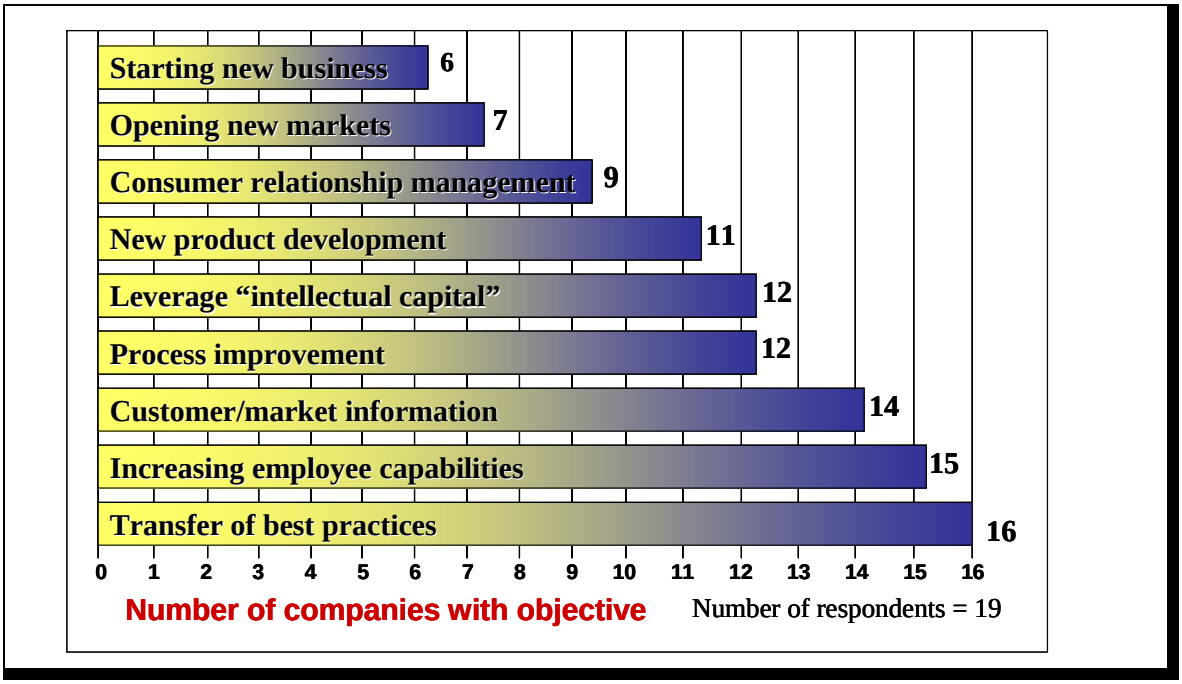


Figure 5-3 Objectives of knowledge management

Figure 5-3 Objectives of knowledge management
Source: Reprinted with the permission of The Free Press, a Division of Simon & Schuster, Inc., from *IF WE ONLY KNEW WHAT WE KNOW:* The Transfer of Internal Knowledge and Best
Practice by Carla O'Dell and C. Jackson Grayson,Jr. with Nilly Essaides. Copyright © 1998 by Carla O'Dell and C. Jackson Grayson,Jr.

5.2 WHAT Is KNOWLEDGE MANAGEMENT?

Knowledge management as an emerging concept is not yet well defined. As a construct, *it* has come to mean many things to many people. It includes work flow, document control and distribution, e-mail, performance support, best practices, and collaborative computing. It also can include Intranets, Extranets, e-business, customer relationship management, business intelligence, data mining, and knowledge portals. All of these are discussed in various ways by different sources in relation to knowledge management.

The idea of the importance of knowledge is not new. Yet as a concept and an organizational process, knowledge management takes on an entirely different meaning. The rapid growth in popularity of this concept has made it difficult to sort out the hype from the reality~ As 9ften happens when a new concept becomes popular, there has been a rush to rename existing technologies or products to make them more marketable. As a result, systems that have been around for a long time, such as artificial intelligence (Al), expert systems, databases, and document management systems, now are touted as knowledge management systems. What, then, are we talking about when we say

knowledge management? Many sources offer definitions of KM with varying degrees of consistency.

The American Productivity and Quality Center defines the term *knowledge management* as "the broad process of locating, organizing, transferring, and using the information and expertise within art organization."[2] According to O'Dell and Grayson in their book *If Only We Knew What We Know*, "Knowledge management is a conscious strategy of getting the right knowledge to the right people at the right time and helping people share and put information into action in ways that strive to improve organizational performance."[3]

The Gartner Group, a prominent marketing research firm, defines knowledge management as:

> …..a discipline that promotes an integrated and collaborative approach to the process of information asset creation, capture, organization, access and use. Information assets include databases, documents, and most importantly, the uncaptured, tacit expertise and experience resident in individual workers.[4]

In his book *Business @ the Speed of Thought,* Bill Gates describes KM this way:
Knowledge management as I use it is not a software product or a software category. Knowledge management doesn't even start with technology It starts with business objectives and processes and a recognition of the need to share information. Knowledge management is nothing more than managing information flow, getting the right information to the people who need it so that they can act on it quickly. It goes back to Michael Dertouzos' idea that information is a verb, not a static noun. And knowledge management is a means, not an end.[5]
The editors of *Harvard Management Update* define knowledge management simply as a formal, directed process of figuring out what information a company has that could benefit others in the company, then devising ways of making it readily available.[6]
Knowledge management, according to Daniel Tkach, IBM worldwide marketing manager for Knowledge Management Solutions says:
Knowledge management is a discipline used to systematically leverage expertise and information to improve organizational efficiency responsiveness, competency and innovation. Systematically means that the discipline does not rely on just water cooler conversations, but on planned processes, technology and behaviors. Knowledge management leverages all the key resources that a company has already and that can be put to use in a more effective way.[7]
According to Thomas Davenport (professor at the University of Texas and noted KM guru), Knowledge management caters to the critical issues of organizational adaptation, survival and competence in the face of increasingly discontinuous environmental change. Essentially, it embodies organizational processes that seed synergistic combinations of data and information processing capacity of information technologies, and the creative and innovative capacity of human beings.[8]

In summary knowledge management is the concept of managing organizational knowledge, but in the sense of facilitating learning and collaboration—not in the old sense of controlling information. The old concept of sharing information on a *need-to-*

know basis was a control concept as if information were a finite resource. In contrast, knowledge management recognizes knowledge as an infinite resource or asset. As pointed out by Jan Duffy in *Harvesting Experience: Reaping the Benefits of Knowledge,* knowledge is different and much more difficult to manage than other assets. Rather than become less as it is used, new knowledge is developed as existing knowledge is shared. Knowledge is a dynamic, evolving product that depends on an organization and its network of relationships for its existence. Processes that encourage creativity and innovation—processes that are seeded by new knowledge as it is being created—enhance the value and growth of knowledge. Knowledge value comes from processes that allow continuous progress and that minimize regressive relearning and reinvention of the wheel. The value of knowledge increases dramatically when it is used and diminishes when it is allowed to atrophy. Perhaps the best way to think of knowledge management is as knowledge plus process.

Knowledge management = knowledge + process

Let's briefly examine both components of this equation. What precisely is *knowledge,* and how is it different than data and information? Organizational knowledge consists of *explicit knowledge* (knowledge that is documented and public) and *tacit knowledge* (undocumented and personal). Explicit knowledge generally comes in the form of documents, manuals, financial statements, databases, books, and other print or electronic formats. Tacit knowledge, in contrast, is found in the heads of employees. It is context sensitive, dynamic, experienced-based, and often subjective or intuitive. It consists of such things as judgment, know-how, and perception and is difficult to document and explain. Both types of knowledge are important.

Knowledge is broader than intellectual capital, which generally refers to the commercial value of trademarks, brand names, patents, licenses, and other intellectual property. It also is bigger than information or data although it is related to both. Organizations are flooded with data and information, but until people use it, it is not knowledge. Although it has meaning, information without context adds little value to the decision-making process. Knowledge is information that has been validated and that has context, which provides the understanding associated with knowledge. Knowledge comprises a fluid mix of contextual information, data, experience, values, and insight that provides a framework for evaluating and incorporating new experiences and information. A simple working definition is: "Knowledge is information in action."[9]

Although knowledge creation is a natural phenomenon, the *process* part of the knowledge management equation implies that an organization can improve performance by employing purposefully designed strategies for creating, identifying, collecting, organizing, and sharing or transferring knowledge. Note that it does not imply management in the sense of control, but rather in the sense of facilitating and nurturing the creation and sharing of knowledge. It suggests the concept of the learning organization, as articulated by Peter Senge in *The Fifth Discipline.* In formulating strategies, some enterprises have adopted a mantra of becoming a learning organization while other enterprises use the rhetoric of leveraging knowledge as an intellectual asset. Although the rhetoric may vary, the intent is the same: making shared learning or knowledge management a high priority.

5.2.1 Evolving Concepts and Directions

The knowledge management industry has roots in several disciplines. KM appears to represent a synthesis of these various distinct markets or disciplines—not a progression from any one of them. Perhaps it is this convergence of several threads that accounts, more than any other factor, for what seems like a sudden explosion of interest in KM. Moreover, this convergence is consistent with emerging models of organizations. Most modern business models involve people in teams coming together on a project basis, then moving on to new relationships. All these models are process oriented, not bound by functions, industries, or structures. Knowledge underpins their continuous existence.

Key disciplines or threads from which KM has roots are summarized in the sections that follow. These varying roots account at least in part for some of the current variation in terminology, perspectives, and recommended approaches to KM..

1. Best practice. transfer. One of the most dominant themes is the systematic transfer of best practices. According to a study conducted by the American Productivity and Quality Center, best practice management was the one strategy pursued by 100 percent of the firms implementing knowledge management approaches.[10] This is the approach emphasized by O'Dell and Grayson based on research and work with numerous *Fortune* 500 firms.
2. Information and records management. KM also has roots in document management, both paper and image. The Association of Information Image Management (AIIM) and ARMA International, the former Association of Records Managers and Administrators, have a huge presence in the knowledge management market. This approach reflects a strategic view of managing and safe-guarding information resources from a corporate perspective. It is the approach reflected by Jan Duffy in *Harvesting Experience: Reaping the Benefits of Knowledge.*
3. Organizational learning and innovation. The concept of the learning organization generally is associated with Peter Senge, author of *The Fifth Discipline.* It embodies the notion that organizations as well as individuals can learn from experience, and it emphasizes the need for information sharing and collaboration. Senge defines the learning organization as "a group of people continually enhancing their capacity to create what they want to create."[11] This is essentially a human resources approach and reflects the changing view of organizations from a mechanistic industrial era to the information age, from a structural view to a process view, and from adaptive learning to generative learning. Whereas adaptive learning has to do with coping, "generative learning emphasizes continuous experimentation and feedback in an ongoing examination of the way organizations go about defining and solving problems."[2] Generative learning, in Senge's view, requires systems thinking, shared vision, personal mastery, team learning, and creative tension. The concept of the learning organization is increasingly relevant given the growing complexity and uncertainty of the twenty-first-century organizational environment.
4. Electronic performance support systems (EPSS) and computer-based training (CBT). One of the early precursors of KM is electronic performance support, the concept of just-in-time delivery of online reference, training, and help. During the 1980s hundreds of firms focused on creating online performance support and computer-based training using tools such on Goal Systems Preference and Phoenix CBT authoring system. This approach is described in books such as *Designing*

Elec4ronic Performance Support Systems by Gloria J. Gery and *Designing and Writing Online Documentation* by William K. Horton.

5. Database management and data warehousing. Another school of thought that has received a great deal of attention is based on IS methodologies related to data warehousing and data mining. This approach is represented in works such as the book by Thomas H. Davenport and Laurence Prusak, *Working Knowledge: How Organizations Manage What They Know* (Harvard Business School Press, 1997).
6. Internet and e-business (and more recently customer relationship management, business intelligence, and portal technologies). This appears to be the dominant focus *of Knowledge Management Magazine, Business Intelligence for Strategic Decision Makers,* aimed at executives interested in organizational and technological knowledge-management strategies.
7. The knowledge economy and knowledge as a corporate asset. Another perspective is based on economic concepts related to productivity and measuring economic value in the new economy. Economists and business leaders today are concerned with whether traditional accounting and statistical models are capable of calculating the true productivity gains created by knowledge in the new economy. Recent works in this area include those by Paul A. Strassmann, columnist on knowledge metrics for *Knowledge Management Magazine* and Thomas A. Stewart, author of *Intellectual Capital: The New Wealth of Organizations.*

5.2.2 Major Trends in Knowledge Management

When *Knowledge Management Magazine* started publishing in October1998, the notion of KM for strategic advantage was treated with more than a little skepticism by much of the business community~ including many opinion makers in the corporate computing market. By the end of the century—just 15 short months later—the landscape had changed considerably, with explicit support coming from the likes of Xerox, IBM, the Big Five accounting firms, Bill Gates and even Federal Reserve Board Chairman Alan Greenspan. More significantly, the connection of knowledge to almost every other aspect of business grew more evident, such that the concepts of the knowledge worker, the Knowledge Age, and the knowledge economy—if not necessarily of knowledge management—now are recognized widely among the general public.'[3]

A list of top 10 trends in KM, compiled *by Knowledge Management Magazine* in December 1999, included the following:[14]

1. The rise of the corporate portal as the defining KM application. The advent of corporate portals according to the editors of KM *Magazine,* crystallized a union of technology, function, and need. The *portal,* in effect, makes collaboration, business intelligence, and unstructured text-search capabilities available through a single interface. The portal is a natural evolution of e-commerce and Internet and Intranet technologies.
2. The recognition of knowledge economics as the context for next-century business. Economists in the U.S. Labor Department have acknowledged the new economy with a substantially revised economic classification system— the first such revision since the 1930s. The old Standard Industrial Classification (SIC) code system will be replaced with a new North American Industrial Classification System (NAICS),

which will be expanded 35 percent to accommodate information technologies and information-based industries. In a September 1999 speech, Federal Reserve Board Chairman Alan Greenspan endorsed the notion that a combination of intellectual capital, technology~ and evolving know-how are responsible for increased economic productivity in the United States. According to Greenspan, such icons of America's earlier might as steel mills, petrochemical complexes, auto assembly plants, and skyscrapers are being replaced with "economic value best symbolized by exceedingly complex, miniaturized integrated circuits and the ideas—the software—that utilize them. Most of what we currently perceive as value and wealth is intellectual and impalpable."

3. Corporate initiatives target strategic KM. Bipen Junnarkar, vice president of KM/chief knowledge officer at Gateway, pointed out that companies now are looking clearly at KM as a way to differentiate their companies from the competition and create tangible value. "The focus in KM has evolved from integrating information to leveraging human interactions to just beginning to apply knowledge-based products and services for the extraction of value." Another sign of KM's ascending strategic role in the enterprise is that the Big Five firms such as PriceWaterhouseCoopers, Ernst & Young, and Andersen Consulting started up substantial KM consulting practices in 1999.
4. Organizational behavior focuses attention on human-resources aspects of KM. Recognition is growing that the cultural factors influencing KM are paramount to its success. Accordingly, the movement is broadening its impact from within the IT department to organization-wide management initiatives focused on organizational learning, collaborative work processes, and change management. "There's a much greater degree of interaction between knowledge management and those concerned with human resources, training, and management development issues. If there's a dominant group talking about KM issues now, it's shifted to HR people."[5]
5. Microsoft also embraces KM. In *Business @ the Speed of Thought*, Bill Gates prescribes knowledge-focused strategies for e-business. Microsoft has announced a platform-wide KM initiative, introducing a new portal-like product, Digital Dashboard, which was announced as the front end for other KM components such as file-sharing on the Web, mobile connectivity solutions and enhanced computer interfaces.
6. Intellectual capital as a corporate asset. Intellectual capital, which has long been regarded as an intangible quality of individuals and organizations, is gaining ground as a tangible line item on the corporate balance sheet. The most prevalent model has been the *balanced scorecard approach*, which makes the assumption that "innovation" and "learning and growth" relate directly to future organizational performance. Various accounting bodies and economists are making progress in developing methodologies to measure the value of intellectual capital.
7. Theory gives way to emergence of practical KM. Enough people have been implementing knowledge management projects to compile a significant body of knowledge about what works and what doesn't. More and more KM piojects are being initiated by line-of-business managers without necessarily labeling them as knowledge management projects.

8. Customer successes show tangible results. A growing number of KM success stories show significant benefits in streamlining work flow, improving customer relations, reducing cycle times, or increasing capacity to process business.
9. Alignment of IT priorities and business strategy. Implementing KM demands a close alignment between the IT side and the business side of the house. KM is not a discipline unto itself. Rather it is a series of tools, techniques, processes, and concepts that are an aspect of the larger domain of executing business processes.'[6]
10. IBM and Lotus led the convergence of business intelligence and knowledge management by coordinating their approaches to KM. Thus, IBM become an advocate for the convergence of structured and unstructured information even before corporate portals began to make that convergence a reality. In addition, IBM's Global Services consulting group focuses on the KM service element, and its Institute for Knowledge Management has emerged as a center of thought leadership for the KM community.

5.3 KNOWLEDGE MANAGEMENT IN ACTION

An enormous amount of valuable knowledge, both explicit and tacit, is available within most enterprises. Information technologies can provide access to vast reservoirs of knowledge. For example, workers can surf the Internet to seek out new ideas and developments. Industry associations provide online knowledge-sharing forums. Enterprises are working more closely with suppliers and customers, sharing information and experience to streamline operations. Moreover, partners, alliances, mergers, joint ventures, and even customers are potential sources of valuable knowledge. Seven primary sources of knowledge that enterprises commonly tap into when implementing knowledge management systems are described briefly here.

- Best Practices. One of the fastest, most powerful ways that companies can manage knowledge is through the systematic transfer of best practices. *Best practices* can be defined as "those practices that have produced outstanding results in one situation and that could be adapted for another situation."[17] "Managing knowledge and transferring best practices is simple in concept but difficult in execution."[18]
- Corporate Memory. Corporate memory refers to the enterprise's corporate records, official documents, reference manuals, procedure manuals, policies, and other pertinent business knowledge. For most contemporary enterprises, it includes a vast archive of digital records, as well. It also encompasses the accumulated knowledge, experience, expertise, strategies, stories, assumptions, methodologies, and history of an enterprise as these exist in its employees.
- Data Warehouses and Other Corporate Databases. Most large organizations today have vast amounts of data stored in computer files and databases. Data warehouses and data mining are ways of trying to get at this information to make it more useful for multiple purposes.
- Communities of Practice. *Communities of Practice* are naturally occurring groups of people who come together out of a common interest either on an informal or a formal basis. Participants are motivated by a desire to use and develop their skills and competencies and to work together on issues of common interest.

- Current Operations. Enterprises constantly are generating new knowledge from operations. In today's fast-paced environment, it is extremely important to capture and share this new experience. Enterprises frequently fail to learn from success stories and failures alike, which often go relatively unshared and unanalyzed. Equally devastating, enterprises often learn the wrong lessons or draw the wrong conclusions from current successes or failures. This occurs either because the experience is not adequately evaluated or because it is interpreted in light of past experience (i.e., old paradigms), which may no longer be applicable in today's changing business environment.
- Innovation and Generation of New Knowledge. It is clear that the best knowledge management systems foster and capture new learning and innovation, not just share existing knowledge.
- Outside Information. In addition, enterprises are looking outside their own walls for sources of important knowledge. As enterprises form closer alliances with suppliers$_1$ outsourcmg vendors, and others, these partners also are being looked to as sources of critical knowledge. Outside contacts can be important sources of knowledge about industries, economics, marketplace trends, customers, and so on.

5.3.1 Knowledge Management and Individual, Group, and Organizational Performance

Much of the current focus on knowledge management deals with managing knowledge on an enterprise level. However, KM also applies on the group and individual levels, and these projects can yield significant benefits. Despite what the conventional KM wisdom suggests about serious efforts to manage organizational knowledge requiring broad scope, top management commitment, and major resource allocations, smaller-scale projects can and do pay off. KM programs also can start small and grow from the ground up.[19] On the other hand, it cannot be assumed that an increase in individual learning automatically leads to an increase in organizational learning. For knowledge to be transferred effectively across the enterprise, attention should be given to how work groups might learn from one another and how this will facilitate continuous improvement.

Thus, it is important when initiating KM projects to be clear about which level(s) is being targeted and what the objectives are. Attention must be paid to the connections between knowledge and learning at the individual, group, and enterprise levels. Explicit strategies are needed to capitalize on knowledge resources in a systematic way to increase innovation, productivity, and performance.

5.3.2 Enterprise Knowledge Management Environments

Thomas Davenport and Laurence Prusak studied various KM projects and identified three broad types of KM objectives on an enterprise level.[20]

1. Attempts to create knowledge repositories. The typical goal of knowledge repositories is to take knowledge embodied in documents—memos, reports, presentations, articles, and so forth—and organize it so that it can be stored and

retrieved easily. A somewhat less structured forum of accumulating knowledge is the discussion database, in which participants record their own experience on an issue and react to others' comments. Three basic types of repositories are:

External knowledge (e.g., competitive intelligence);

Structured internal knowledge (e.g., research reports); and

Informal internal knowledge (e.g., discussion database full of know-how). Davenport and Prusak studied an automobile company that compiled an external repository of competitive-intelligence knowledge, encompassing analyst reports, trade journal articles, and external market research on industry competitors. Using a software tool called GrapeVINE, the knowledge managers for this project could route information or knowledge on different topics to managers with a specified interest in that topic. Items of particular importance could be prioritized and sent to everyone, thus making the information or knowledge in the system more accessible and useful.

2. Attempts to create knowledge access. Another type of project is providing access to knowledge or facilitating its transfer among individuals. Whereas knowledge repositories capture knowledge itself, knowledge access projects focus on the possessors and prospective users of knowledge. The primary objective is to find the individual with the knowledge one needs, and then successfully transfer that knowledge from one person to another—a sometimes daunting process. Furthermore, knowledge access projects vary in their technological orientation.
3. Attempts to improve knowledge environment and cultures. A third type of project is to establish an environment conducive to knowledge management. This type of project intends to measure or improve the value of knowledge capital. Objectives include building awareness and cultural receptivity, changing behavior as it relates to knowledge, and improving the knowledge management process. For example, at one direct marketing firm, the goal of KM efforts was to increase awareness and reuse the knowledge embedded in client relationships. The chief knowledge officer, who had no staff, worked through the education and exhortation of others.

Industry studies show growing adoption and growth of KM in business.[2,] Although KM gained its first solid foothold in professional services and a few other industries, many other organizations today are actively developing KM programs, including communications, manufacturing, financial services, and government. KM also is becoming less technology focused and more driven by specific business goals. The applications that enterprises are focusing on to achieve their goals, according to the survey, involve knowledge sharing, best practices, and customer-relationship management (see Figure 5-4).

5.3.3 Small-Scale Knowledge Management Projects

As pointed out earlier, many KM proponents believe that KM does not have to be implemented on an enterprise scale to be effective. Although no one denies the value and desirability of having an enterprise knowledge management strategy and top-level leadership in fostering a culture of learning and collaboration, ample evidence exists of good results achieved with smaller-scale KM projects. Thus,

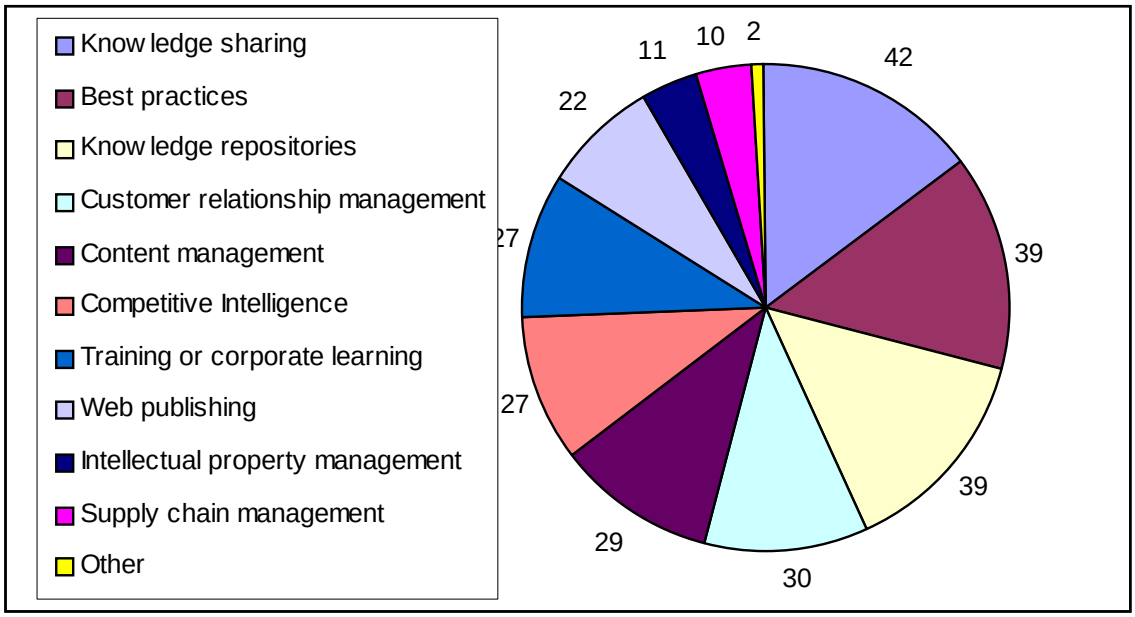


Figure 5-4 Current business applications of KM initiatives
Source: Greg Dyer, IDC State of the Market Survey: KM Crosses the Chasm, published in *Knowledge Management Magazine* 3 (March 2000): 52.

sometimes the most effective approach to implementing a KM initiative is to look for low-cost small wins in a single department or community of practice.

When planned and implemented effectively, a small, local KM project can produce immediate benefits and be integrated effectively with the corporate KM program later. Even if it ultimately has to be redesigned to integrate with corporate directions, chances are that everyone involved with the project learned a great deal about what works and what doesn't, which will help ensure the success of future projects. Moreover, early successes can help build needed support for larger-scale projects. "In fact, a collection of carefi4ly conceived, small-scale knowledge projects are more likely to have a positive cumulative impact than any single attempt at enterprise-level change, which often requires enormous amounts of time, resource, and cultural adjustment."[23]

With smaller-scale projects, it is especially important to define the project scope carefully and to develop a realistic estimate of the time and resources required to complete it. In most cases, the scope should be limited to achieving a few clearly defined goals and staying focused on achieving them. One of the best ways to do this is to avoid starting by attempting to define what knowledge or information is needed. It is better to concentrate on why the information is needed and how it is going to be used. Is the goal to expand the scope of a specific group of workers? Is the goal to empower workers who previously did not have adequate information to make important decisions? Is the goal to improve customer service by providing access to customer records so that service representatives can answer inquiries on the first call? Once the goal is clear, it is much easier to define the scope of required information and knowledge and the most appropriate way to organize, capture, and present it.

The other critical point in controlling the scale of a project is the selection and integration of technology. It's important to remember that technology is the enabler, not

the goal. Options might be limited by budget, but that does not necessarily have to handicap the project. A limited budget doesn't mean working with outdated or inadequate technology. The technology selected needs to be appropriate for the defined purpose. The latest all-powerful software program might be great, but a number of lower-cost alternatives might achieve the desired results at a much lower cost.

Required approvals will depend upon the project scope and people who will be affected. While top management support could be helpful, it might not be necessary. The most important support is the support of the people who will be affected—the ones who need and will use the KM system.

Ultimately, success at a small-scale KM system might be the best avenue to approval for more extensive projects in the future.

5.4 SECOND-GENERATION KNOWLEDGE MANAGEMENT

Most proponents of KM stress that it is more about process than about technology. Despite the process rhetoric, much of the recent activity and hype have focused on aligning KM with various technologies and applications. Many software vendors have been repositioning their products for the knowledge management market.

SPOTLIGHT ON SOLUTIONS → Technology, People, Structure, Processes

CLARICA LIFE INSURANCE: ALIGNING THEORY AND PRACTICE

Clarica is the new name of Mutual Life of Canada, adopted following its demutualization and transition to a public company. Clarica's new brand emphasizes [11]clarity through dialogue" in the way its 3,000 agents and representatives guide customers through the decision-making process of choosing insurance and investment solutions. The firm, founded in 1870, serves 3 million Canadians and 250,000 Americans from 100 offices across Canada and in two major U.S. cities. It employs 7,000 workers overall.

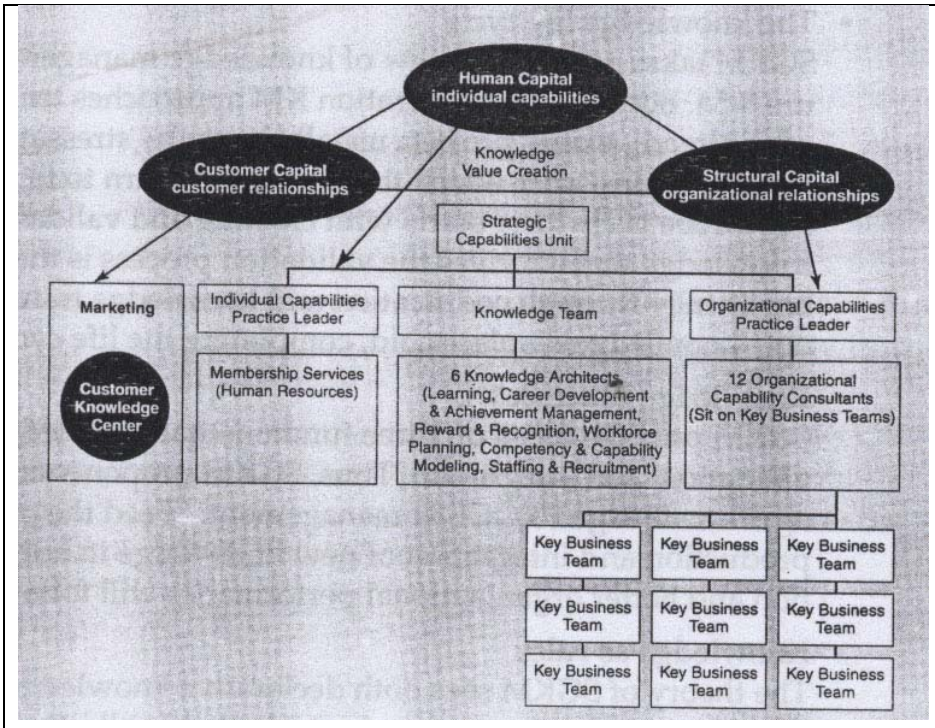
Clarica has built knowledge management into its organizational structure. It created a strategic capabilities unit (SCU) to support individuals (Clarica calls employees "members") and teams. Individual capability is about developing all of the individuals in the organization, putting learning resources at their disposal, and providing an environment and structure that encourages application of their talents. The individual capability practice leader supports Clarica's membership service group (which has replaced human resources), where both members and their managers access services through the company intranet on a self-initiated basis. For instance, through the Knowledge Depot, members can access just-in-time learning as part of their everyday work.

Organizational capability requires alignment across the enterprise of five components: strategy, structure, processes, culture, and leadership. An organizational capability consultant sits on each of the 12 key business teams in the organization to ensure that these five components are aligned to encourage optimal team performance.

In between is the knowledge team, which provides the enabling technology infrastructure and knowledge architecture as a platform to accelerate learning among individuals and teams, and between the organization and its customers. Six knowledge architects are responsible for learning, career development and achievement management, reward and recognition workforce planning, competencies and capability modeling, and staffing and recruitment. The knowledge team is responsible for the architecture and the approach to knowledge.

The practice leader for organizational capability focuses at a fundamental level on the shaping of the culture and the development of values-centered leadership

To Think About Is Clarica taking an organizational learning (OL) approach or an intellectual assets approach? What benefits did Clarica achieve through KM' How did their KM efforts affect the company's culture and how people work?



Source: Adapted from Steve Barth, "Clarica Life Insurance: Aligning Theory and Practice," *Knowledge Management Magazine* (May 2000) 24

Some KM proponents have expressed concern that an overemphasis on technology could be placing the credibility of KM. as a relatively new concept, at risk.

The term *second-generation knowledge management* (SGKM) has emerged among supporters of a less technology-centric view of KM. Second-generation thinking is more inclusive of human resources and process initiatives. Although KM and organizational learning take different approaches at the strategic level, they are increasingly similar in terms of tactics and tools. Supporters of second-generation KM contend that "While much of KM has been made possible by technology, many IT-centric approaches have had limited success. For long-term success, the underlying cultural factors and support systems are key factors."[24] A fundamental flaw in viewing KM as a technology issue is that technology is not holding organizations back. Rather, it is a lack of strategy and a failure to build KM into the organization's day-to-day operations and its culture, and consequently, a failure to gain end user buy-in.[25]

Mark McElroy, a principal with IBM's Knowledge Management Consulting Group, argues for embracing SGKM. "The arrival of second-generation knowledge management," he argues, "includes the introduction of some new terms, new concepts, and new insights that give it some real depth and distinction when compared to first-generation models."[26] These second-generation ideas fall into the following seven categories.

- **Supply-side versus demand-side KM**
  Whereas first-generation KM emphasizes sharing existing knowledge (i.e., supply-side view), SGKM emphasizes the generation of new knowledge (i.e., a demand-side approach). Thus, SGKM focuses on enhancing the conditions in which innovation

and creativity naturally occur. The emphasis is on high-performance learning. "The emergence of SGKM thus signals the convergence of the knowledge management and organizational learning (OL) communities."[27]

- **The knowledge life cycle**
  SGKM takes a life cycle view of knowledge management, as illustrated in Figure 5-5a. Because first-generation KM approaches tend to assume that knowledge already exists, projects usually begin by stressing codification and transfer issues, after which they invariably turn to technology. In contrast, the SGKM life cycle view starts with creating and validating new knowledge. Knowledge that survives the validation process is then operationalized systematically through codification and knowledge transfer processes. Ultimately, new knowledge displaces old, completing the life cycle.
- **Knowledge processes**
  SGKM puts the focus on three fundamental knowledge processes: production, validation, and integration. Thus, SGKM proponents advocate new terminology: knowledge PROCESS management. "Feed the processes that spawn the production and integration of new knowledge in human affairs, and innovation and better organizational performance will follow."[28]
- **Knowledge as rules**
  The theory of SGKM sees both declarative knowledge (know-what) and procedural knowledge (know-how) as rules held collectively by people in organizations, which are practiced en masse from one day to the next. Thus, all knowledge can be expressed in the form of rule sets, such as the example shown in Figure 5-5b.

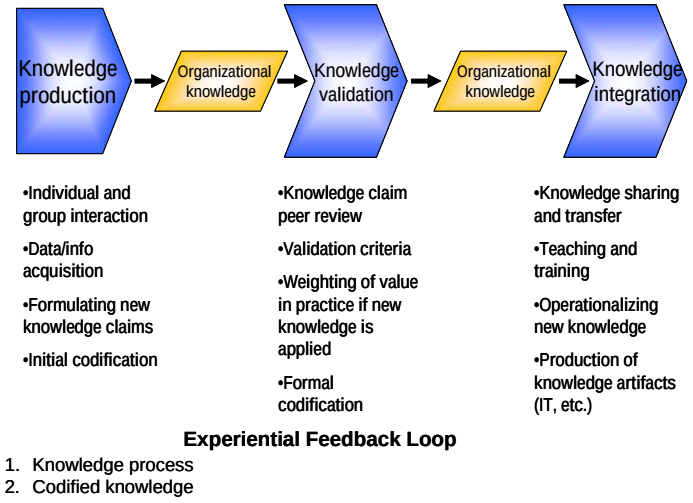


Figure 5-5a
Second-generation knowledge management
Source: Mark McElroy, "White Paper: The Second Generation of KM." *Knowledge Management Magazine* 2 (October 1999): 86.

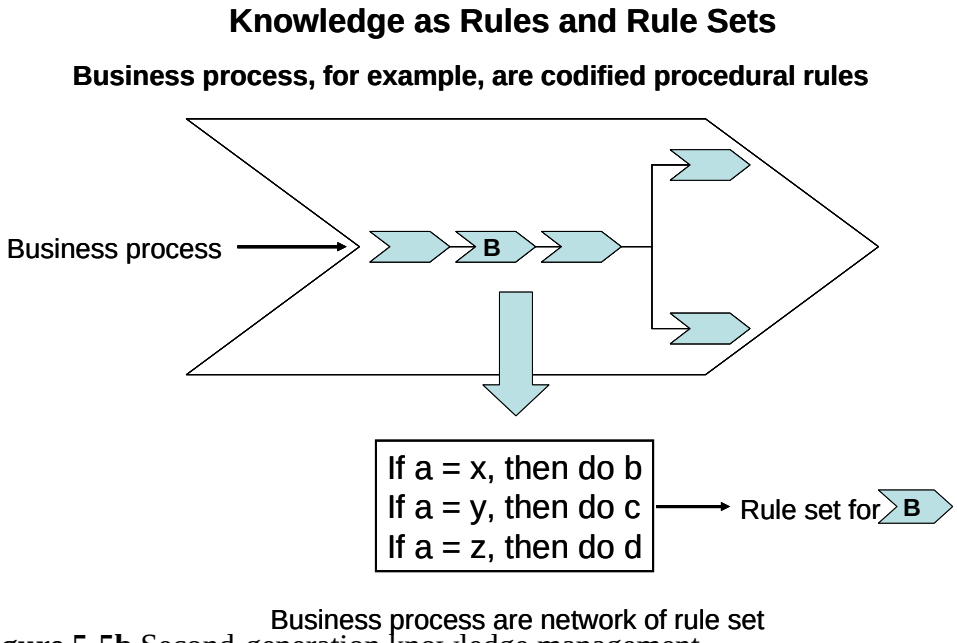


Figure 5-5b Second-generation knowledge management
Source: Mark McElroy, "White Paper: The Second Generation of KM." *Knowledge Management Magazine* 2 (October 1999): 86.

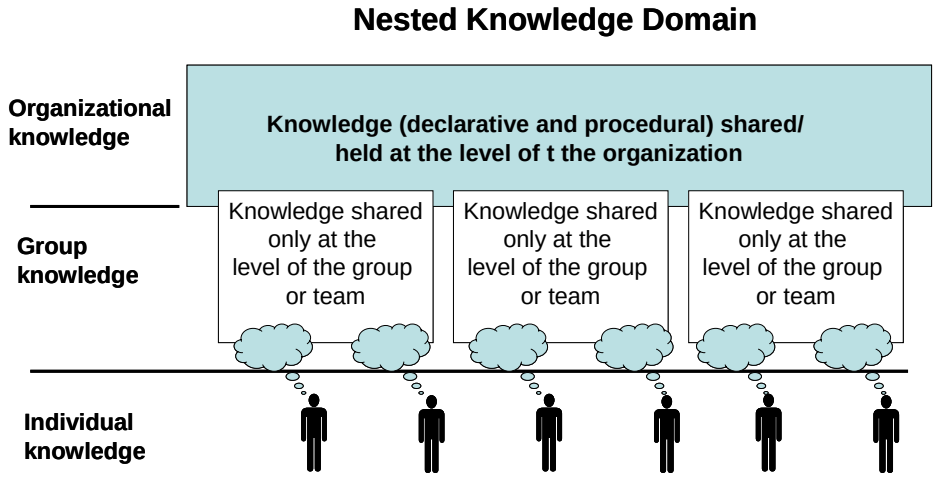


Figure 5-5 Nested knowledge domains
Source: Mark McElroy, "White Paper: The Second Generation of KM." *Knowledge Management Magazine* 2 (October 1999): 86

- **Knowledge structures**
  SGKM views business processes and business strategies as examples of knowledge structures, each of which holds embedded organizational knowledge or codified rule sets. Not all knowledge structures take conventional forms, however; informal storytelling also can play a valuable role.
- **Nested knowledge domains**

SGKM clearly distinguishes between individual and organizational learning, something first-generation KM failed to do. SGKM is focused squarely on organizational learning. Its techniques stress the importance of focusing on knowledge processes in knowledge life cycles. SGKM sees knowledge held by individuals as nested within the broader domain of organizational knowledge, as illustrated in Figure 5-5c. The dynamics between these levels give rise to new knowledge through "creative tension."

- **Organizational learning (OL)**
  One of the most striking distinctions made by SGKM is the explicit connection between knowledge management and organizational learning, in the tradition of Peter Senge. OL is widely regarded as the only sustainable advantagein business: the ability to learn faster than your competitors can. The primary objective of SGKM is seen as increasing an organization'4 ability to learn effectively.

SGKM provides a new theoretical framework—a theory of knowledge—that up to this point has been absent from KM practice. At this point, the concept is still too new to determine how much influence it will have on the future direction of KM.

5.5 TECHNOLOGY INFRASTRUCTURE FOR KNOWLEDGE MANAGEMENT

Most enterprises already have an information technology infrastructure in place. The typical knowledge worker has a personal desktop with an array of productivity tools linked to the enterprise network and the Internet. This remarkable increase in the availability of information and the equally remarkable increase in the need to apply knowledge to everyday tasks have directly influenced the evolution of knowledge management.[29] A powerful synergistic relationship exists between KM and technology. Technology has made it realistic to share knowledge not only within the enterprise, but across the continent and around the world.

5.5.1 IT as an Enabler for Knowledge Management

Information technology is critical; however, it is not sufficient to enable knowledge management. IT provides the infrastructure for sharing knowledge but does not make it happen. One of the most common mistakes made by enterprises in implementing knowledge management is assuming that putting the technology in place is the major part of the effort. Enterprises must create an environment that supports and rewards information sharing and have a clear strategy and a structured process for achieving it. KPMG Consulting concluded in their *Knowledge Management Research Report* 2000 that "It is not the technology that is holding organizations back but a lack of strategy and a failure to build KM into the organization's day-to-day operations and its culture in order to encourage end-user buy-in."[3o] According to Thomas Davenport, "If you're spending more than one-third of your energy on the technology side, you're probably not going to be successful."[3']

Using technology to share data and information is not a startling new concept. Enterprises have been using tools such as mainframe-based e-mail systems, list serves, bulletin boards, conferences, and so forth to share information for more than 15 years.

Mainframe-based online reference systems also have been available and used by many companies to create effective performance support systems. What has changed? The answer is the pervasive use of Internet and Intranet technologies and groupware along with the giant leaps in ease of use that they represent. Moreover, widespread exposure to dot.com enterprises has raised awareness of the power of digital networks. In fact, knowledge management is a huge part of e-business.

A growing number of excellent tools can be crafted into solutions tailored to meet an enterprise's needs. Two critical considerations in selecting technologies for knowledge management are ease of use and the ability to integrate it into the process of doing the work. Most authorities stress, however, that selecting the right technologies is only half of the solution, and not the bigger half. The biggest challenge is in deciding how the actual KM solutions will be used and maintained.

KM solutions must support the way in which individuals and groups are organized and how they work. People interpret, understand, use, and share information in situation-specific and task-specific contexts, and they relate knowledge objects to other knowledge objects in different ways. For example, knowledge about customers is interpreted and used differently by a credit manager than by a sales representative. As a general rule of thumb, the simpler the solution is, the better.

5.5.2 Information Technologies That Support Knowledge Transfer

What technologies support and enable knowledge management? Different sources emphasize different technologies, depending somewhat on how broadly they define KM. Viewpoints are evolving and changing rapidly. One point on which everyone seems to agree is that no one out-of-the-box solution exists for KM because it is not something that a single product can provide. Firms apply a wide variety of technologies to the objectives of KM. some of which have been available for years. However, it is the availability of Internet-based systems and collaborative tools, such as Lotus Notes, that many authorities believe were most instrumental in catalyzing the KM movement. The convergence of these networking tools along with a common set of tools for word processing, presentations, spreadsheets, databases, search engines, and more have created an infrastructure for digital information flow that has reached critical mass. A standardized company-wide architecture is important to ensure the sustainability and scalability of KM efforts. Knowledge and best practice sharing are difficult when companies allow the proliferation of separate systems. If a firm does not have the architecture of an organization-wide solution in mind when designing local KM/IT solutions, then the organization will, over time, face problems in integration and scalability; subsequently, it stands to lose much of the leverage knowledge management can create.[32]

The sections that follow provide a brief discussion of key technologies currently used to support KM solutions. The process of selecting and implementing technologies for KM is fundamentally the same as it is for all end-user technologies (see chapters 15 and 16). The three basic steps in selecting a KM technology infrastructure are:[33]

- Determine what you want to be able to do. (What functionality do you need?)
- Design an architecture that will allow you to do this.

- Select the technologies that will accomplish your objectives best.

5.5.2.1 Intranet-Based Solutions

Intranets are private, company-wide networks for posting and disseminating company information. Some authorities credit the emergence of Intranets as the single biggest boost to the concept of KM. In fact, Intranets are credited with enabling groupware and KM systems. Intranets have been successful because they have a single computer interface, which makes them easy to learn and use. The technology makes it possible to merge data streams from different sources in ways that make sense to users or that serve specific needs. Additionally, it allows information displayed to be customized based on specific objectives, such as by work groups; by hardware; or through filters, alerts, and searching.

The single biggest caution is that simply making an Intranet available is not KM. KM is not simply a case of "build it and they will come." An Intranet is nothing more than the platform to enable the building of KM solutions. It is a starting place, not the finish line.

5.5.2.2 Groupware, Especially Lotus Notes

Groupware supports groups and people working together and is built around three key principles: communication, collaboration, and coordination. It allows groups to work together on documents, schedule meetings, route electronic forms, access shared folders, develop shared databases, and send e-mail. Companies use groupware for a variety of reasons ranging from sharing knowledge within work groups to supporting collaborative efforts among geographically dispersed teams. (See chapter 4.) For example, some insurance companies use Lotus Notes to set up on location claims - paying operations when massive disasters, such as hurricanes, call for prompt handling of large numbers of claims. The World Bank relies on Lotus Notes to help its traveling staff members say in touch when on missions. Ernst &Young, one of the Big Five accounting firms, used Lotus Notes to create a global collaboration environment to help teams in different locations work together on projects.

The Web has spurred development in groupware and collaborative tools. Now virtually every groupware maker has come out with a Web-based version. This means that a combination Web/groupware server lets Web users search company application databases, view contents, and create, edit and delete documents, as well as have interactive forms, threaded discussions, and personal Web pages. Using a browser and a password, employees all over the world can access, share, and track documents.~

5.5.2.3 Knowledge Portals

Virtually overnight, portal technology has taken over the function of operating systems, allowing content and data from disparate systems to move in and out of repositories more easily and in the forms users need. Portals enable enterprises to extend knowledge management and business intelligence initiatives within and beyond the walls of their organization in ways that could not have been envisioned just a few years ago.[35] Figure 5-6 illustrates conceptually how portal applications can serve as a hub for organizing various types of KM activities with examples of related products.

Portal software comes in a variety of types designed for different purposes, but the technology is evolving so rapidly that this is expected to continue to change for the foreseeable future and eventually result in consolidations. Some clear, use-defined segments include business to business (B2B), business to employee (B2E), business to consumer (B2C), and vertical portals (vortals) that target specific

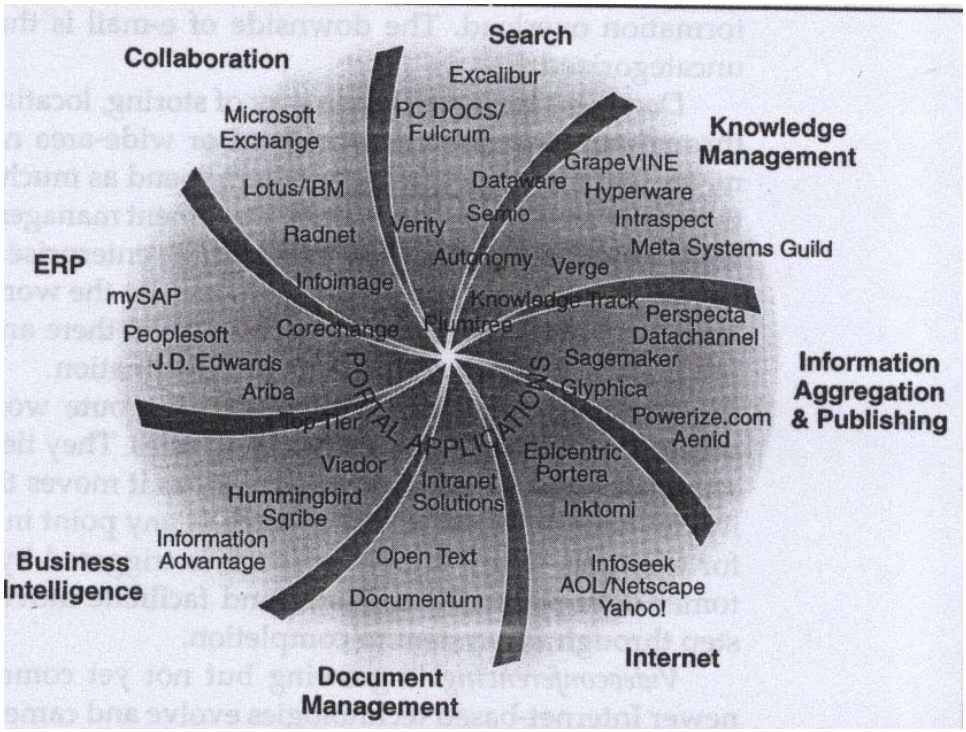


Figure 5-6 Portal applications can serve as the hub for organizing various types of KM activities and related products
Source: Peter Ruber, "Portals on a Mission: Second-Generation Portals Combine Knowledge Management and E-Business Applications to Meet Market Requirements," *Knowledge Management Magazine* 3 (April 2000): 44.

industries. These segments include subcategories or technological classifications such as structured and unstructured data portals, mobile portals, hosted portals, collaborative portals, and application integration portals.[36]

Currently, the business-to-business and collaborative portals are of most interest for KM. Business-to-employee portals provide a point of aggregation for corporate knowledge bases, which departmental employees can search with a desktop browser. Web-based portals for collaboration and project management are coming to market. These portals can be set up by groups of users, and these work groups can align and realign as needed. Early adopters include professional service firms, which use collaborative portals to manage internal knowledge bases and collaboration with clients.

5.5.2.4 Knowledge Transfer and Exchange

A number of KM tools fall into the category termed *knowledge transfer and exchange*.[37] Discussed here are structured document repositories, pointer systems, document exchange, document management, workflow/process management, and videoconferencing.

Structured document repositories organize content into short descriptions that can be stored in conventional relational databases. Some companies have created repositories of best practices with short descriptions and perhaps pointers to contacts in the firm who have knowledge about those best practices. Other examples include databases that provide customer data or competitor intelligence. Knowledge repositories also include computerized databases of published materials, such as Lexis/Nexis and Dialog, which have been around for decades. *Discussion databases* might include list serves, bulletin boards, news groups, threaded electronic discussions, or groupware-based discussion groups.

Pointer systems are directories of internal expertise, human resource listings, personnel profiles, or other corporate skills repositories. The objective is to make it easy to identify and contact workers who have specific skills or knowledge.

Document exchange now is handled primarily through e-mail. In fact, it has become so fast and easy to exchange documents that some workers complain of information overload. The downside of e-mail is that it is largely unfiltered and uncategorized.

Document management is a way of storing, locating, and controlling documents throughout their life cycle on local or wide-area networks. Gartner Group estimates that most knowledge workers spend as much as 20 percent to 40 percent of their time managing documents. Document management occurs on the individual, work group, and enterprise levels. At the enterprise level, document management is generally a highly structured process. At the work group level, it is usually far less structured, and at the individual level there are seldom structured efforts to provide any level of consistency or coordination.

Workflow/process management systems route work from one activity, role, or process to another, based on business rules. They tie activities together in a logical sequence and track the status of work as it moves through the system. Users easily can determine the status of work at any point in the flow. A workflow system$_1$ for example, might support processes triggered by outside events, such as customer or supplier transactions, and facilitate moving those transactions step by step through the system to completion.

Videoconferencing is growing but not yet commonplace on the desktop. As newer Internet-based technologies evolve and camera prices continue to drop, it is anticipated that videoconferencing at the desktop will continue to grow.

5.5.2.5 Search and Retrieval

Search engines are tools for locating specific information or sites on the Internet or an Intranet. Search-and-retrieval vendors have made KM the cornerstone of their recent product plans and marketing campaigns. Dataware Technologies, Excalibur, Fulcrum, and Verity offer engines that in one query will search hundreds of document formats across multiple repositories. Users can create agents that perform specific searches regularly and deliver the results via personalized Web pages or push technology.

5.5.2.6 Databases

Database vendors are positioning a new class of database management system, so-called universal databases, to play a central role in KM architectures. IBM, Informix Software, Oracle, and Sybase all have introduced variants on the universal database. The systems

manage data in many different forms—documents, spreadsheets, photographs, video clips, or sound bites—and that makes them ideal KM platforms, the database vendors say. Oracle has developed a text-search engine, called Oracle Context Cartridge, that works with the Oracle8 database and allows e-mail, spreadsheets, and documents to be searched and summarized in the database with the same security, backup, and recovery capabilities of relational data.

5.5.2.7 Performance Support Systems

Performance support systems (PSS) are used to support individual job performance and learning—a kind of just-in-time learning and help. Gloria Gery, an expert in performance support, says that the goal of an electronic performance support system is to provide whatever is necessary to generate performance and learning at the moment of need. This kind of support always has required human beings in the past. We now have the means to model, represent, structure, and implement that support electronically—and to make it universally and consistently available on demand any time, any place, and regardless of situation, without unnecessary intermediaries being involved in the process.

PSS can be implemented in many and diverse ways depending on requirements, available technology, developer skill, and resources, and they can be more or less powerful. The common denominator that differentiates a PSS from other types of systems, according to Gery, is the degree to which it integrates information, tools, and methodology for the user. These systems are generally most useful for complex jobs that require a high level of training and expertise, especially when continual learning is required to keep up with changing regulations, rules, or technologies, for example.

Sales and call center support systems are good examples of this type of solution. These systems usually support direct customer interaction and rely heavily on effective training and expertise. A call center might provide customized guidance for resolving different types of problems at varying levels of detail, which the user could select as needed. It might incorporate scripts for customer interaction (tacit knowledge made explicit) and expert systems to aid in problem identification and resolution.

At Mass Mutual Financial Group, managers realized that the growing complexity of financial products made it hard to keep the hundreds of life insurance customer support representatives around the country trained and up to date. When they developed a new application processing system, they incorporated an extensive electronic performance support system that provides just-in-time help and online reference. The PSS provides help and information at varying levels of detail depending on the needs of the user at the moment. The user can start at the most concise level and drill down for additional detail, if needed. The help is context specific. For example, if the user were required to select options for an insurance policy, only those options applicable to the specific type of policy in the applicant's state of residence would be displayed (perhaps a list of six options out of hundreds of possibilities). If the user were unfamiliar with any of these choices, he or she could drill down for additional detail as needed.

5.5.2.8 Data Analysis Systems

\Data analysis systems (also called analytical processing) discussed here include èL\ata mining and simulation software. A number of other analytical processing tools also may

be used as part of KM systems, such as on-line analytical processing and knowledge discovery.

Data mining tools are used to analyze data from data warehouses and convert it into usable knowledge for decision making. A data warehouse consolidates data from many sources and in many forms. The data are converted into a consistent, uniform format (i.e., cleansed) and organized so that users can extract data for their business purposes. Note that most KM authorities do not consider the data in data warehouses as knowledge. Data mining tools are used to identify trends, to uncover implicit relationships that would be extremely difficult for people to spot in a sea of data, and to extract hard-to-get data. Data mining has become popular with retail chains, airlines, financial institutions, and other businesses for analyzing customer activity and tailoring services. For example, airlines mine customer data to determine optimum fares on particular routes. Retail chains mine data from the point-of-sale registers (checkout counters) to analyze patterns in the way customers shop and use it to optimize store displays or target sales promotions, for instance.

Simulation software allows users to test decisions before putting them into practice. Simulation software can be purchased off the shelf or custom designed. Custom-designed systems can be expensive to produce, but off-the-shelf systems, such as project management, provide a cost-effective training tool that goes beyond classroom lessons to give workers simulated application experience.

5.5.2.9 Artificial Intelligence (AI)

Although A! has been around for a long time, KM has spurred a rebirth of interest in A!. The goals of Al sound remarkably like those of KM. Researchers at MIT's Al lab foresee Al linking human and computer expertise; anticipating and distilling needed information; and providing decision makers with the right information at the right time, in the right quantity, and in the right form.[39] A! technologies— such as genetic algorithms, neural networks, bayesian reasoning, rule induction algorithms, fuzzy logic, fuzzy concept mapping, case-based reasoning, and expert systems—are all finding their way into products for the KM environment. Two case-based reasoning and expert systems that appear to have the most widespread applicability initially are discussed here.

Case-based reasoning (CBR) tools are problem resolution systems that allow companies to retain, retrieve, and reuse solutions, called cases. These cases generally aye expressed as a series of problem characteristics or probable scenarios coupled with proven solutions. CBR takes users through iterations of questions and answers to locate relevant experiential knowledge to help classify the problem and solve it. Users may add cases as new problems or solutions are identified. Typical applications include Help-Desk operations, customer service centers, medical diagnosis, equipment maintenance, and other areas that involve recurring questions or problems.

Expert systems can be used to develop job aids for decision making. An expert system has a knowledge base, which contains the logic of how the human expert makes a specific decision, plus an inference engine that uses the facts and rules in the knowledge base to arrive at a conclusion for a specific problem. Users interact with the expert system much as they might a human expert. When provided a problem, the system might provide a single answer or pose several alternatives. The response generally includes an explanation of how the system arrived at the recommended solution. Use of expert

systems generally is limited to well-structured problems, such as granting credit, that can be limited to no more than a few thousand rules.

5.5.2.10 Intelligent Agents

Intelligent agents are software programs that work in the background to carry out specific, repetitive tasks for an individual user, business process, or software application. The agent uses a built-in or learned knowledge base to accomplish tasks or make decisions on behalf of the user. The use of intelligent agents is growing. Some of the most familiar intelligent agents are the Wizards found in Microsoft Office Suite and agents used to cruise networks, including the Internet, in search of information. They are becoming especially popular in e-commerce applications to help users find products or services and compare prices or features. Users of Yahoo! and Excite, for example, can avail themselves of a "shopping agent" to help them shop for certain products, such as music, toys, or books. The shopper simply enters information about the desired product into a form and sends the shopping agent off to search. The agent reports back with a list of Web sites that sell the product along with prices and a purchase link.

5.5.2.11 Visualization

Visualization refers to presentation of data by technologies such as digital images, geographical information systems, multidimensional tables and graphs, virtual reality, three-dimensional presentations, and animation. Visualization software packages offer users capabilities for self-guided exploration and visual analysis of large amounts of data.

Virtual reality systems, for example, have simulation capabilities that go way beyond conventional computer-aid design (CAD) systems. They use interactive graphics software to create computer-generated simulations that are so close to reality that users feel like they are participating in a real-world situation. Visualization is just starting to provide benefits in business, educational, and scientific work. At Boston's Brigham and Women's Hospital, for instance, surgeons are using virtual reality systems in which a three-dimensional representation of the brain using CT and MRI scans is superimposed on live video. Using this system, surgeons can pinpoint the location of a tumor in the brain with 0.5 millimeter accuracy. Virtual reality applications are being developed for the Web using a standard Virtual Reality Modeling Language (VRML). VRML is a set of specifications for interactive, three-dimensional modeling on the World Wide Web that can organize multiple media types, including animation, images, and audio, to put users in a simulated, real-world environment. VRML is platform independent, operates over a desktop computer, and requires little bandwidth. Users can download a three-dimensional virtual world designed using VRML from a server over the Internet using a Web browser.

5.5.2.12 Knowledge Management Software

Although no single out-of-the-box solution exists, a number of vendors market niche KM products. Firms vying for leadership in KM software include startups like FireDrop Inc., Semio Corp. (Taxonomy), and Tacit Knowledge Systems Inc. (Knowledge Mail). Other contenders include established business-intelligence tool vendors such as Cognos

Inc. and document-management software suppliers such as Documentum Inc., that are tailoring their products for KM projects.

IBM! Lotus's KM server, code named *Raven,* has a core discovery engine made up of two components: an expertise locator and a content catalog. The expertise locator, a searchable repository of profiles of fellow employees and information about their skills and areas of expertise, serves as a "Who's Who" within an organization. The locator creates the profiles based on the content of documents that people write and post to a network. The content catalog provides users with a means of tracking down documents (including Word files, spreadsheets, and e-mail) within a corporate network, data within database systems, and external HTML-based content. Atop this engine is a KM portal that provides individuals with a means of aggregating and managing the content to which they have access, and personalizing their view of the content and applications that run on Raven. The KM system also includes collaboration capabilities. This package puts together multiple KM functions in a single integrated package.

Microsoft crafted Exchange 2000 with KM in mind. It offers workflow features, as well as improved content-indexing and retrieval capabilities. Microsoft also has structured data within its SQL Server database and documents created with Microsoft Office, all accessible through its Digital Dashboard portal.

A somewhat more structured technology for bringing external knowledge into an organization, GrapeVINE (GrapeVINE Technologies) is used by firms such as Hewlett Packard, Arthur Andersen Consulting, and Ford Motor Company. It can be combined with Lotus Notes for purposes of distribution and alignment with other knowledge management applications. GrapeVINE searches through external databases not on the basis of simple keywords, but rather on a "knowledge chart"—a hierarchical map of an organization's knowledge terms and relationships. The chart is not easy to construct and maintain, but it can allow a more strategic perspective of what knowledge really matters to the organization. GrapeVINE also allows designated knowledge editors to comment on and prioritize—in other words, add value to—external data captured by GrapeVINE.

5.6 MEASURING THE VALUE OF KNOWLEDGE AND KNOWLEDGE MANAGEMENT

The concept of knowledge as an asset that has economic value to an enterprise has evolved. Although most people would agree intuitively that knowledge has value to a firm, quantifying it as an asset on the balance sheet is another matter.

Measuring the economic value of knowledge management initiatives is a critical challenge for enterprises. The more closely a project is tied to specific business objectives, the easier it is to quantify the benefit. For example, if a KM system is developed to support a Help Desk or customer service operation, the benefits could be quantified against benchmarks established prior to implementing the KM system. Typical benchmarks in this situation might include number of problems resolved on the first call, average time to resolve a problem, customer satisfaction measures, and number of staff required to handle call volumes.

KM initiatives with broader objectives related to information sharing, innovation, continuous learning, and raising the enterprise's overall knowledge IQ are harder to

quantify. Difficulties relate to a number of factors. The most ambitious KM efforts aim to transform how people work so that the organization as a whole will become more innovative and flexible. Transformations happen slowly and generally do not yield quick benefits. Proponents of KM projects are often in a position where they know the investments will provide important benefits but cannot define precisely what the benefits will be or when they will come. Nonetheless, comprehensive KM efforts are rightly directed at long-term, systemic change, rather than more immediate and easily measurable efficiencies.

Another difficulty in assessing economic value is that many knowledge benefits are intangible. Better decision making, higher-quality work, more sharing, better morale, a more collaborative culture, and more responsiveness to customers are descriptions of qualitative improvements that are hard to quantify~ Some measures used to assess knowledge project success, such as the number of documents in a repository, the number of times a particular piece of intellectual content is downloaded from a system, or the amount of traffic on a system, tell nothing about the value of the content stored or shared, or whether it actually helped anyone in the firm do better work.

5.7 BARRIERS TO INTERNAL TRANSFER OF KNOWLEDGE

Although the idea of identifying, sharing, and transferring knowledge and best practices seems logical and simple, implementing it is much more complex and time-consuming than most people imagine. Efforts tend to be thwarted by a variety of logistical, structural, and cultural hurdles and deterrents present in organizations, which act as *barriers* to knowledge transfer. Research has revealed that a practice can go unrecognized and unshared for years in a company. Even when recognized, it still took more than two years on average before other sites began to try actively to adopt the practice, if at all. Research identified four primary barriers to the effective transfer of knowledge and best practice within enterprises.[40]

Reason 1: Ignorance. Those who have the knowledge are not aware that others may find it useful. At the same time, those who could benefit from the knowledge have no idea that someone in the company already has it.

Reason 2: No absorptive capacity. Even when workers knew of the knowledge or best practice, they lacked the money, time, and management resources to pursue and study it in enough detail to make it useful.

Reason 3: The lack of preexisting relationships. People absorb knowledge and practice from other people they know, respect, and—often-—like. If two managers have no personal bond or link that preestablishes trust, they are unlikely to incorporate each other's experiences into their own work.

SPOTLIGHT ON SOLUTIONS →Technology, People, Structure, Processes

CULTURAL EVOLUTION: CENTRALIZED KNOWLEDGE MANAGEMENT STRATEGY PERPETUATES KNOWLEDGE-SHARING ENVIRONMENT AT ASTRA PHARMACEUTICALS

Research and development (R&D) is the pharmaceutical industry s knowledge intensive strong suit or its Achilles heel, depending upon how companies fare in the race to get products to market Astra Pharmaceuticals has developed a cross-enterprise Knowledge Management Program Office (KMPO) to oversee knowledge-sharing processes and technologies so that new knowledge is leveraged instead of being replicated.

Creation of this office, said Beverly Buckta, knowledge management leader of the KMPO, came out of a need to start addressing information overload and to try to coordinate better. “We wanted to have more dynamic content and enable more effective decision making,” Buckta said.

Astra Pharmaceuticals, the U.S. marketing and product development arm of Sweden’s Astra AD, was created in June1998 from the merger of Astra Merck and Astra USA. The twelfth-largest pharmaceutical company in the United States, Astra Pharmaceuticals reported net sales of $3.6bihion in 1998. Organized around cross-functional teams, it makes extensive use of information technology and encourages a corporate culture of sharing knowledge.

Astra put the KMPO under the umbrella of Knowledge Services & Information Resources, which provides enterprise-wide information technology (IT) and infrastructure services. Although it is not unusual to see KM projects tied to IT, Astra Pharmaceuticals made the much less common decision to include people from the world of library and information science in key KMPO positions. The two individuals most responsible for the implementation of KM at Astra, Buckta and Jennifer Klein (director of knowledge services and information resources), have backgrounds in this discipline. According to Klein, “Rather than having an unmanageable flow of information, we are frying to build the paradigm where the information that you need and keep track of will be kept current. Our backgrounds in library science enable us to effectively address the challenge of creating and managing a knowledge management .infrastructure.” The combination of IT and information science provides the KMPO with strong competencies in the principles of information management content organization, indexing search and retrieval, content development, and database design. The melding of IT and information science is a very powerful one.

The KMPO is responsible for providing a framework for implementing an enterprise-wide KM infra structure designing arid implementing the company s intranet growth strategy, and managing the process for adding content to the intranet An enterprise-wide perspective allows the KMPO to identify redundancies common needs across teams and orphaned or out-of date content It also means that the KMPO can be more neutral in working across team and department cultures

When someone wants to publish information— build a Web site on the intranet or create a Lotus Notes database—they fill out a KM submission form Because teams submit their ideas and plans through a centralized process, the KMPO can easily spot content that already exists elsewhere within the company. When the KMPO receives multiple requests for the same content, it meets with the stakeholders and recommends that one of the teams take responsibility for or ownership of that information and manage the Web site. The biggest short-term advantage from KM is in situations where employees do not have to reinvent the wheel. For instance, if a re-searcher can find somebody that solved a similar challenge with a substructure or someone that has already documented the toxicity profile of a particular family of compounds, they need not duplicate the work.

An early example of KMPO flagging a common request centered on information about team members. By working with the teams to decide who should “own” and

manage the content, they were able to avoid the multiplication of sites that would duplicate information already existing at Astra. Initially, everybody who planned to create a departmental home page wanted to include information about team members—for example, pictures, roles, contact information—on their sites. "Rather than have each team build and manage the content specific to their team, we worked with our corporate communications department to create a centrally managed electronic picture book that teams could leverage as they designed their respective home pages," Klein said. "Corporate Communications was identified as the content sponsor based on the historic role they played in creating the company's hard copy picture book." Owners,
or sponsors, of content have a responsibility to keep the content current and accurate, while evolving site content as the need grows. The KMPO feels that its efforts identifying and supporting content sponsors creates numerous operating efficiencies, including reduced effort identifying and supporting content sponsors creates numerous operating efficiencies, including reduced effort, saved time and money, and miximized organizational expertise.
Tipically, as teams begin to build sites on the intranet, they envision only other members from their team as their audience. While some information requires restricted access for legal and regulatory reasons, Buckta said the KMPO encourages teams to make access to the content unrestricted across the whole company. Because of the KMPO's central role, it has been able to point out to reluctant teams that requests for similar information often comes from other teams. These same people get excited, Buckta said, when they see that they. have something to deliver that is needed by areas of which they were not aware There is no value in building a Web page on an Intranet unless that page is a gateway to the right kind of information. Approaching the Intranet at a corporate level has given the KMPO a holistic approach to KM. enabling it to leverage information, knowledge, and expertise across the enterprise while reducing redundancies and saving time and effort. Perhaps more importantly, the KMPO helps foster a growing knowledge culture at Astra Pharmaceuticals.
To Think About How did Astra Pharmaceuticals decision to centralize responsibility for knowledge management influence the results they have achieved? What was the significance of combining the expertise and perspectives of both IT and information science? What benefits has Astra Pharmaceuticals derived from its knowledge management program? What are some of the key factors that have contributed to the success of Astra's cross-functional approach to knowledge management? What is the importance of knowledge management for pharmaceutical companies such as Astra Pharmaceuticals?

Source: Adapted from Michael Robin, "Best Practice: Cultural Evolution: Centralized KM Strategy Perpetuates Knowledge-Sharing Environment at Astra Pharmaceuticals," *Knowledge Management Magazine* 2 (May 1999): 16—17.

Reason 4: Lack of motivation. Workers may not perceive a clear business reason for pursuing the transfer of knowledge and best practices.

Although personal elements are involved, these hurdles are generally the result of organizational structures, management practices, and measurement systems that discourage—rather than encourage—information sharing within an organization. Therefore, it is not sufficient to put in place strategies and platforms for knowledge management. Enterprises must consciously dismantle these systemic barriers, as well.

5.8 PLANNING FOR KNOWLEDGE MANAGEMENT

Introducing and implementing knowledge management strategy on an enterprise level is a major undertaking. It takes strong leadership, commitment, and courage on the part of sponsors and advocates. For most enterprises, it requires not only vision and preparation but major changes in culture and business processes, as well. Whether an enterprise begins with a comprehensive strategy or smaller-scale project, thoughtful planning is important. Fundamentally, the planning process is similar to planning for all EUTS projects (see part V). This section highlights some important considerations for KM projects. A more comprehensive discussion of project planning is covered in chapter 13.

5.8.1 Responsibilities

Identifying the need for a KM officer (KMO) and choosing the right person might be one of the greatest challenges. The role of KMO requires a visionary who has the ability to assess what the company has achieved and position it for future growth. At the same time, the KMO has to have the technical understanding to exploit corporate data and rapidly evolving information technologies, but most importantly, to understand the difference between data and knowledge. A KMO profile includes the following traits.[4,]

- Ambition to succeed
- Expressiveness
- Responsiveness: the ability to take immediate, appropriate action
- Leadership
- Articulateness
- Appreciation of others' efforts
- Social skills
- Dependability
- A strong work ethic
- A vision of future growth

One might add to this list an understanding of organizational learning; change management; and the dynamics of innovation, productivity, and performance. Finding an individual with such broad experience and perspective is truly a challenge. Equally critical to visionary leadership is wide involvement in formulating strategies and plans. Project teams should be representative and appropriate given the scope of the project.

5.8.2 Project Strategy, Scope, and Budget

Setting the direction for the KM project and defining the project scope and budget are critical first steps. The strategy should articulate a knowledge management vision, articulate the knowledge management value proposition, and assess readiness for change. In defining the strategy for the project, it is important to identify the goals clearly in measurable terms. At this point, the focus should not be on defining what knowledge is wanted but on why it is wanted. Is it to improve responsiveness to customer inquiries? To increase customer satisfaction? To what level? To increase innovation in product development? Is the intent to empower individuals who previously

were unable to make important decisions? Clear, measurable goals will provide a framework for determining key design issues, such as what knowledge is needed, by whom, for what purpose, and in what format.
Clear goals are important not only to determining the project strategy, but also to defining the project scope and budget. Sometimes the best strategy is to plan big and start small. If well planned, this approach provides an opportunity to demonstrate the success and value of KM within a framework that provides for future scalability and flexibility. Regardless, the project scope must be defined clearly at the outset.

Another crucial step is developing a budget. The extent of resources will be determined by the scope of the project. KM projects can be costly but are not necessarily so. Clear goals with measurable outcomes that directly relate to achievement of business strategies can increase greatly the likelihood of budget approval. If the project strategy and scope are defined clearly, it also might be possible to consider alternative designs and technologies that could be less costly but still achieve project goals. If resources are limited or the budget fails to gain approval, the project objectives and scope might have to be reevaluated and scaled back.

These steps are critical in order to gain needed commitment to the plan and to formulate a communication strategy for making KM principles and objectives well understood by the organization.

5.9 A MODEL FOR TRANSFERRING KNOWLEDGE AND BEST PRACTICES

According to O'Dell and Grayson, the overwhelming majority of KM success stories involve the transfer of best practices. Some of the results reported in *If Only We Knew What We Know* include the following success stories.

- Buckman Laboratories credits their transfer of knowledge and best practice system with helping to boost new product-related revenues by 10 percent and sales of new products by about 50 percent. Responding to customer inquiries about products now takes hours instead of weeks.
- Texas Instruments generated $1.5 billion in annual increased fabrication capacity by comparing and transferring best practices among its existing 13 fabrication plants. Plant managers and teams from Texas Instruments's Semiconductor Group, led by that group's president (now TI president and CEO) Tom Engibous, created the equivalent capacity of an additional semiconductor wafer fabrication plant, thereby avoiding a $500 million investment and providing needed capacity to customers. They called it a "free fab" and have repeated this triumph two more times, for a total of more than $1.5 billion in cost avoidance, in addition to going from last (1992) to first (1994) in on-time delivery satisfaction in customer rankings.
- At Dow Chemical, early efforts to manage intellectual capital brought an immediate kickback in the form of $40 million in savings. Analysis of existing patents to determine which technology streams were the strongest and which were weakest allowed more effective negotiations with joint venture partners.

- At Kaiser Permanente, benchmarking of their internal best practices helped drastically cut the time it took to open a new Woman's Health Clinic. In addition, it opened smoothly with no costly start-up problems.
- Skandia has leveraged internal know-how to dramatically reduce start-up time for new ventures to 7 months, compared to an industry average of 7 years.
- At Andersen Consulting, a Global Best Practice Knowledge base has improved the quality of services, helped lower research costs, and shortened delivery time in business consulting.
- Chevron's network of 100 people who share ideas on energy-use management has generated an initial $150 million savings in Chevron's annual power and fuel expense by sharing and implementing ideas to reduce company-wide energy costs. Chevron credited this best-practice transfer team with generating more than $650 million in savings.

Based on several years of research and experience with more than 70 companies, O'Dell and Grayson have developed a model for knowledge and best practice transfer. This model has three major components:

1. The value proposition
2. The enablers
3. The four-phase change process

These three components are described briefly in the sections that follow and are illustrated in Figure 5-7.

1. *The value proposition.* The first step toward profitable management of knowledge assets is having a clearly defined purpose—the right value proposition. The enterprise starts by identifying the problem or process that will be targeted for improvement. Every enterprise has different reasons for wanting to transfer knowledge and best practices. Value propositions tend to fall into three basic categories:
   - Customer intimacy. This strategy focuses on capturing and using knowledge across the company about how to market, sell, and service customers more efficiently and effectively.
   - Product-to-market excellence. This strategy focuses on using best practices in product development to accelerate time to market.
   - Operational excellence. This strategy focuses on boosting operational excellence by transferring best practices from one plant or location to receptive sites throughout the global organization.
2. *The Four Enablers.* The second component is creating the right environment for transfer of knowledge and best practices. Four key enablers that must be understood and leveraged are culture, technology, infrastructure, and measurement.
   - Culture. A culture supportive of knowledge management has strong professional ethics and pride supported by well-honed skills in teaming, including cross-functional teams. It also helps to have a common approach for thinking about work, improvement, and process. If an enterprise is not so fortunate as to start with a supportive culture, it must be willing to expend efforts to create such a culture or risk failure.

- Technology. Technology—especially the Internet, Intranet, and groupware-provide the platform for KM. However, technology is necessary but not sufficient. The key is understanding the limitations as well as the power of technology.
- Infrastructure. To work effectively, KM must be institutionalized into the enterprise through the creation of new support systems, new job responsibilities, new teams, and new formalized networking. Transfer of knowledge and best practices doesn't happen automatically; it requires a process and an infrastructure of people committed to facilitating the process.
- Measurement. While this is the least-developed aspect of KM, it is important to measure the projects and business processes that are being improved through knowledge management and let the users evaluate the contribution. "Without measurable success, enthusiasm from employees and management will dissipate. And without measurable success, you won't be able to tell what works and what doesn't."[42]

3. *The Four-Phase Process.* The O'Dell and Grayson model provides a simple four-phase methodology for implementing knowledge management programs: plan, design, implement, and scale-up. Although this basic method has proven to be effective for a broad range of knowledge management projects, every enterprise is different and the actual steps and issues are never identical. Moreover, it takes more than good project management; excellent diagnostic and change management skills are also critical to meaningful design and execution. Details on the four-phase process follow.

    1. Plan. The first phase involves assessing the current opportunities, defining specific objectives (the value proposition), identifying a champion for the project, preparing the organization, and defining the business case.
    2. Design. The comprehensive design phase involves determining the scale of the initiative, defining the KM process, and outlining the roles and functions of people and technologies, as well as any necessary overlay to the organizational structure and performance measures. The outcome includes a comprehensive action plan with required resources.
    3. Implementation. The third phase is to put the plan and design into action. It normally involves a pilot program that will test new ideas and yield lessons in what works and what does not: It involves training participants, providing support, observing, learning, and assessing results.
    4. Scale-up. The final phase involves scaling up the pilot to an enterprise-wide process to capture the full benefits of effective transfer. It is important at this point to capture success stories and use them for learning and promoting the contributions of knowledge management. At this point, the enterprise also must be prepared to create new organizational structures to oversee the ongoing process.

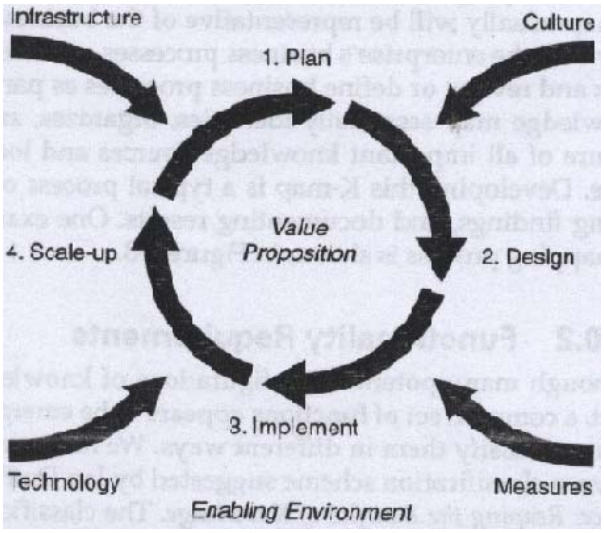


Figure 5-7 A model for knowledge and best practice transfer
Source: Reprinted with the permission of The Free Press, a Division of Simon & Schuster, Inc., from IF WE ONLY KNEW WHAT WE KNOW: The Transfer of Internal Knowledge and Best Practice By Carla O'Dell and C. Jackson Grayson,.Jr. with Nilly Essaides. Copyright © 1998 by Carla O'Dell and C. Jackson Grayson,Jr.

5.10 DEFINING AN ENTERPRISE KNOWLEDGE MANAGEMENT ARCHITECTURE

Many organizations take an enterprise-level approach to knowledge management. The objective is to leverage better the vast information resources and knowledge— both explicit and tacit—that exist within the enterprise. For organizations with well-defined core competencies and business processes, KM can be a logical next step to improve organizational performance. It is also an essential component of establishing the value of knowledge as an asset. Enterprise knowledge management environments can be expensive endeavors to establish and maintain. Thus, an effective business case must be made to identify the objectives and anticipated benefits and to justify the cost. As pointed out earlier, the benefits and payback for enterprises from KM can be substantial.

5.10.1 Knowledge Infrastructure

Building an enterprise-level KM architecture generally begins with a process of identifying existing knowledge resources within the enterprise. The end result is a knowledge infrastructure or knowledge map (K-map). This can be a daunting task, and is, in fact, a place where many enterprises get bogged down early in the KM process. In

a large enterprise, it can take several months. Because the enterprise is generally just at the beginning of their KM endeavors, the experience level with knowledge management is probably limited at this point. Therefore, participants in the process may be relatively unsure how KM is going to work and what the benefits will be for them personally. For this reason, enterprises may want to get their feet wet with a few smaller projects or one department or division rather than the entire enterprise—even if they have to go back and rework some areas later.

The project team charged with developing the K-map will include key individuals from various parts of the enterprise. These individuals should be familiar with overall operations and the information resources used within their departments or divisions. It is also helpful to include team members with expertise in information classification, such as records management managers or librarians.

Developing the knowledge infrastructure or map involves many steps. The K-map usually will be representative of the business model. Thus, depending on how well the enterprise's business processes are defined, it may be necessary to go back and review or define business processes as part of developing the K-Map. A knowledge map essentially identifies, organizes, and presents a comprehensive picture of all important knowledge sources and locations throughout the enterprise. Developing this K-map is a typical process of gathering information, analyzing findings, and documenting results. One example of the steps in a typical K-mapping process is shown in Figure 5-8.

5.10.2 Functionality Requirements

Although many potential configurations of knowledge management technology exist; a common set of functions appears to be emerging in the literature. Different sources classify them in different ways. We have elected to use here, as representative, a classification scheme suggested by Jan Duffy in her book *Harvesting Experience: Reaping the Benefits of Knowledge.* The classification scheme outlined here is meant to provide a broad overview of typical functionality for KM environments.

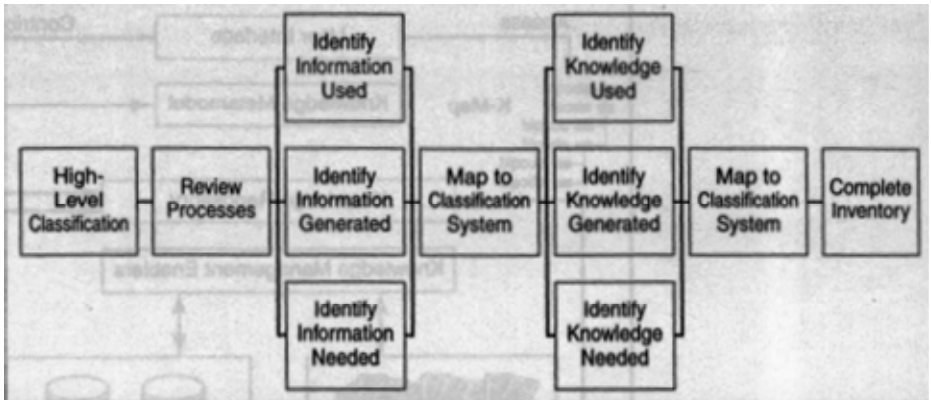


Figure 5-8 Developing the knowledge map
Source: Excerpted from *Harvesting Experience: Reaping the Benefits of Knowledge.* Copyright 1999 by ARMA International Used with permission.

The objective of a planning team would be to pinpoint the specific functionality needed for their organization to achieve the agreed-upon business objectives.

- Getting where you need to be. Options to consider include pointers to paper or document images, hyperlinks, e-mail hot links, navigation links, internal business application links, and external links.
- Finding what you need. Functionality to consider includes search functions, fuzzy searching, query functions, intelligent push based on a profile or event, and knowledge mining.
- Storing what you've found. Storage options to consider are multidimensional cataloging/indexing, unclassified information, expiration/supersede dates, knowledge rules, and resource directories of subject experts and others.
- Tracking where you've been. Approaches for tracking include personal navigation trail (access path), evolving trail of knowledge (history), and usage audit trails.
- Providing support for using knowledge. Support options include online collaboration and learning, multimedia support, and performance measures support.

5.10.3 Technology Architecture

The technology architecture provides the framework for the various components of the KM system and their relationships to each other. The technology architecture should reflect the knowledge strategy An example of a knowledge architecture, is shown in Figure 5-9. Major components are: user interface, knowledge metamodel, knowledge repository and knowledge access tools, which are described briefly in the section that follows.

- **The user interface.**

A simple, easy-to-understand user interface is critical for acceptance and use of any system. The user should be able to understand easily and relate to the metaphor for representing the classes of information (see chapter 10). An effective metaphor hides the underlying complexities of the system and presents a logical view of the knowledge objects in the knowledge base. The interface ideally should behave much like an Internet browser. The more consistent the KM interface is with the desktop technology platform with which users are already familiar, the easier the learning curve will be.

User input is critical to designing an effective interface. The usability of the design should be tested thoroughly by representative users during the design process when adjustments can be incorporated easily into the final design. Usability testing should not be an add-on at the end of the process.

- **Knowledge metamodel.**

"The knowledge metamodel is the heart of the knowledge management environment because it houses the context that makes the knowledge valuable and meaningful." It provides the context or knowledge about knowledge, known to KM professionals as

metaknowledge. "Everything in the knowledge infrastructure works according to the metamodel and the metaknowledge that it contains."[43]

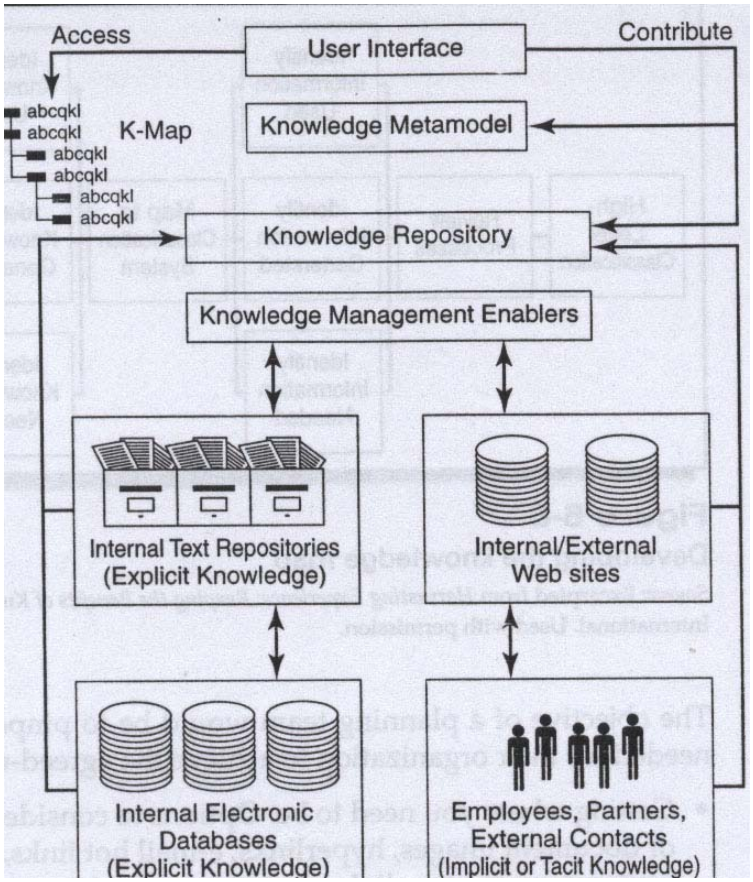


Figure 5.9 Knowledge management technology architecture
Source: Excerpted from Harvesting Experience: Reaping the Benefits of Knowledge. Copyright 1999 by ARMA International Used with permission

A metamodel usually contains information about the types of knowledge objects, such as documents, e-mail, data file, person with special expertise, or other types. It describes the knowledge object, such as creation date, author, recipient, subject, software used, location, list of persons authorized to access it, related documents, and more. The metamodel also contains business rules associated with the use of a particular knowledge object. Since the whole notion of using technology to share knowledge is relatively new, few standards govern KM infrastructure design and development.

If metamodels have been developed independently for other projects, the interfaces may be incompatible. However extensible markup language (XML) is emerging as the metaknowledge language of choice. It defines the syntax and rules that govern the preparation of metaknowledge so that it can be interpreted, processed, and communicated by multiple applications. XML is a subset of standard general markup language (SGML), which is the metalanguage that defines hypertext markup language (HTML).

- **Knowledge map.**
  The knowledge map or K-map is a visual representation of enterprise

knowledge. It identifies the links between existing islands of information and represents all categories of knowledge and the relationships among them.

- **Knowledge repository.**

"In implementations where the knowledge repository is a separate physical layer, the repository gathers all of an enterprise's separate knowledge objects from disparate information systems and transforms them into a structured resource. This central repository provides for contributing and retrieving knowledge through a universal access tool, such as a Web browser, while maintaining the functionality and format of the original applications. The knowledge metamodel and its K-map govern the structure and operations of the knowledge repositoiy"[44]

In many implementations, various kinds of source repositories form the foundation layer of knowledge management architecture. These various repositories of knowledge will be integrated in such a way that the users still will have a single point of access to the organization's knowledge assets—their own user interface. The knowledge architecture can include fileservers, database servers, groupware servers, document management systems, and Web sites. It also can include mission-critical systems, such as financial reporting, human resource management, and sales automation, which represent enormous stores of legacy knowledge about products, customers, and suppliers.

- **Knowledge access tools (Knowledge Management Enablers in Figure 5-9).**

The knowledge access layer and the meta model are totally interdependent, but they need to be kept separate. This is because system management and access tools may change, and if the two layers were to be combined, maintenance could become complicated. The knowledge access layer of the architecture is a complex combination of system administration tools and knowledge management enablers. This layer can include:

2 system administration information
2 location information
2 database type
2 access protocol for database
2 knowledge access tools and engines
2 distribution tools and engines

In organizations with a virtual knowledge repository, automated information request brokers can be used to access, with a single query, multiple repositories housed on an Intranet. Sophisticated search engines can make connections between related knowledge objects, uncovering new insights or previously unknown relationships.

5.11 SUMMARY

Knowledge Management (KM) is a relatively new concept that is evolving rapidly. It appears to represent a synthesis of a number of disciplines, rather than a progression from any one of them. This factor, at least in part, may account for the rapid explosion of interest in KM. Moreover, this convergence is consistent with emerging models of organizations, which are process oriented and collaborative.

Knowledge Management is not yet well defined. Various definitions are contrasted to provide a sense of similarities and differences in perspective on this rapidly evolving field. lit summary, KM is the concept of managing organizational knowledge, but in the sense of facilitating learning and collaboration, not in the old sense of controlling information. Perhaps the best way to think of KM is as knowledge plus process. Although knowledge creation is a natural phenomenon, the process part of the Knowledge Management equation implies that an organization can improve performance by employing purposefully designed strategies for creating, identifying, collecting, organizing, and sharing or transferring knowledge.

Knowledge Management has tremendous potential for improving organizational learning and performance, but it also faces many challenges. Many proponents feel that the current high-level focus on KM is too technology centric, which may ultimately lead to disillusionment. Recent surveys show that manyenterprises are failing to grasp the fundamental changes in their day-to-day operations and culture that successful KM implementation requires. Tension is growing between a more technology-oriented approach to KM and an organizational learning focus to KM, leading some KM proponents to propose a strategy for second-generation knowledge management.

At the same time, no one denies the crtitical importance of new digital technologies and networks as an enabler for KM. Many industry watchers credit the rapid growth in Intranets and groupware as major contributors to the emergence of the KM concept. Key technologies used for building KM architectures include Intranets, groupware, knowledge portals, document repositories, data warehouses! data mining, data analysis, artificial intelligence, electronic performance support, intelligent agents, and knowledge management niche products.

KM is gaining credibility and momentum. Some of the key trends include the rise of the corporate portal as a defining KM application, recognition of knowledge economics as the context for twenty-first-century business, growth in firms undertaking strategic KM projects, KM embraced by major vendors such as Microsoft and IBM, and a growing focus on the behavioral aspects of KM.

Measuring the economic value of Knowledge Management initiatives is a critical challenge for enterprises. Although the idea of identifying and transferring knowledge and best practices is intuitively appealing, implementing it is much more complex and time-consuming than most people imagine. To he successful, enterprises must be prepared to address organizational barriers to the transfer of knowledge. Moreover, creating a KM environment entails significant cultural change that enterprises must be prepared to address in order to succeed.

The most common objectives for enterprise-level KM projects include creating knowledge repositories, creating knowledge access, and improving knowledge environments and cultures. The most common application is implementation of knowledge transfer and best practice programs. Other major applications include Performance Support Systems and training, knowledge repositories, customer relationship management, content management, competitive intelligence, Web publishing, intellectual property management, and supply chain management (see Figure 5-4). The chapter presented a model for transferring knowledge and best practices based on research and practice and a method for defining an enterprise KM architecture.

KEY TERMS

- Balanced score card approach
- Barriers to knowledge transfer
- Best practice
- Case-based reasoning
- Communities of practice
- Data mining
- Expert systems
- Explicit knowledge
- Intellectual capital
- Intelligent agents
- Intranet
- Knowledge management
- Knowledge transfer and exchange
- Performance Support Systems (PSS)
- Portal ‘Second generation knowledge management (SBKM)
- Simulation software
- Tacit knowledge
- Visualization

DISCUSSION QUESTIONS

1. How would you define Knowledge Management (KM)? Explain the current variation in definitions for KM.
2. Explain the importance of KM in contemporary organizations. Identify some of the key technologies that support KM. Which are most important in your view? Why?
3. Identify major issues and requirements for designing an enterprise KM architecture.
4. What are some of the common pitfalls for enterprises seeking to implement KM? How can organizations avoid these pitfalls?
5. Discuss the impact of Intranets and groupware on KM.

APPLICATION EXERCISES

1. Conduct a Knowledge Management Assessment. Go to the text Web site and download *The Knowledge Management Assessment Tool (KMAT)*, jointly developed by the American Productivity and Quality Center and Arthur Andersen to help organizations self-assess where their strengths and opportunities lie in managing knowledge. Working alone or in an assigned group, select an organization of which you are a member, are employed, or are familiar, and conduct the survey. The survey should take no more than about 10 to 15 minutes to complete. Compile the survey results and report beck to your classmates. if you were a KM consultant, what recommendations would you make to this organization for getting started with a KM program? What benefits would you see for a KM program? Develop a KM value proposition statement for this organization.
2. Corporate portals have been touted as the “defining KM application.” What is a corporate portal and how do portals support KM? Working individually or in an assigned group, research current developments in portal technology. Use the Web or current trade publications. Look for examples of the use of portals for Knowledge

Management applications. Report back to your classmates and share your best KM example. Discuss and compare your findings with those of your classmates.

3. Evaluate and compare the Knowledge Management and e-learning features provided by Microsoft and IBM/Lotus Development. Compare different features and discuss their implications for implementing a KM strategy. What do you see as the major strengths and weaknesses of each of these products?

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USEFUL WEBSITES

www.kmmag.com. Knowledge Management Magazine. A magazine of executives interested in organizational and technological knowledge management strategies. It addresses issues of strategy, technology, process, and corporate culture.

www.businessinnovation .ey.cm/mko/index.html. Managing the Knowledge Organization (MKO).Web site for the MKO Consortium, which is a group of business leaders, academics, and researchers brought together by the Center for Business Innovation at Ernst & Young. Their purpose is to "develop a greater understanding of how businesses can better use knowledge to create value."

www.knowledgeinc.com. Knowledge, Inc. Online version of the *Knowledge, Inc.* monthly newsletter produced by the Stamford, Connecticut, consulting firm Quantum Era Enterprises and designed for corporate executives. The Web site is divided into three main areas: Empires of the Mind, The Smart Enterprise, and Leading Lights and includes excerpts from the print publication, interviews with executives and top thinkers on knowledge management and intellectual capital, conferences, links to other sites, and other relevant information.

www.kmworld.com. Web site of KM *World,* a monthly newspaper produced by Knowledge Asset Media, Inc., which is focused on creating and managing the knowledge-based enterprise.

ENDNOTES

1. Carla O'Dell and C. Jackson Grayson,Jr., with Nilly Essaides, *If Only We Knew What We Know: The Transfer of Internal Knowledge and Best Practice* (New York: The Free Press, 1998), 12.

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Case Study Cisco Systems

A Matter of Connections: More than an infrastructure supplier. Cisco makes a market dominance a product of knowledge.

Search on "knowledge management" on Cisco Systems' customer portal, the Cisco Connection Online (CCO) Web site, and you won't find much: a fact sheet, some marketing materials for small businesses and a smattering of other documents. But Cisco is an object lesson on how well a company can- use knowledge management to reshape its culture and processes without resorting to KM rhetoric.

Knowledge management practices have taken hold in most successful companies, even if they are not called KM. The benefits of working collaboratively, identifying expertise wherever it may reside and sharing key information on a timely basis are well-known; now the necessity of extending knowledge-sharing beyond the enterprise to customers, partners and suppliers also is becoming clear. Cisco has long pursued these strategies, and they have played a significant role in making the company one of the most valuable in the world today

In practice, Cisco has leveraged its position as a leader in the infrastructure of data networks. It has used the routers, hubs, switches and other products it sells to build open information architectures that link its employees, suppliers and customers to the information and knowledge

they need to do their jobs. The resulting channels have allowed Cisco to streamline processes, automate practices and share its knowledge with suppliers to build trusted, mutually profitable partnerships.

Culturally, Cisco promotes knowledge-sharing rather than knowledge-hoarding. It has shrewdly added to its knowledge base by acquiring innovative companies and integrating them into the corporate whole. In an industry notorious for its turnover rates, Cisco is known for hiring and retaining smart employees. All these moves are paying off as the company applies the knowledge gained to its bottom line.

"There are companies doing knowledge management that don't really call it that," says Mark O'Connor, associate director of enterprise knowledge management for the Yankee Group in Boston. "From our perspective, knowledge management is leveraging the organization's intangible assets. In that context, Cisco does a very good job."

Riding the Wave

Cisco owes a great deal of its success to serendipity: It has been in the right place at the right time. The San Jose, Calif., company was founded in 1984 by computer scientists from Stanford University seeking an easier way to connect different types of computer systems. Its core business has been the unglamorous "plumbing" that makes it possible to connect computers and their users. As mainframes and dumb terminals gave way to the client/server architecture, the TCP/IP LANs that Cisco's hardware enables became one of the linchpins of business. Then the biggest of all 3, TCP/IP networks—the Internet—took *off,* and the rest is history.

Cisco has sustained double-digit revenue growth for more than 38 consecutive quarters. Belief in the value of the company's products' and services has become so strong that this year, Cisco's market capitalization surpassed that of General Electric and then of Microsoft; it peaked at $555 billion. Even so, until recently, relatively few people had ever heard of Cisco. "We're like the overnight rock star that took 10 years to get there," says John Sifonis, managing director of Cisco's Internet business solutions group (IBSG).

"Cisco is a fierce competitor that succeeds in nearly every market sector it enters," says O'Connor. "Depending on how you segment it, Cisco positions close to 25 products in seven technology categories, ranging from network interface cards and remote-access devices to routers and ATM/WAN switches. Cisco's objective is to be number one or two in each category, and for the most part it is."

As the network infrastructure business has boomed, the company has prospered while competitors such as 3Com, Cabletron and Nortel Networks struggle. Cisco claims to have captured 85 percent of the market for Internet switching equipment. Yet for so dominant a company, there has been surprisingly little criticism of Cisco in the business press. "They make mistakes like anybody else, but their mistakes are hidden in the dramatic growth they have had," O'Connor says.

"Cisco is one of those firms that are pretty much firing on all cylinders strategically," says Chris Nicoli, who monitors Cisco for Current Analysis, a provider of industry analysis and software in Sterling, Va. "There are some specific blind spots when it comes to carrier voice and optical networking, but strategically it knows how to make itself valuable to its customers—not just with products, but with service and support."

The Internet isn't just Cisco's business: it's also how Cisco does business. Building on the dial-in bulletin board it first posted in 1992, over the past three years the company

has opened portals for its customers (CCO), suppliers (Manufacturing Connection Online) and employees (Cisco Employee Connection). This expansion of access to intellectual capital has increased operational efficiencies and reduced costs. Cisco's Web strategy puts a virtual consultant online, offering the customer expertise in configuring systems, closing orders and delivering goods. "The goal is to create a relationship where customers can get access to every aspect of their relationship with our company over the intranet or Internet," says Pete Solvik, senior vice president and CIO of Cisco.

More than just transaction data flows through Cisco's networks and into its portals. Transmitting an order electronically from the customer straight through to the supplier is one thing, sharing sales forecasts with suppliers and bug reports with customers required a leap of faith. "Early on, in 1991, we took the risk of trusting our employees, our customers and our partners and suppliers with information that normally would be held close to the chest," says Karen Brunett, IBSG marketing director. Cisco gambled that key constituents both inside and outside the organization would learn from each other in mutually profitable ways.

Plans to create its first online technical support database caused a major debate within Cisco, Sifonis admits. Some executives feared that exposing everything—warts and all—would give competitors information they could use to sell against the company. Instead, customers have helped the company find errors ih its network operating system. "The reaction was just the opposite [of what was feared]," Sifonis says. "Once our customers knew what our problems were, they also wanted to know what our competitors' problems were."

One-Stop Shopping

The Cisco Connection Online portal is home to a number of customer-facing applications. Customers use CCO to diagnose network problems, find answers to technical questions and order products. They can configure, price, route and submit electronic orders to Cisco on an automated order-flow system. More than half of those orders go directly to Cisco's third-party suppliers, who in turn ship directly to customers. The site is directly linked to Federal Express and UPS package trackers so customers can determine in real time the status of shipments.

This system has shortened Cisco's order cycle by 70 percent—from sixto eight weeks to one to three weeks. "We don't touch the product at all," says Brunett. "We saved about $440 million in fiscal 1999 by streamlining that process from order entry to shipment.

Using CCO isn't mandatory. Cisco recognizes that not every customer will prefer this virtual storefront. But CCO is there to greet every current or potential customer that arrives via the Web, since handling routine customer issues through electronic systems frees human sales and service reps to address more difficult or higher-value transactions. "They have been innovators in using the Web for fulfillment without doing away with the high-touch, personal face," says Nicoll of Current Analysis. "For customers who are self-sufficient and know what they want, the Web offers a quick and secure means of ordering products. Customers who need more hand-holding or prefer to have a more local interface have a familiar body right in front of them."

CCO has contributed to a 25 percent increase in customer satisfaction since 1995, according to Sifonis, who claims that orders arrive at the customer on time and error-free 98 percent of the time. Cisco surveys report that customers prefer to use the Web for technical questions 60 percent of the time and for product information 80 percent of the

time. The company sells about $50 million in products on the Web each day, Sifonis estimates.

B2B Benefits

The company also created Cisco Manufacturing Connection Online (MCO), a business-to-business (B2B) supply chain portal for its contract manufacturers, suppliers, assemblers, distributors and logistics partners. MCO provides a central access point for manufacturing applications, reports, tools, forecast data, inventory information and purchase orders.

"They don't have to rely upon faxes, e-mail or phone calls. Everything is done electronically, and there are not many opportunities for errors," says Nicoil. "Cisco operates pretty much on a build-as-you-buy basis. With access to Cisco sales information, suppliers can do their own forecasting, keep a tight handle on their own inventory control and maintain their costs accordingly."

Reducing cycle time cut the company's inventory and that of its manufacturing partners by 45 percent, according to Sifonis. He adds that partner satisfaction has increased as vendors develop a more intimate relationship with Cisco.

The challenge of B2B is that in unmediated exchanges buyers and sellers still have to trade useful knowledge, according to Mark Tucker, senior consultant with the Delphi Group in Boston. "The real intelligence and information value has always been the context that you wrap around the information," he says. "Successful people in B2B will have to automate the management and delivery of context, which is at the heart of knowledge management."

One of the most difficult aspects of building Cisco's supplier Web was transforming a culture where employees and vendors were rewarded for hoarding knowledge into one in which shared knowledge is used to create value for all constituencies. "Building a trust model that the organizations have bought into and are comfortable with is key," says Peter Alexander, vke president of enterprise marketing at Cisco. "It's about extending trust and moving historically confidential information out to suppliers."

"We don't believe in the *Field of Dreams* concept," says Sue Bostrom, senior vice president of Cisco's IBSG. "We ac
tively engage customers [and suppliers] through focus groups and advisory boards to determine what they want, and we develop applications that will meet those needs. If you go to the site, it looks like an interaction and transaction engine, not a marketing tool."

From the Inside Out

On the inside, Cisco's intranet portal, Cisco Employee Connection, applies the self-help model to internal processes. Just as the other two portals are valued by how well they improve customer satisfaction, CEC is designed to boost employee satisfaction, retain human capital and help the company add to its workforce without incurring the additional administrative support costs that usually accompany rapid growth.

Online interaction begins even before employees are hired. More than 80 percent of the 25,000 job applications and resumes Cisco receives monthly come in through the Web. Once hired, employees do almost everything online:

hold meetings, learn new skills, order supplies, file expense reports, enroll for benefits, exercise stock options or search for intelligence on competitors.

In the Knowledge Age, companies must strive to keep up. “E-learning is the e-commerce of three years from now,” says Bostrom. “The speed at which we need to learn new skills is accelerating.” Cisco now does some four-fifths of its sales and technical training online and has saved 40 to 60 percent in costs compared to the expense of traditional classroom training and related travel. According to Tom Kelly, vice president of worldwide training, in one year Cisco converted from doing 90 percent of learning in classroom lectures to 80 percent online.

The company believes that learning must be supported by metrics that put accountability on the part of the learner and the learning content, he says. Employees are not penalized for choosing not to learn but are rewarded if they do. “It’s carrot, not stick,” says Kelly. Employee scores on learning-related tests become part of their performance evaluations. For salespeople, measurements of their performance on learning-related tests and similar metrics will be built into the sales commission matrix and salary compensation.

One of the best examples of process automation in CCO is expense reporting. Employees receive electronic statements for their American Express corporate cards and can quickly transfer reimbursable charges to their electronic expense forms. Expenses are submitted automatically, and employees are reimbursed in as little as 48 hours.
Cisco’s business rules are built into the application, which knows what hotels are approved and at what prices; it will even prompt employees to explain why they stayed in a more expensive hotel. According to Sifonis, only two auditors are now required to handle more than 26,000 users per month.

This convenience for employees also boosts the company’s bottom line. Sifonis asserts that by streamlining and automating work processes and employee services, such self-service applications save Cisco about $58 million per year. Yankee Group’s O’Connor points out that the productivity value of such initiatives is reflected in Cisco’s 1999 income per employee of $690,000; its closest competitor, 3Com, earned approximately $435,000 per worker.

Leveraging Lessons Learned

Cisco’s main business is still selling products, but internally it has evolved into a company where knowledge itself is the chief asset. Its understanding of how to reinveent a company is being exported to other companies; Cisco’s thought leaders act as high-level advisors to help Ford Motor Co., General Electric, Procter & Gamble and others develop and deploy their e-business strategies.

In nearly every facet of its business, Cisco not only encourages but expects employees to use both private and public networks effective; Slovik credits Cisco’s strategic reliance on sharing knowledge in this way for the company’s market dominance. Toward this end, Cisco has developed quantifiable ways of measuring the success of information systems. “We measure leading Internet capabilities as a corporate metric,” says Alexander. “We can track right down to the organization level. Whether it is finance, HR or lines of business within engineering, marketing or sales, they are required to report on the ways they are using information technology.”

Each functional organization first works with Andersen Consulting to determine where it stands in relation to the rest of the industry and then reports directly to CEO

john Chambers. “You don’t want to be a laggard with regard to Internet applications here at Cisco,” says Bostrom.

Because Cisco sells products on the Web, supports customers on the Web and consults on the Web, O’Connor says, “They are their own best customer.” With the trend toward e-learning in many industries, by setting an exam-pie with its internal training programs Cisco can benefit directly when other companies follow its lead. “By showing people how to do it, they are gaining leverage for the whole argument of network infrastructure technology,” he says.

Cisco’s evangelism creates a self-perpetuating information feedback loop. “There’s a business case that says the more we can help our customers in their business, the more strategic value we add to them, the more they will understand the value of deploying larger infrastructures with Cisco,” says Alexander.

Two and a half years ago, the company created its Internet business solutions group to help customers apply to their own e-business efforts the lessons Cisco had learned. “People had heard about our e-commerce and service and support applications, and they wanted to know how we did it,” Brunet recalls.

Cisco’s consultants apply the company’s Global Networked Business model, drawn from Cisco’s own experience, which describes an enterprise that strategically uses information and communications to build a network of strong, interactive relationships with all its primary constituencies.

Driven by customer needs and business goals, Cisco has not hesitated to make finandal and cultural investments to maximize return on intellectual capital. On one hand, management connects the efforts of employees to actual results by rewarding managers based on the satisfaction of their customers rather than pure sales numbers. And it encourages employees to take risks. “There is an expectation that if you are not making mistakes, you’re not trying hard enough,” O’Connor says.

“It’s not knowledge management for knowledge management’s sake,” says Bostrom. “You start with the business problem you are trying to solve and ask yourself how this application helps you solve it.”

While other companies talk about knowledge management, Cisco has turned theory into practice without adopting KM jargon. Its success speaks volumes about the importance of knowledge initiatives to a company’s bottom line. Perhaps unexpectedly, Cisco is now finding that its experience in transforming itself to meet the challenges of the Knowledge Age has become itself a strategic asset. As that knowledge gets exported to customers, suppliers and partners, it is helping to shape our economy in ways previously unforeseen.

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CASE STUDY QUESTIONS

1. “Early on we took the risk of trusting our employees, our customers, and our partners and suppliers with information that normally would be held close to the chest,” says Karen Brunett in the Cisco case. Why do corporate cultures tend to

guard information rather than share it? What are the implications of this tendency for KM projects? How did taking this risk pay off for Cisco?

2. How does Cisco use the time saved by making information available via the Web to improve customer service? What has been the payoff for Cisco?
3. How does Cisco's intranet portal, *Cisco Employee Connection*, apply the self-help model to internal processes?
4. How did building Cisco's business rules into its expense reporting system save time and money and improve the process?
5. How is Cisco leveraging its experience with using KM and digital networks to reinvent the company to help other companies and generate additional income?
6. How big a factor is Cisco's strategic reliance on leveraging knowledge to its growth and profitability? How is Cisco measuring this?