CHAPTER 5
Knowledge Management Tools

All organizations deal with knowledge in their daily operation. However, only a few have a systematic and formal way of dealing with knowledge. The majority of organizations rely on individuals and ad hoc processes. The consequence of this is that when people leave the organization, they take their knowledge with them resulting in the loss of valuable organizational assets and resources.

There are a number of factors that can motivate an organization to establish a formal and systematic management of knowledge. These include the desire or need to: (a) get a better insight on how the organization works; (b) reduce the time and effort in searching for information and documents; (c) avoid repetition of errors and unnecessary duplication of work; (d) reduce the response time to questions that are asked frequently; and (e) improve the quality and speed of making important decisions.

Various levels of the organization, including administrative, tactical and strategic, can benefit from a systematic and formal knowledge management. The administrative benefits include significant reduction in Human Resource Management (HRM) workload, better planning of recruitment of employees, personalized training of staff, and improvement in the retention of employees. Knowledge management can provide the employees the necessary tools to auto administer their data. An enterprise portal, for example, can provide the means for employees to update certain data that concern themselves such as home address, bank account and the like. As a consequence of the use of such a portal, the HR department can be relieved of several administrative tasks and focus on other relevant work. In addition, this process gives the employees a sense of being in control of certain aspects pertaining to their personal information.

On the other hand, a web-based skills management system, which can be implemented as a component of the knowledge management system, can enable employees to update and upgrade their own skills. It can also be

used to locate or identify people with the right skills. Once all skills of the staff along with their history are stored in a KM system, a knowledge map of the organization can be generated. This map can show the strong and weak points of the organization and indicate emerging trends.

The tactical benefits include faster access to relevant information and documents at any time resulting in accelerated organizational processes. In addition, the knowledge map, which provides an explicit representation of staff competencies and interests, makes possible a better and faster matching of the requirements of particular projects to the skills and interests of people available within the organization.

The strategic benefits include the competitive advantage that can result from a proper and systematic management of the organization's knowledge. Through knowledge management, the organization can turn knowledge into a strategic asset and create an ever learning organization. By capturing relevant experiences and making them readily available throughout the organization, the entire organization can learn on itself. By having an efficient knowledge storage system and intelligent distribution process, the whole organization can learn from individuals and from groups working within the organization. Such a system also ensures that the right persons with the relevant knowledge are consulted at the most appropriate time.

In order to fully implement a knowledge management system and derive the maximum benefits there is need to provide two elements: one, a technological infrastructure composed of computers, networks and databases; and two, software applications installed in distributed environments. These two elements are usually referred to as knowledge management tools. These tools are designed and built to enable easier and faster use of important functionalities, such as document management, collaborative online workshops, superior search engines and the like, that are essential for the management, safeguarding and harnessing of knowledge. The effective deployment of these tools within a knowledge management system can improve collaboration and working environment, enhance competitive advantage and responsiveness, and increase overall productivity.

Knowledge management tools are used to create, organize and share the knowledge that can be found, most of the time, in a document, a project report, or a memo from one employee to another. There are a number of software applications that are able to create a web of repositories, search engines and virtual spaces where knowledge can be stored, retrieved and shared. An ideal knowledge management tool must include such features like mobility that allows users to interact with the system from any place at any time. It is also important to maintain an updated compact disk (CD) that can be used offline whenever a network connection is not available.

For the end users, the usability of knowledge management tools is of great importance. Such tools must be readily available and user friendly, other-wise employees will not use them. Since most users are already familiar with the Internet Web Browser, it is probably the most common in the market as a default presentation. Hidden from the view of the users are databases, mainly Oracle or SQL server, expert systems, integration with Enterprise Resource Planning (ERPs), such as SAP R/3, applications such as Lotus Notes and development products such as Microsoft or Sun for C, C++, Java and Visual Basic, among others.

There are a great variety of knowledge management tools available in the market comprising many different features that are suitable for a number of different applications. Some of the typical tools that are used in knowledge management solutions will be discussed here. These include: (a) document management system; (b) enterprise portal; (c) knowledge map and skills management; (d) information database and lessons learned system; (e) collaboration tool; and (f) communities of practice.

Document Management

Documents are the most common repository of information and knowledge in any organization. Documents are produced for almost everything: a project proposal, a contract or agreement, a technical report, a scientific paper, and others. Because of the great variety of the types and lengths of documents that an organization can produce, the systematic

and organized management of these documents can save the organization considerable effort and money. And for many organizations such an effort to systematize and organize document management is the starting point of knowledge management. However, knowledge management actually involves much more.

Box 5.1   Document Management: KM Starting Point

There are several document management products on the market, all providing basically the same functionalities (e.g., MS Sharepoint, Oracle iFS, Lotus Domino, etc.). Some typical features are described below.

Description:
Web-based central repository containing all important documents for an organization. Structured according to each organization's needs.

Benefits:
Enterprise-wide sharing of any kind of document (office, html, mail)

Features:
- Easy construction of folder structure
- Define customized document types with corresponding metadata/ attributes
- Indexation of all common file types (office, pdf, html, txt)
- Advanced search
- Alerting/subscription services
- Workflow
- Version control
- Profile and user-based access and actions
- Threaded discussions about documents

*Source: Benjamins, V. R., "Knowledge Management in Knowledge-Intensive Organizations",
          Intelligent Software Components, (2001).*

Document management has two key functions: first, it provides content; and second, it facilitates content management and access. These two functions have significant positive impacts on the efficiency of the organization. Depending on the nature and size of the organization, the inefficiencies related to document accessibility can cost the enterprise millions of pesos annually as employees waste many hours just looking for the needed information.

Document management has four basic elements: first, it records discussions and emails and archives documents; second, it organizes these electronic documents in a hierarchical or network framework; third, it provides search engines for the retrieval of the desired documents; and fourth, it enhances content security by allocating appropriate levels of access to each document.

Most search engines are able to analyze content and search for synonyms. This feature allows users to find keywords or phrases not only in document names but also in document bodies. Many search engines can also manage different document versions, historical documents and archives. This feature ensures that the retrieved version always contains the most recently updated information. Search engines can also have features that allow users to retrieve any document in any desired format and can be used with the preferred software. Such features obviate the need to have all applications installed in the corporate personal computer, which would be expensive and inefficient. As technological development proceeds at rapid pace, it will be possible, in the near future, to retrieve documents in any chosen language, once they have been automatically translated, and to handle voice and video with the same ease as the handling of plain texts today.

Enterprise Portal

Portals can be defined as single points of access that provide easy and timely access to knowledge. Portals are important tools for knowledge management since they make it easier to share knowledge in an organization. In essence, knowledge portals serve as the central point for

sharing knowledge. Through this portal, users can contribute information to the corporate pool of knowledge, access information, and collaborate with other experts and their peers. Since one of the goals of portals is to enhance corporate performance, it is essential to populate the portal with information of the highest quality in order to ensure its successful use in a knowledge management system.

The complete cycle of knowledge includes a series of episodes. A knowledge worker seeks and retrieves knowledge from the portal and then organizes and analyses it so that it may be used to make decisions or take action. Finally, the outcome is shared and disseminated as lessons learned. This knowledge is then stored in a place that can be accessed by other colleagues. The user can obtain knowledge from people with the required expertise or from documents and other artifacts, thus capitalizing on past experiences. In order to make them more useful, documents and artifacts accessed through a portal include a summary, authorship, type, date and other contextual data.

An employee portal provides a single entrance point through which employees can find all the information they need. In addition, it provides tools where employees can update certain data that concern themselves, like home address, bank account, etc. Major benefits of such a portal are that the human resource department is relieved of several administrative tasks (and can therefore focus on other relevant tasks), and it gives employees a sense of being in control over their own information.

The concept of an enterprise portal encompasses the various tools, technologies and practices that make knowledge available to all the staff of the organization and other authorized outside users. They serve to support the collaborative work of groups of knowledge workers in communities of practice and can serve various purposes including academic, business, non-governmental and government-based organizations. Portals are frequently Web-based, allowing creation of distributed documents and making possible to search online information.

Box 5.2   Key Enterprise Portal Basic Functions

- Single sign-on, profile
- Structure, navigation, and personalization
- Community, share and collaborate
- Work flow
- Capture, store and publish
- Categorize and classify
- Search and retrieve
- Notification
- Integration with business applications
- Maintenance

As information and communication technologies become more powerful and widely available, portals are becoming broader structures that support numerous different knowledge-based activities. A good example of a single entry point of access to broad-based and wide-ranging types of information is Google.com. However, majority of portals are usually limited to a number of persons who belong to an organization, government agency or civil society institution or who share a common knowledge area although belonging to different organizations. Another type of portal is organized around the knowledge of a particular sector in a country or group of countries. This type is usually referred to as a "vertical portal".

From a technical perspective, the two main features of portals are taxonomies and crawlers. Organizational taxonomies and advanced search engines are essential elements of portals that facilitate navigation. In addition, most portals include a web-crawling function the primary objective of which is research and analysis of information. After documents are submitted to portal repositories, these can be accessed by crawlers that browse and extract text and meta-data from sets of documents, which can be in multiple repositories over networks.

Box 5.3   A Case Study of the Performance of an Enterprise Portal

THE PROBLEM: UNLOCKING KNOWLEDGE

Corporate executives knew that capturing best practices and corporate information would give employees something they could sink their teeth into. However, information was scattered around the company in disparate systems, and there was no easy way for the geographically dispersed sales force to get at it. "We had knowledge trapped in files everywhere", says Mike Marino, vice-president of customer development at Frito-Lay, an $8.5 billion division of PepsiCo in Plano, Texas. Marino says that he knew if the 15-member sales team could only access the same information, it would solve its ongoing problems within information sharing and communication.

Additionally, much valuable knowledge was squirreled away on each salesperson's system. There were many idiosyncratic methods of capturing information, "none of which were terribly efficient", Marino says. The sales team also lacked a place for brainstorming and collaboration online. If somebody got a piece of research and wanted to get input from account executives in Baltimore and Los Angeles, the ability to collaborate [online] just was not there.

THE SOLUTION: A KOWLEDGE MANAGEMENT PORTAL

The answer, Marino's group realized, was to build a knowledge management portal on the corporate intranet. A KM portal is a single point of access to multiple sources of information, and it provides personalized access. Companies are starting to pay attention to portals because they offer an efficient way to capture information, says Carl Frappaolo, executive vice president and cofounder of the Delphi Group, a consultancy in Boston. A KM portal at Frito-Lay would give the sales department a central location for all sales-related customer and corporate information and cut down on the time it took to find and share research. In addition to different types of information about the team's customers – including sales, analysis, and the latest news – the portal would contain profiles on who's who in the corporation, making finding an internal expert a snap.

Box 5.3   A Case Study of the Performance of an Enterprise Portal

THE IMPLEMENTATION: BUILT FROM SCRATCH

Marino's group established three goals for the Frito-Lay portal: to streamline knowledge, exploit customer-specific data, and foster team collaboration. He brought in Navigator Systems, a consultancy based in Dallas, which had worked with Frito-Lay in the past and had some experience building knowledge management portals. Navigator built a prototype in about 3 months using technologies previously approved by Frito-Lay's IS department

Marino and Navigator essentially had to start from scratch when it came to populating the portal. "Never before at Frito-Lay had they tried to capture expertise systematically in one place", notes Todd Price, a consultant at Navigator. Marino and Price did an audit within the company and then created expertise profiles on the portal so that sales staff in the field would have an easy way to learn who's who at headquarters in Plano. That way, people who have expertise in areas such as promotion planning, activity planning, costing, or new product announcements can be readily tracked down and contacted for information.

The portal went live in January 2000. Since then, three additional sales teams, or customer communities as they are called internally, have been given access to the portal with different content – including research abstracts and what Marino calls performance scorecards, which evaluate account performance. "If somebody in sales or market research did a study in a particular area like private-label trends, [the user] would be able to click to that abstract and get a summary of that study." Users access the portal, known as the Customer Community Portal (CCP), through a Netscape Navigator browser and enter their name and password on the Frito-Lay intranet.

THE RESULTS

The CCP has paid off with increased sales. "What we expected to see was that the pilot team would outperform others in terms of sales and profitability", Marino says. While he declined to give figures, he says the test team doubled the growth rate of the customer's business in the salty snack category. It also made the sales team happier.

Box 5.3   A Case Study of the Performance of an Enterprise Portal

For example, the pilot team members reside in 10 different cities, so the tool has become extremely valuable for communication and helps cut down on travel. A year after implementing the portal, the pilot group has been able to share documents concurrently instead of having to send faxes around the country to different offices. "It's almost a distance learning tool as much as anything else", he says.

The CCP has also helped foster a sense of camaraderie and relationship building. For example, the portal homepage lists the team members' birthdays. People can also share best practices – on anything under the sun. If someone developed an effective sales presentation for a potential customer in Boston, a salesperson in San Francisco could co-opt the information. Salespeople can also find the latest news about their customers, and theirs is an automatic messaging feature that tells team members who is online.

For Ackerman, the portal has also been an invaluable tool for helping him assess employee skill sets, because each salesperson is required to catalog his or her strengths and areas of expertise. "As a team leader, it helps me analyze where people's gaps might be without having to travel to another member's location", he says.

The portal has also helped boost employee retention rates, says Ackerman. Turnover used to be terrible, he says, because salespeople felt pressured to find vital information and communicate with the rest of the team. Marino adds that salespeople felt frustrated and disconnected because there was no way to efficiently collaborate with the rest of their group unless they flew into a central location.

Since the portal has been in place, not one person on the 15-member team has left. Part of that can directly be attributed to the portal, says Ackerman, because it helps build the connection. In company surveys, salespeople previously complained about geographic constraints and how they did not feel connected and part of a team, he says.

The portal has proven so successful that its use has now become a PepsiCo initiative, says Marino. That means it will soon have added functionality so that employees across all three divisions – including Tropicana – can take advantage of product performance information on a jointly shared customer like a supermarket, he says.

Box 5.3   A Case Study of the Performance of an Enterprise Portal

Marino says the different PepsiCo divisions will have the ability to co-promote and co-merchandise multiple products that are consumed together – such as carbonated beverages and salty snacks – to drive greater sales internally, naturally and for its customer. That's talking more than just peanuts.

Source: Shein, E., "The Knowledge Crunch", CIO,
<http://www.cio.com/archive/050101/crunch.html>, (2002)

Since the essential purpose of a portal is to facilitate the sharing of high quality knowledge that has been captured electronically, it is important that the portal content be relevant. The organization that makes use of a particular portal must assess and evaluate the quality of the contribution being submitted and assign meta-data according to its particular features. This enables the creation of structures and categories. Once receipt of documents and other artifacts is authorized, workflow systems deliver the contents to involved or interested persons. This can be done via electronic mail, with appropriate attachments.

Policies and guidelines need to be established in order to ensure that quality is high. For this purpose an organization may implement a policy of incentives to promote contributions and use. Automation helps to count the number of times a piece of knowledge is used by other members and assess its relevance. Users can also rate documents in terms of importance and quality. Documents that are not useful, such as those written in poor style or containing inaccurate information, should not be kept in the repository.

A critical balance must be achieved for the dynamic and rapid retrieval of quality information. Some organizations opt for "convergent" information, meaning that every piece of knowledge received must be validated by the organization and so create a body of high-quality correct knowledge. Others adopt a "divergent" approach, allowing users to contribute at their own risk. The divergent approach is similar to brainstorming and needs careful

management. In order to obtain optimum results, both approaches need to be integrated into a combined set of knowledge habits.

In order to support knowledge workers and communities of practice, portals offer additional functionality for distributed meetings, shared workspaces, telephone and video conferencing and dissemination or exchange of artifacts such as presentations or text documents used in meetings. Moreover, an agenda could allow members graphic access to events and happenings. Collaborating members can also use real-time chat applications. Open topics, formed groups, the identity of discussion participants and events in real time can be browsed graphically with hypertext and visual maps. Also, instant messaging is a well-known and powerful collaboration tool for real-time meeting support.

Call centers provide an illustration of the use of portal systems as they rely very heavily on the tools that such systems provide. Call centers need to access information at high speed while solving the technical problems of clients during a telephone conversation. These systems can provide mining and browsing of key information in a visual way that allows users to understand the implications of the information that they see and discover new facts. In this sense, portals are more than virtual libraries as they integrate all the tools needed to support the sharing of best practices and the functioning of communities of practice.

The implementation of portals requires customization in order to revise the specific environment, analyze functional needs and add personal and social considerations. This is done with an implementation tool that allows – using powerful algorithms – a high-level programming interface to assist customizing applications and the manipulation of data for specific needs and queries from users. It is typically installed in web infrastructures in order to standardize further access. It generates web pages with dynamic data that are presented in any Internet browser without compatibility problems. It also controls access, security and registration in forums. It is not necessary for knowledge workers to be aware of such implementation and maintenance techniques, although such awareness would enhance their performance.

"Out of the box" portals do not exist. Various communities of practice and different organizations have multifarious needs making it necessary to customize and personalize the portals that they utilize. Although the acquisition of the latest and most reliable information and communication technologies need to be considered in the development of enterprise portals, operational issues are even more important. The success of a portal is ensured through the identification of the practices and answers appropriate to the issues faced by the knowledge workers who use it. It is anticipated that in the not-too-distant future, knowledge workers will have access to an electronic desktop containing intelligent and highly task-oriented tools, rather than common standardized portals.

Knowledge Map and Skills Management

Knowledge management tools deal not only with documents but, also, with information about living experts who provide advice and share their expertise with colleagues. The system is an efficient way of making the "localization of experts" easy and quick.

In an organization where people are the most important assets, managing their skills, capabilities, interests and experience is critical. A skills management system is a web-based tool that supports this in a distributed way, spreading the workload over the whole organization. All employees can update their own skills (adding new skills or changing skill levels) and interests, and use the tool to locate people with particular skills. Such tools include a back office tool where the HRM department (or equivalent) can define skills and their levels, i.e., what does it mean to have level 4 (or 5) on skill 'web servers', as well as profiles, e.g., what are the skills required for a senior programmer or a junior business consultant. Available software such as Skillman includes a matching function, which enables people (or HRM, depending on permissions) to see how close they are to a particular profile, e.g., a person needs one more year of experience to be a senior consultant.

<table>
<tr><td colspan="4">Box 5.4 – Example of Expert Directory</td></tr>
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Box 5.4 – Example of Expert Directory			

Experts in Globalization
Read more about a specific expert or contact one now!

Experts (23)	Expertise	View Bio	Contact Expert
David Coelho	Wireless/Telecommunications, Venture Capital/Funding, Startups/Entrepreneuring	View Bio	Contact
David Heaslip	Business Leadership, Business Positioning, Strategic Planning and Strategic Marketing	View Bio	Contact
David Schuelke	Technical Communication	View Bio	Contact
Edmund Astolfi	Technology Transfer Licensing	View Bio	Contact
Felix Germino	Food Chemistry & Product Development	View Bio	Contact
Frederic de Hemptinne	Strategic Environmental Information	View Bio	Contact
Frederick Zimmerman	Manufacturing Efficiency & Engineering	View Bio	Contact
Gregory Lunde	Corporate Governance, Business Strategy Review, Business Intelligence/Audit, and Compensation	View Bio	Contact
Han Kang	Inorganic Chemist (Boron Compounds, H_2O_2, ClO_2, Percarbonate), Household Chemicals	View Bio	Contact

Source: Giga Information Group, (2002).

Projects can be defined along with the skills required for successful execution. For example, an online marketplace project requires as skills Ariba, payment gateways, auctions, etc. Given the project requirements, the matching algorithm can suggest suitable persons and teams, as well as calculate the coverage of the project needs.

Having stored all skills along with their history, the system can generate a knowledge map of the company, which gives insight in the strong and weak points of the company, as well as in emerging trends. A knowledge map helps navigate through documents, versions, authors, experts and external users of information, which could be partners, customers, suppliers and competitors. Knowledge maps are the standard tools employed in order to control crawling, portal access to repositories and categorization of documents and experts.

Information Database and Lessons Learned

In each organization people learn everyday and improve their work constantly based on the experiences gained. Apart from the fact that this is positive for the employee (who is incrementing his knowledge and skills) it is also beneficial for the company as a whole in the sense that individuals perform better, and thus the organization as a whole. However, the organization can also learn on itself by capturing relevant experiences and distributing them through the organization. This ensures that the appropriate persons consult the right knowledge at the right time.

The Lessons Learned knowledge base forms the memory of the company. At the same time the Lessons Learned system supports the process of capturing and diffusing the knowledge. Lessons Learned systems are very important in organizations where mistakes can be very costly and avoiding them in the future provides significant savings. These systems are also extremely useful in organizations where best practices need to be repeated and disseminated as much as possible. This is true, for example, among technology consultancy companies that are project-based or among development banks that provide funds for projects since during the execution of the projects many lessons are learned. Apart from a supporting system, the processes that define what knowledge has to be captured and when knowledge has to be diffused are critical factors for the success of a Lessons Learned system. Experience has shown that a properly functioning Lessons Learned system can provide many of the required functionalities to turn a company into a learning organization.

Box 5.5   KMApps and Mapview

The Asian Development Bank is developing a knowledge management applications (KMApps) to support knowledge capturing, sharing and dissemination by department, sector and theme. KMApps are an electronic tool to manage, access and share information among departments, committees and networks. Each KMApp has eleven modules: library, calendar, concern, cooperation, correspondence, forum, indicators, lessons learned, news, operations, and profiles.

The eleven modules for the KMApps contain data and information for six sector and thematic committees, including water, urban development, governance and capacity building, regional cooperation, private sector development, and non-governmental organizations. The KMApps will be extended to additional sector and thematic committees and networks as well as other departments. It will support the construction of virtual workplaces that can be accessed by all staff anytime, anywhere. These workplaces will be open to all ADB staff and its offices worldwide.

The Bank is also developing a spatial database called Mapview to store maps and map-related resources and materials generated for ADB projects. Spatial information range from remote sensing to satellite imagery, and from topography maps to site photographs. With Mapview, developing member countries data can be seen on a map or from a spatial context. ADB staff can use the map library (capture), add new data (enrichment), post a new map (storage), and share the new map (dissemination). Creation of a single environment where people can store and share spatial maps will result in improved efficiency and cost-effectiveness in designing projects.

Source: Asian Development Bank, Knowledge Management in ADB, (June 2004).

Collaboration Tool

Along with document management, collaboration is one of the most important aspects of knowledge management tools. Collaboration resembles a large meeting room in which colleagues work together, even over long distances or at different times of day. They share opinions, calendars and projects. A collaborative environment enables people to work in secure

online workspaces, in which they use e-mail, Internet web browser and desktop applications in order to share knowledge, build closer organizational relationships and streamline work processes. Such an environment also encourages employees to share information in open discussion forums, thereby providing access to tacit knowledge. Moreover, collaboration tools offer better user interface for internal and external users, thus providing the link between the organization and its partners and customers.

Groupware and workflow management are also collaborative functionalities. Groupware brings together virtually all employees involved in a certain task or project. The use of groupware products, such as Microsoft Exchange or Lotus Notes, is often described as artifact-based collaboration because the collaborative activity involves one artifact, such as an e-mail text or shared document authored by many people, for example a sales order or an individual file in a government agency. Groupware technologies include other ICT applications for organizing meetings and supporting group interaction and decision-making.

Workflows describe interactions among employees by defining paths, time and individuals involved in certain procedures. Once described, the system can automatically manage the procedures, improving the quality of collaboration. Workflows are predominantly effective in distributive environments in which employees are frequently inaccessible or not permanently located in the same physical workplace. In such cases, the organization designs document exchange and collaboration between individuals involved in the same process. For example, when an employee completes work on a document, the system might be programmed to send it to a list of supervisors, who would automatically be notified via e-mail, and request a review.

E-mail messaging is a basic but highly efficient way to collaborate. It allows people to make contacts and share views on work, problems and solutions. In order to achieve mass dissemination, the ideal knowledge management tool incorporates web page creation in order to facilitate the arrangement of a number of documents and contents together and make them widely available.

Virtual rooms open a series of possibilities. The ideal knowledge management tool has virtual meeting rooms operating in real time, simultaneously and instantly for all employees, who might be distributed over different locations yet remain connected and thus able to exchange information at once. Various possibilities are available, such as chats, videoconferences, forums, email and web pages.

Box 5.6 Groupware as Collaboration Tool

What is Groupware?

Groupware is technology designed to facilitate the work of groups. This technology may be used to communicate, cooperate, coordinate, solve problems, compete, or negotiate. While traditional technologies like the telephone qualify as groupware, the term is ordinarily used to refer to a specific class of technologies relying on modern computer networks, such as email, newsgroups, videophones, or chat.

Groupware technologies are typically categorized along two primary dimensions:

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

	Same time "synchronous"	Different time "asynchronous"
Same Place "co-located"	voting, presentation support	shared computers
Different Place "distance"	video phone, chat	email, workflow

Box 5.6   Groupware as Collaboration Tool

What is CSCW?

CSCW (Computer-Supported Cooperative Work) refers to the field of study which examines the design, adoption, and use of groupware. Despite the name, this field of study is not restricted to issues of "cooperation" or "work" but also examines competition, socialization, and play. The field typically attracts those interested in software design and social and organizational behavior, including business people, computer scientists, organizational psychologists, communications researchers, and anthropologists, among other specialties.

How is Groupware Design Different from Traditional User Interface Design?

Groupware design involves understanding groups and how people behave in groups. It also involves having a good understanding of networking technology and how aspects of that technology (for instance, delays in synchronizing views) affect a user's experience. All the issues related to traditional user interface design remain relevant, since the technology still involves people.

However, many aspects of groups require special consideration. For instance, not only do million-person groups behave differently from 5-person groups, but the performance parameters of the technologies to support different groups vary. Ease-of-use must be better for groupware than for single-user systems because the pace of use of an application is often driven by the pace of a conversation. System responsiveness and reliability become more significant issues. Designers must have an understanding of the degree of homogeneity of users, of the possible roles people play in cooperative work and of who key decision-makers are and what influences them.

Box 5.6   Groupware as Collaboration Tool

Why Bother?

Why is groupware design worth paying attention to in the first place?

Groupware offers significant advantages over single-user systems. These are some of the most common reasons people want to use groupware:

- to facilitate communication: make it faster, clearer, more persuasive
- to enable communication where it wouldn't otherwise be possible
- to enable telecommuting
- to cut down on travel costs
- to bring together multiple perspectives and expertise
- to form groups with common interests where it wouldn't be possible to gather a sufficient number of people face-to-face
- to save time and cost in coordinating group work
- to facilitate group problem-solving
- to enable new modes of communication, such as anonymous interchanges or structured interactions

In addition to the benefits of groupware, another good reason to study usability and design issues in groupware is to avoid a failed design. Groupware is significantly more difficult to get right than traditional software. Typically, a groupware system can't succeed unless most or all of the target group is willing to adopt the system. In contrast, a single-user system can be successful even if only a fraction of the target market adopts it.

Applications

There are several types of groupware applications. Comparing those design options across applications yields interesting new perspectives on well-known applications. Also, in many cases, these systems can be used together, and in fact, are intended to be used in conjunction. For example, group calendars are used to schedule videoconferencing meetings, multi-player games use live video and chat to communicate, and newsgroup discussions spawn more highly-involved interactions in any of the other systems.

Box 5.6   Groupware as Collaboration Tool

Asynchronous Groupware

Email is by far the most common groupware application (besides, of course, the traditional telephone). While the basic technology is designed to pass simple messages between 2 people, even relatively basic email systems today typically include interesting features for forwarding messages, filing messages, creating mailing groups, and attaching files with a message. Other features that have been explored include: automatic sorting and processing of messages, automatic routing, and structured communication (messages requiring certain information).

Newsgroups and mailing lists are similar in spirit to email systems except that they are intended for messages among large groups of people instead of 1-to-1 communication. In practice the main difference between newsgroups and mailing lists is that newsgroups only show messages to a user when they are explicitly requested (an "on-demand" service), while mailing lists deliver messages as they become available (an "interrupt-driven" interface).

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

Hypertext is a system for linking text documents to each other, with the Web being an obvious example. Whenever multiple people author and link documents, the system becomes group work, constantly evolving and responding to others' work. Some hypertext systems include capabilities for seeing who else has visited a certain page or link, or at least seeing how often a link has been followed, thus giving users a basic awareness of what other people are doing in the system -- page counters on the Web are a crude approximation of this function. Another common multi-user feature in hypertext (that is not found on the Web) is allowing any user to create links from any page, so that others can be informed when there are relevant links that the original author was unaware of.

Box 5.6 Groupware as Collaboration Tool

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

Collaborative writing systems may provide both real time support and non-real time support. Word processors may provide asynchronous support by showing authorship and by allowing users to track changes and make annotations to documents. Authors collaborating on a document may also be given tools to help plan and coordinate the authoring process, such as methods for locking parts of the document or linking separately-authored documents. Synchronous support allows authors to see each other's changes as they make them, and usually needs to provide an additional communication channel to the authors as they work (via videophones or chat).

Synchronous or Real time Groupware

Shared whiteboards allow two or more people to view and draw on a shared drawing surface even from different locations. This can be used, for instance, during a phone call, where each person can jot down notes (e.g., a name, phone number, or map) or to work collaboratively on a visual problem. Most shared whiteboards are designed for informal conversation, but they may also serve structured communications or more sophisticated drawing tasks, such as collaborative graphic design, publishing, or engineering applications. Shared whiteboards can indicate where each person is drawing or pointing by showing telepointers, which are color-coded or labeled to identify each person.

Box 5.6   Groupware as Collaboration Tool

Video communications systems allow two-way or multi-way calling with live video, essentially a telephone system with an additional visual component. Cost and compatibility issues limited early use of video systems to scheduled videoconference meeting rooms. Video is advantageous when visual information is being discussed, but may not provide substantial benefit in most cases where conventional audio telephones are adequate. In addition to supporting conversations, video may also be used in less direct collaborative situations, such as by providing a view of activities at a remote location.

Chat systems permit many people to write messages in real time in a public space. As each person submits a message, it appears at the bottom of a scrolling screen. Chat groups are usually formed by having a listing of chat rooms by name, location, number of people, topic of discussion, etc.

Many systems allow for rooms with controlled access or with moderators to lead the discussions, but most of the topics of interest to researchers involve issues related to un-moderated real time communication including: anonymity, following the stream of conversation, scalability with number of users, and abusive users.

While chat-like systems are possible using non-text media, the text version of chat has the rather interesting aspect of having a direct transcript of the conversation, which not only has long-term value, but allows for backward reference during conversation making it easier for people to drop into a conversation and still pick up on the ongoing discussion.

Decision support systems are designed to facilitate groups in decision-making. They provide tools for brainstorming, critiquing ideas, putting weights and probabilities on events and alternatives, and voting. Such systems enable presumably more rational and even-handed decisions. Primarily designed to facilitate meetings, they encourage equal participation by, for instance, providing anonymity or enforcing turn-taking.

Multi-player games have always been reasonably common in arcades, but are becoming quite common on the internet. Many of the earliest electronic arcade games were multi-user, for example, Pong, Space Wars, and car racing games. Games are the prototypical example of multi-user situations "non-cooperative", though even competitive games require players to cooperate in following the rules of the game. Games can be enhanced by other communication media, such as chat or video systems.

Source: Usability First, <http://www.usabilityfirst.com/groupware>, (2005).

Communities of Practice

Communities of practice are described extensively in the previous chapter as an excellent means to share knowledge among people who have common interest. Here they will be described again briefly from the perspective of being used as a tool in the implementation of a knowledge management system within an organization. The fact that communities of practice can be viewed as an important enabler for the sharing and enrichment of knowledge as well as a useful tool for the implementation of a knowledge management system lends credence to the claim of many knowledge management practitioners regarding its great importance.

It is common sense that people working together on a project perform better as a team if they often communicate. However, in modern organizations team members often work at different physical or departmental locations. Communities of practice provide a virtual place where those people can exchange knowledge and experiences.

Box 5.7   Communities of Practice

ADB's Communities of Practice priority sectors and themes act as a think tank and provide advice on
- strategic direction and issues in the sector or thematic area covered by it
- sector and thematic annual reports to be prepared by lead specialists
- rationalization of the knowledge products and services (KPS) program and prioritization of ADB participation in external events
- special studies
- ADB's major publications.

Box 5.7   Communities of Practice

The input to strategic direction would also include advice on certain aspects of the HR strategy such as the ADB-wide competencies, skills and numbers required to meet its medium- and long-term strategic objectives and implementation of the proposed technical stream.

The Formal COPs are:
- Education
- Energy
- Environment
- Finance and Trade
- Gender and Social Development
- Governance
- Health
- Regional Cooperation and Integration
- Transport
- Urban
- Water

Recognizing the value of COPs as venue for knowledge sharing, ADB also has informal COPs in the following areas:
- Agriculture and Natural Resources
- Education
- Financial Management
- Information and Communication Technology
- NGO and Civil Society
- Poverty
- Resettlement
- Transport
- Urban Development
- Water

Source: Asian Development Bank, <http://www.adb.org/about/COPs.asp> (2006)

Once a community of practice has appeared or an organization has decided to create one from scratch, there are three main considerations that will need to be taken into account. These are the size of community, the system of interaction, and the budgetary allocation to adequately support its activities.

The size of a community of practice is important. It needs to be large enough to allow critical mass but small enough to avoid inhibiting direct interaction. Experienced practitioners advise that a community with between 20 to 40 members is best able to function smoothly. The actual number depends on the way in which relationships develop and informal leadership grows within the community. A less centralized informal leadership of a community of peers, practitioners and professionals is the preferred structure since decentralization and informality allow for openness and reciprocity in interaction.

In addition to determining the size of the community, it is also necessary to choose an appropriate system of interaction. Under some conditions, face-to-face meetings cannot be relied upon, such as in the case of geographically distant and distributed communities of practice where knowledge problems and issues are common but sharing documents, procedures or experiences over long distances is more difficult. The distance problem can be resolved, in part, through use of interactive information and communication technologies such as videoconferences, teleconference calls, teleconferences on web sites, e-mails and forums but such interactive systems must be carefully designed.

Every knowledge worker has had many experiences of face-to-face interactions, which are predominantly driven by how well each person can express himself or herself or how well a person knows the subject being discussed. But in virtual interaction there are other factors that can limit participation, which can be driven by the technology and system. For example, in most teleconferences, the technology and system decide when and how a member can make a contribution or pose a question. In virtual interaction, one has to deal with the fact that participants are usually visible only when they are making a contribution. The facial reaction or body language of the other participants listening may not be visible at all times.

Moreover, sound budgeting and availability of the financial resources required are critical if members are to dedicate their time. As communities of practice are investments that will yield results, the size of budget allocation

to these communities can be interpreted as an indirect statement from the hierarchy with regard to the extent of the commitment of the organization to the knowledge initiative. Some organizations offer time and travel to participating members. For instance, McKinsey allows formal free time to employees on Fridays after lunch for professional development. But at what point should organizations allow funding for a new community of practice? A system of formal proposals is often established and only those of sufficient interest are funded. For example, the World Bank uses projects as primary source for funding communities of practice infrastructure.

Several experts in a certain area know more than one expert. Therefore, it is important to provide people with the same skills and interests a place where they can discuss and exchange their latest experience, facts, etc. A person working on a project, can – through such a virtual place – stay in contact with his or her peers and therefore always provide the optimal solution known in his area (as opposed to known by himself). This, in fact, is the very essence of communities of practice. It is a useful knowledge management tool that can promote the free exchange of ideas and knowledge resulting in the growth and enrichment of these ideas and knowledge, which ultimately redound to the benefit and competitive advantage of the concerned organizations.