An immense and ever-increasing wealth of knowledge is scattered about the world today; knowledge that would probably suffice to solve all the mighty difficulties of our age, but it is dispersed and unorganized. We need a sort of mental clearing house for the mind: a depot where knowledge and ideas are received, sorted, summarized, digested, clarified and compared.

— attributed to H.G. Wells, 1940
KNOLEDGE-MANAGEMENT spending is expected to rise from $410 million in 1994 to over $4.5 billion in 1999. Similarly, 42% of the Fortune 1000 have appointed a CKO—Chief Knowledge Officer. Virtually all major consulting firms have developed systems for knowledge management—the formal management of knowledge resources, usually using advanced information technology. KM is a process of converting knowledge from the sources accessible to an organization and connecting people with that knowledge.

Typical KM tools include the World Wide Web, Lotus Notes, the Internet, and intranets. AI developments—such as intelligent agents, knowledge bases, knowledge discovery, and ontologies—also play an important role in KM systems. According to the CKO of Dow Chemical:

Companies are leapfrogging others based on their intellectual assets. If a company is not addressing these things, it’s running a very high risk, because a lot of other companies are.

Why knowledge management?

Organizations use KM for a number of reasons, including environmental pressures, technological advancements, and the ability to create valuable information.

Environmental pressures. Environmental pressures—stemming from our increasingly competitive global marketplace—force firms to consider more formal KM. Competitive pressures lead to downsizing, which, in many instances, results in substantial losses of critical knowledge. Such pressures also force mergers, and “good old boy” networks are difficult to implement in merged firms. Many employees—and their knowledge—are lost, while those who remain are unaware of critical information resources. In addition, finding the necessary information sources and determining what is or is not important information are hard to accomplish in a new organization.

Globalization and geographical dispersion also create a demand for KM. For example, consider the following situation involving a drug company with offices in many countries. Spanish regulators hesitated to approve a certain product, because they feared that the randomization approach might have introduced bias into the trial process. The company had experienced a similar problem the year before in Sweden but failed to properly record and disperse the information to all its divisions:

“Why weren’t we told?” Quesada asked. “Perhaps we could have anticipated the regulators’ criticisms and been ready with some intelligent answers.”

“I told headquarters,” Olsson said [the sales manager for Sweden]. And indeed he had...

KM is difficult even if participants are in the same location. Geographic dispersion makes it harder because information and knowledge flows that can take place at mundane events—such as lunch—have no forum.

Technological advancements. Technology made available from Internet developments has played an important role in facilitating KM. Virtually all accounts of KM stress using Internet browsers. In addition, many tools developed for independent Internet use have developed rapidly in the Internet environment—intelligent agents, for example.

Creating valuable information. KM systems help organizations create value by converting information and individually available knowledge into group or organizationally available knowledge. Sequent Computers’ CKO asserts, “Commercial knowledge is only valuable for the commercial performances that it produces.”

The direct impact of these connecting and converting processes depends on the organizational setting. For example, for Monsanto, a national security agency, the goal is customer satisfaction. Monsanto’s KM director says, “the ultimate value of the [knowledge management] effort is that it has allowed Monsanto to bring innovations to the market quicker, improve upon the operational efficiency of Monsanto’s business, and serve its customers better.” Dow Chemical’s global director of intellectual asset and capital management relies on KM to generate a competitive advantage over other firms: “People in knowledge-management processes that create learning environments will increase competitive advantage.”

Converting and connecting

Classic KM thinking assumes that a firm gathers all its important knowledge in a single place, and employees use it to make good decisions that will benefit the organization.

According to David Bank,

The premise behind the boom is simple. Employees hold a wealth of knowledge and experience... If these bits and pieces could be gathered and distributed throughout the entire company, the shared knowledge—a sort of collective IQ—would become a powerful force.

This kind of thinking, however, is only partially right—it is only a partial implementation of KM converting and connecting processes.

This classic approach stresses converting employees’ private knowledge to generally available public knowledge but ignores knowledge generated from data and text-based information. It also stresses connecting knowledge and people, but it doesn’t link knowledge to other knowledge or push knowledge out to employees. Tables 1 and 2 summarize the full range of KM converting and connecting capabilities.

Converting individual to group-available knowledge. One of the primary KM premises is that an individual’s knowledge can be captured and converted into group- or organization-available knowledge. According to Ikjiro Nonaka,

Making personal knowledge available to others is the central activity of the knowledge-creating company. It takes place continuously and at all levels of the organization.

However, converting individual knowledge requires knowledge sharing and collection in a form that can be generated and reused. Knowledge sharing must identify knowledge that is desirable to share, worth converting, and usable by others. It must also consider production processes and other variables. Knowledge bases might be generated to sup-

<table>
<thead>
<tr>
<th>Knowledge source</th>
<th>Converting activity</th>
<th>Example knowledge</th>
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<tbody>
<tr>
<td>Individuals and groups</td>
<td>Knowledge harvesting and sharing</td>
<td>Operations, products, and sales</td>
</tr>
<tr>
<td>Data</td>
<td>Knowledge discovery</td>
<td>Fraud or customer-service analysis</td>
</tr>
<tr>
<td>Text</td>
<td>Knowledge discovery</td>
<td>News concerning management changes</td>
</tr>
</tbody>
</table>

Table 1. Knowledge-management converting.
port the sales process (what new sales opportunities have created the greatest response from customers?) and customer service (how do customers solve specific problems?).

One of the keys to converting individual knowledge is having the appropriate incentive system for sharing knowledge. Without the proper incentives, individuals will not share knowledge. Ernst & Young C&O John Peetz says that to ensure contribution to the KM system, employee contribution is one of the five basic areas of yearly evaluation.3

Although individuals might have generic knowledge to contribute, case histories are particularly robust. For example, when Buckman Laboratories, a specialty chemical manufacturer, asked each sales representative to write a case and share it with other representatives, their sales increased. As one Buckman group leader explained:

“One of my people wrote about how a canner in California’s Imperial Valley was using a certain Buckman product in canning tomato products. My person in Texas saw that application story and decided to visit a canning factory in his area—a potential customer he had never called on. The case history and the subsequent sales call resulted in a substantial new sale.”8

Buckman currently has a knowledge base of over 2,500 such cases.8

Converting data to knowledge. Knowledge discovery is a new and rapidly evolving discipline that uses many different techniques and tools from both AI and statistics to tease knowledge out of data warehouses and other sources (visit IBM’s data-mining Web page at http://direct.boulder.ibm.com/bi/info/overview.htm). Knowledge-discovery tools focus on turning data, such as financial data, into knowledge. Gregory Plattsy-Shapiro and William Frawley define knowledge discovery as “the nontrivial extraction of implicit, previously unknown, and potentially useful information from data.”9 It has found use in a wide range of applications, including fraud, consumer, and product analysis.

Converting text to knowledge. Other important sources of knowledge include text-based information such as news articles. Typically, companies make these information sources available to their intranet users as part of the KM system.

With KM systems, people can manually cull through news articles or they can use systems designed to facilitate that search. A number of systems help users generate knowledge from text to meet user needs. For example, newBot is an intelligent agent designed to help users monitor over 100 different news-oriented sites, including Business Week and USA Today.1 Similarly, Price Waterhouse has developed ODIE (On Demand Information Extractor), a system that reads over 1,000 news stories nightly to generate knowledge about management changes.10 It exploits knowledge about stylized business articles and syntactical patterns of business events related to management changes.

Connecting people to knowledge. KM converting can result in very large sets of knowledge to navigate. For example, the Ford Motor Company is reported to have over 30,000 pages available to its users.11

In addition to search engines, some firms are generating unique tools to help connect users and information (see Table 2). For example, Cooper’s & Lybrand is building “Michelin Guides” into its knowledge bases to help people understand what is available and where it is located.12 These guides summarize available knowledge and suggest other places with the same or similar information.

Intelligent agents offer another approach. Arthur Andersen has developed InfoFinder,13 an intelligent agent that learns about a user’s information interests in a document repository (Lotus Notes). InfoFinder generates a user profile based on sample documents that the user investigates while browsing. It learns profiles from documents and guides the user to other new and existing documents in the repository.

Connecting knowledge to knowledge. Historically, KM systems have had a document-oriented focus. Unfortunately, documents themselves do not establish the content of a topic in the knowledge base. Content comes from facilitating links between different documents using, for example, hypertext.

The business-strategy director at Xerox argues, “Since many feel that the road to new knowledge is triggered by invalidating the old knowledge, tools that build these active connections and links between the new information and the old knowledge are really of high value.”14 Consequently, connecting knowledge is one of the most critical tasks in a KM system.

There are, however, different ways of deciding which knowledge should be connected. Some say there is a “top down” spectrum; others discuss it as a “bottom up” spectrum. I refer to the top-down model as the “Vatican” model. The Vatican Web site is one of the largest in the world. Virtually all the links are to other links at the Vatican site. It is analogous to building a spectacular cathedral. The contrasting view is the “classic World Wide Web” model—which individual page owners take responsibility for particular topics and links. Rather than a single cathedral, there would be many churches, each maintained locally.

The first approach can result in many traditional links to accepted and massaged material, while the second can result in surprises (possibly resulting in creative solutions) but miss some important foundation links. A merger of the two strategies is likely to generate the most flexible set of knowledge links.

Using either model, users don’t all have the same views and thus don’t connect knowledge in the same way; KM systems must accommodate these multiple views. For example, Carol Hildebrand asserts that “because all of the (Coopers & Lybrand) 70,000 employees don’t all look for the same information in the same way, [the system] is careful to offer several routes (business geography maps) to each destination.”12

Connecting people to people. The greatest source of knowledge is other people; good old boy networks are valued assets. As noted in Christopher Bartlett’s discussion of McKinsey & Co., “the firm’s most successful partners were those with the largest personal networks.”14

Intranets, like the Internet, let individuals share what they know. Human-resource capabilities are being captured on home pages that allow employees to “advertise”

Table 2. Knowledge-management connecting.

<table>
<thead>
<tr>
<th>CONNECT</th>
<th>PEOPLE</th>
<th>KNOWLEDGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>People to...</td>
<td>Emphasize personal networks and replace “good old boy” networks.</td>
<td>Use “pull” technology—search engines and intelligent agents.</td>
</tr>
<tr>
<td>Knowledge to...</td>
<td>Use “push” technology to send knowledge directly to people.</td>
<td>Focus on content instead of document information and link knowledge with multiple paths.</td>
</tr>
</tbody>
</table>

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skills, and some organizations are giving those home pages easy access. For example, as Bill Roberts shows, users of the Booz Allen intranet can gain immediate access to “Experts and Resumes” from the title page for the “Knowledge On-Line 2.0” system. The knowledge base contains a repository of expert skills.

Furthermore, intelligent agents can be used to connect people. ContactFinder is a proactive intelligent agent that reads and responds to electronic bulletin-board messages. Rather than trying to solve users’ problems, ContactFinder offers assistance by referring people to others who might be able to solve their problems—it responds to questions with a referral. When it does have a referral, it posts its knowledge to the bulletin board as if it were another user, which increases the bulletin board’s density and connectivity. Rather than a good boy network, Bruce Krulwich and Chad Burkey argue that ContactFinder provides a “good old ‘bot” network.

Connecting knowledge to people. Classic KM systems assume that if people want or need knowledge, they will ask the system to search for it; they will pull knowledge from the system. KM systems in this scenario passively store knowledge. Unfortunately, waiting for users to pull information can result in unfound or unused knowledge and unsolved problems. There is substantial interest in alternative strategies that push the knowledge to the user.

One of the first widespread applications of push technology in a Web environment was the introduction of the “PointCast” screen saver. PointCast brought news, weather, and sports directly to a user’s desktop. That same push approach can be used with KM. Organizations can take a proactive KM approach and push knowledge out to users, rather than wait for the user to go to the KM system.

Currently, an important question in push technology asks, “Is some knowledge more amenable to push than other knowledge?” David Steier and his colleagues report on a push strategy used in two different settings at Price Waterhouse. In the first case, they discovered financial data from Edgar (Electronic Data Gathering Analysis and Retrieval) that met certain conditions and then forwarded it to users responsible for monitoring financial filings. In the second case, they extracted information about management changes from newswires and sent it to users with an interest in those companies. Users in the second case preferred to monitor the management changes themselves, while in the first case, the information push continues to be well received.

Pushing knowledge to people has the advantage of getting knowledge out to users with a larger chance that it will be found and used. In addition, pushing can result in less effort spent by employees on searching for knowledge. Unfortunately, compared to pulling knowledge, the push-knowledge strategy has higher administrative costs. Also, in a push environment, the knowledge is less likely to be secure, particularly if it takes the form of a screen saver. This could potentially produce knowledge at inconvenient times, such as when clients or competitors are on-site or when the user is not there.

Knowing the limitations

In spite of the gains from using KM, there are still limitations associated with focusing on knowledge. First, knowledge does not necessarily result in direct action to create value; “The wise see knowledge and action as one.” Second, knowledge processes are nonstationary. Bill Dauphinais notes that “Today’s conventional wisdom becomes tomorrow’s folly. This is the new corporate reality ... the paradox of a game where the rules are continuously changing.” Knowledge-management systems are in danger of providing continually outdated material. Third, as stated by Albert Einstein, “Imagination is more important than knowledge.” Even if organizations can provide access to substantial quantities of knowledge, creativity achieves the ultimate breakthroughs. Knowledge alone does not guarantee a creative response to decision-making situations.

References


Daniel E. O’Leary’s bio appears on page 39.