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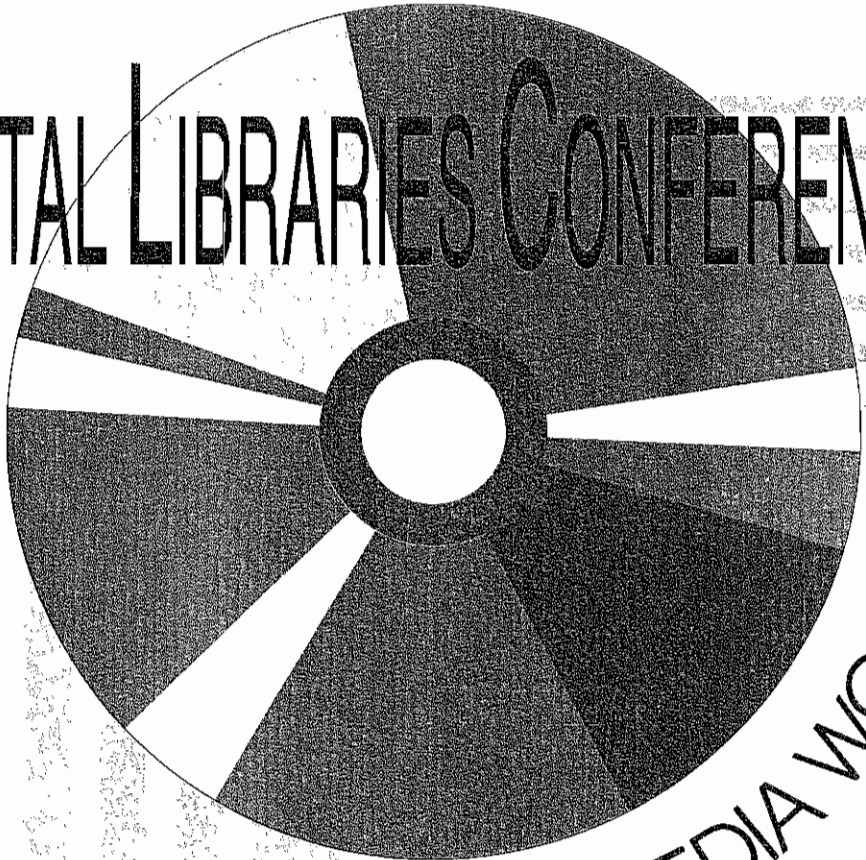
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## Information Management and the Intelligent Organization: Roles and Implications for the Information Professions

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### Abstract

*The intelligent organization is able to mobilize the different kinds of knowledge that exist in the organization in order to enhance performance. It pursues goals in a changing environment by adapting behavior according to knowledge about itself and the world it thrives in. The intelligent organization is therefore a learning organization that is skilled at creating, acquiring, organizing, and sharing knowledge, and at applying this knowledge to design its behavior. Organizational learning depends critically upon information management – the capacity to harness the organization's information resources and information capabilities to energize organizational growth. Information management is a cycle of processes that support the organization's learning activities: identifying information needs, acquiring information, organizing and storing information, developing information products and services, distributing information, and using information. An analysis of each of these processes suggests new strategies for maximizing the value of information in organizations, and for a reinvention of the roles of information professionals, be they librarians, information providers, information technologists, or information scientists.*

### 1 The Intelligent Organization

An organization behaves as an open system that takes in information, material and energy from the external environment, transforms these resources into knowledge, processes, and structures that produce goods or services which are then consumed

in the environment. The relationship between organizations and environment is thus both circular and critical: organizations depend on the environment for resources and for the justification of their continued existence. Because the environment is growing in complexity and volatility, continuing to be viable requires organizations to learn enough about the current and likely future conditions of the environment, and to use this knowledge to change their own behavior in a timely way (Choo 1991, Choo and Auster 1993).

An organization works with three classes of knowledge: tacit knowledge, rule-based knowledge, and background knowledge (Table 1). Tacit knowledge consists of the hands-on skills, special know-how, heuristics, intuitions, and the like that people develop as they immerse in the flow of their work activities. Tacit knowledge is deeply rooted in action and comes from the simultaneous engagement of mind and body in task performance. Tacit knowledge is personal knowledge that is hard to formalize or articulate (Polanyi 1966, 1973). The transfer of tacit knowledge is by tradition and shared experience, through for example, apprenticeship or on-the-job training. Tacit knowledge in an organization ensures task effectiveness – that the right things are being done so that the work unit could attain its objectives. It also provides for a kind of creative robustness – intuition and heuristics can often tackle tough problems that would otherwise be difficult to solve. Whereas tacit knowledge is implicit, rule-based knowledge is explicit knowledge that is used to match actions to situations by invoking appropriate rules. Rule-based knowledge guides action by answering three questions: What kind of situation is this? What kind of person am I or What kind of or-

ganization is this? and finally, What does a person such as I, or an organization such as this, do in a situation such as this? (March 1994) Rule-based knowledge is used in the design of routines, standard operating procedures, and the structure of data records. Rule-based knowledge enables the organization to enjoy a certain level of operational efficiency and control. It also promotes equable, consistent organizational responses. The third kind of organizational knowledge is background knowledge. This is knowledge that is part of the organizational culture and is communicated through oral and verbal texts such as stories, metaphors, analogies, visions, and mission statements. Background knowledge supplies the mindset or worldview by which people in the organization understand particular events, actions, objects, utterances, or situations in distinctive ways (Morgan 1986). Background knowledge draws the cognitive context for the construction of reality and endows meaning on the organization's actions and activities. It promotes commitment through the creation of shared meanings and values. All three forms of knowledge can be found in any organization. The intelligent organization however, is skilled at continuously expanding, renewing, and refreshing its knowledge in all three categories. The intelligent organization promotes the learning of tacit knowledge to increase the skill and creative capacity of its employees, takes advantage of rule-based knowledge to maximize efficiency and equability, and develops background knowledge to unify purpose and meaning in its community. In effect, the intelligent organization has mastered a fourth class of knowledge a higher order or meta-knowledge that it uses to create, integrate, and invigorate all its intellectual resources in order to achieve superior levels of performance.

Examples of intelligent knowledge creation may be found in Japanese companies like Canon, Honda, Matsushita, NEC, and Sharp. These companies are widely admired for their ability to innovate continuously, recognize and respond swiftly to customer needs, dominate technologies while they are still emerging, and bring new high-quality products to market with impressive speed. For ex-

ample, Canon reinvented the 35mm camera, pioneered the personal photocopier and color copier, invented the laser printer and inkjet printer, and is now working on using ferroelectric liquid crystals for large flat panel displays. Judged by the number of US patents granted, Canon can claim to be the world's most consistently creative company - for a fifth of the R&D budget, Canon has obtained about as many patents as IBM. Or consider Honda's history of agile adaptiveness: it gained a late but successful entry into the highly competitive automobile market, won victory in the motorcycle war against an established leader (Yamaha), and developed its own automotive engine that set new standards in fuel-efficiency and pollution control. Many regard Honda as one of the best managed companies in the world (Pascale 1990). A Japanese scholar explains the success of companies like Canon, Honda and Matsushita:

*The centerpiece of the Japanese approach is the recognition that creating new knowledge is not simply a matter of "processing" objective information. Rather, it depends on tapping the tacit and often highly subjective insights, intuitions, and hunches of individual employees and making those insights available for testing and use by the company as a whole. The key to this process is personal commitment, the employees' sense of identity with the enterprise and its mission. Mobilizing that commitment and embodying tacit knowledge in actual technologies and products require managers who are as comfortable with images and symbols ...*

*A company is not a machine but a living organism. Much like an individual, it can have a collective sense of identity and fundamental purpose. This is the organizational equivalent of self-knowledge a shared understanding of what the company stands for, where it is going, what kind of world it wants to live in, and, most important, how to make that world a reality. ...*

*In the knowledge-creating company, inventing new knowledge is not a specialized activity the province of the R&D department or marketing or strategic planning. It is a way of behaving, indeed a way of being, in which everyone is a knowledge worker that is to say, an entrepreneur.*

(Nonaka 1991, p. 97)

The intelligent organization adopts a holistic approach to knowledge management that successfully combines tacit, rule-based, and background knowledge at all levels of the organization. Tacit knowledge is cultivated in an organizational culture that motivates through shared vision and common purpose. Personal knowledge is leveraged with explicit knowledge for the design and development of innovative products, services and processes. Strategic vision and operational expertise are fused in creative action.

An intelligent organization pursues its goals in a changing external environment by adapting its behavior according to knowledge about its external and internal settings. In other words, an intelligent organization is a learning organization that is skilled at creating, acquiring and transferring knowledge, and at modifying its behavior to reflect the new knowledge and insights (Garvin 1993). Learning thus begins with new knowledge and ideas which may be created in-house, or may come from external sources, but must be applied to change the organization's goals and behaviors in order for learning to be complete. Failure to learn often means failure to survive: nearly 30 percent of the corporations in the Fortune 500 list of five years ago are missing today (Pascale 1990); and for every successful turnaround there are two declining firms that do not recover. When the Royal Dutch Shell Group surveyed 30 firms that had been in business for over 75 years, it attributed their longevity to "their ability to live in harmony with the business environment, to switch from a survival mode when times were turbulent to a self-development mode when the pace of change was slow. ... Outcomes like these don't happen

automatically. On the contrary, they depend on the ability of a company's senior managers to absorb what is going on in the business environment and to act on that information with appropriate business moves. In other words, they depend on learning." (de Geus 1988, p. 70) Much of an organization's learning is from past experience. After the problem-plagued launch of their 737 and 747 planes, Boeing formed an employee group called Project Homework to compare the development of the 737 and 747 with that of the 707 and 727, hitherto two of the firm's most lucrative planes. After working for three years, Project Homework identified hundreds of lessons learned and recommendations. Some group members were moved to the 757 and 767 start-ups which eventually produced the most successful, error-free launches in Boeing's history (Garvin 1993). In another example of learning from the past, British Petroleum established a five-person project appraisal unit that reported directly to the board of directors. Every year, the unit reviewed six major investment projects, wrote them up as case studies, and derived lessons to guide future planning. This form of review is now done regularly at the project level. (Gulliver 1987)

For the intelligent organization, learning and adaptation are behaviors that must paradoxically embrace their own opposites. Organizational learning necessarily includes unlearning about the past the organization should not restrict learning and exploration to its existing markets, products or practices, but should rediscover new goals and responses by stepping out of habitual frames of reference and reexamining norms and assumptions (Hedberg 1981). Similarly, adapting to an environment necessarily includes creating an environment that is advantageous to the organization. After all, the external environment consists of other organizations, and every organization is in fact part of larger ecological systems whose members are bound together by common interests and interlocking activities (Moore 1993). In creating the environment, an organization, either by itself or with its partners, develops foresight about future benefits that it can deliver, grows capabilities to provide these benefits, and so ensure a future for

itself (Hamel and Prahalad 1994). Creating the environment is more than reactively enacting or interpreting the environment, and more than finding a matching fit with the environment. In effect, the intelligent organization can engineer such a fit through its deep understanding of the forces and dynamics that give shape to the future.

The organizational intelligence/learning process is a continuous cycle of activities that include sensing the environment, developing perceptions and generating meaning through interpretation, using memory about past experience to help perception, and taking action based on the interpretations developed (Choo 1995) (Fig. 1). Sensing is collecting information about the external and internal environment. Because the organization cannot attend to every event or development, it must select areas of priority, filter incoming data according to its interests, and sample events for learning. Memory is derived from the experiences of the organization in interacting with the environment, and is expressed formally (documents, procedures) and informally (beliefs, stories). Experience develops rules that are used to match situations with appropriate responses, and frames that are used to define problems and their salient dimensions. Perception is the recognition and development of descriptions of external events and entities using the knowledge that is available in memory. Perceptual strategies include developing a representation of an external scene, classifying objects and events according to categories that are known or have been encountered before, and recognizing the identity and main attributes of interested objects. Organizational perception depends heavily on the norms, frames and rules that members use as lenses to view trends and developments. Interpretation is at the centre of the intelligence cycle as it attempts to explain "What is really going on here?" in terms that are meaningful to the organization. Interpretation is hard because it must balance conservatism (to interpret data according to existing beliefs) with entrepreneurship (to interpret data for the exploration of new alternatives). Interpretation leads to understanding and creative insight by which future consequences and opportu-

nities are anticipated and evaluated according to preferences. Ultimately, interpretation is the making of meaning meaning about where the organization was in the past, what it is today, and where it wants to be in the future. In organizations, finding meaning is a social process, requiring people to socialize and exchange information. Finally, adaptive behavior initiates a new cycle of learning as the organization makes decisions and takes actions that result in effects and outcomes. These are fed back into the loop by modifying sensing strategies (adjusting selection and sampling criteria) and by modifying frames and rules in memory (changing existing beliefs, adding new rules).

## 2 Information Management

The basic goal of information management is to harness the information resources and information capabilities of the organization in order to enable the organization to learn and adapt to its changing environment (Choo 1995, Auster and Choo 1995). Information creation, acquisition, storage, analysis and use therefore provide the intellectual lattice-work that supports the growth and development of the intelligent organization. The central actors in information management must be the information users themselves, working in partnership with a cast that includes information specialists and information technologists. Information management must address the social and situational contexts of information use – information is given meaning and purpose through the sharing of mental and affective energies among a group of participants engaged in solving problems or making sense of unclear situations. Conceptually, information management may be thought of as a set of processes that support and are symmetrical with the organization's learning activities. Six distinct but related information management processes may be discerned (Fig. 2): identifying information needs, acquiring information, organizing and storing information, developing information products and services, distributing information, and using information (Davenport 1993, McGee and Prusak 1993).

Table 1. Three Types of Organizational Knowledge

Type	Form	Examples	Use
<b>Tacit Knowledge</b>	– Procedural – Embedded in action	• Know-how • Heuristics • Intuitions	◊ Ensures task effectiveness
<b>Rule-based Knowledge</b>	– Declarative – Encoded in programs	• Routines • Standard operating procedures • Record structures	◊ Promotes operational efficiency and control
<b>Background Knowledge</b>	– Contextual – Expressed in texts	• Stories/metaphors • Mindsets/worldviews • Visions/scenarios	◊ Instills commitment through shared meaning

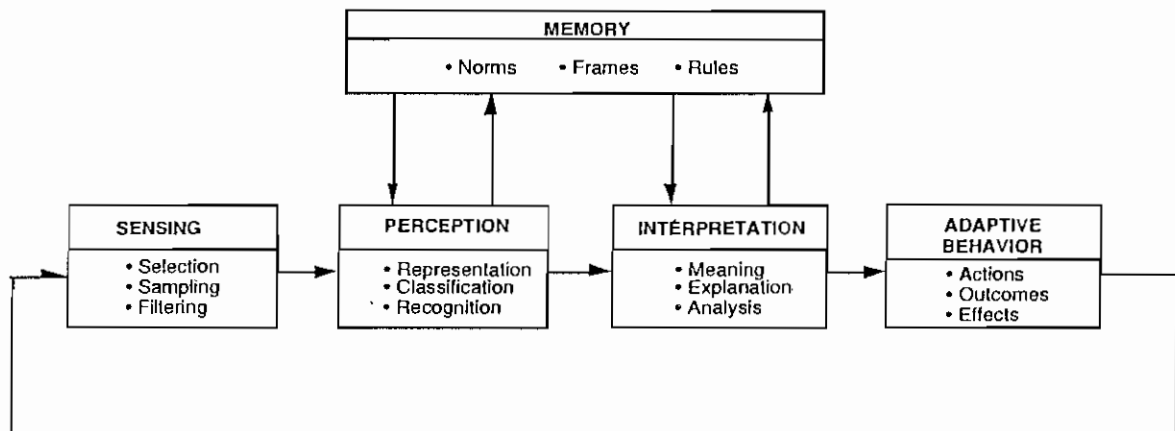


Fig. 1. Organizational Intelligence/Learning Cycle

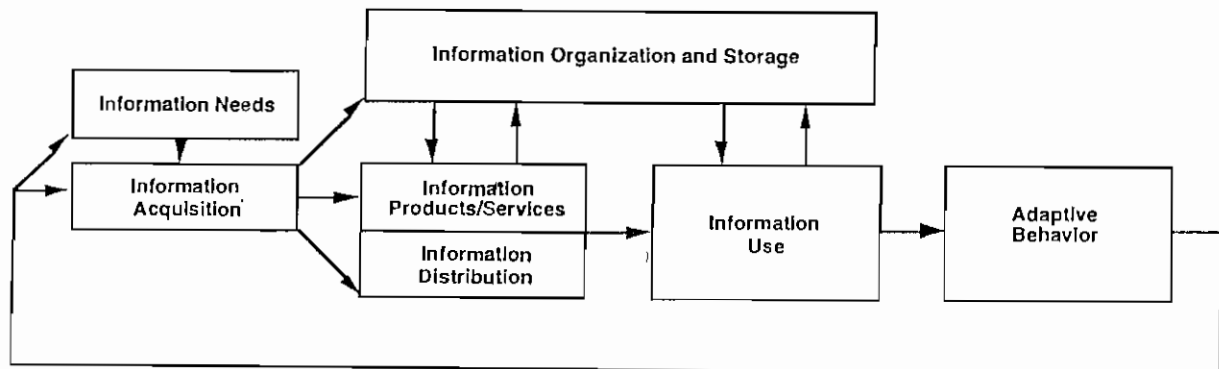


Fig. 2. Information Management Cycle

### 3 Information Needs

The identification of information needs should be sufficiently rich and complete in representing and elaborating users' true needs. Since information use usually takes place in the context of a task or problem situation, it is helpful to recognize that information needs consist of two inseparable parts (Taylor 1986, 1991): that pertaining to the subject matter of the need (what information is needed), and that arising from the situational requirements of utilizing the information (why is the information needed and how it will be used). Asking questions such as is the problem well or poorly structured, are the goals specific or amorphous, are the assumptions explicit and agreed upon, and is the situation new or familiar, will indicate the kinds of information that could be of greatest value to the user. Depending on the information use requirements, information could emphasize hard or soft data, elaborate existing goals or suggest new directions, help define problems or make assumptions explicit, locate historical precedents or provide future forecasts, and so on. Identifying information needs therefore not only involves determining the topics of interest to the user, but also the attributes of the information to be provided that will enhance its value and usefulness.

An accurate description of information requirements is a prerequisite for effective information management. Ironically, system designers often take this for granted and assume that information requirements can be quickly determined by examining existing paperflows and data flows. Similarly, senior managers believe that it is the information specialist's job to identify their information needs, and do not assume the "information responsibility" of defining in detail what information they require (Drucker 1994). In reality, particular information needs will have to be elicited from individuals. Unveiling information needs is a complex, fuzzy communication process. Most people find it difficult to express their information needs to their own satisfaction. Personal information needs have to be understood by placing them in the real-world context in which the person expe-

riences the need, and to the ways in which the person will use the information to make sense of her environment and so take action.

### 4 Information Acquisition

Information acquisition has become a critical but increasingly complex function in information management. Information acquisition seeks to balance two opposing demands. On the one hand, the organization's information needs are wide-ranging, reflecting the breadth and diversity of its concerns about changes and events in the external environment. On the other hand, human attention and cognitive capacity is limited so that the organization is necessarily selective about the messages it examines. The first corollary is therefore that the range of sources used to monitor the environment should be sufficiently numerous and varied as to reflect the span and sweep of the organization's interests. While this suggests that the organization would activate the available human, textual, and online sources; in order to avoid information saturation, this information variety must be controlled and managed.

A powerful way of managing information variety is to involve as many persons as possible in the organization in the gathering of information, effectively creating an organizationwide information collection network. People, not printed sources or electronic databases, will always be the most valuable information sources in any organization. People read widely; communicate frequently with customers, competitors, suppliers; work on a variety of projects; and accumulate specialized knowledge and experience. Unfortunately, information acquisition planning typically does not include human sources. This is a serious deficiency. Human sources are among the most valued by people at all levels of the organization: human sources filter and summarize information, highlight the most salient elements, interpret ambiguous aspects, and in general provide richer, more satisfying communication about an issue. Information acquisition planning should therefore include the creation and coordination of a distributed network for information col-

lection. Complementing the network could be a directory or database of experts: both the business and subject experts who work within the organization, and the external consultants or professional specialists who have worked with the organization. A well maintained database of internal and external experts can become a prized information asset of the organization, as people seeking information use it to connect with the best available expertise. The database may also be used to locate knowledgeable experts who can assist in evaluating current information resources, recommending new materials, assigning priorities, and so on.

The selection and use of information sources has to be planned for, and continuously monitored and evaluated just like any other vital resource of the organization. Furthermore, incoming information will have to be sampled and filtered according to their potential significance. Such sampling and filtering is an intellectual activity best performed by humans – it requires human judgement based on knowledge of the organization's business as well as the strengths and limitations of information resources.

## 5 Information Organization and Storage

Organizing and storing information may be facilitated with the application of information technology. Traditional data processing technologies were first used to raise work efficiency, whether on the office floor or the shop floor. The operational use of computers generated an abundance of detailed information about transactions, customers, service calls, resource utilization, and so on. While such systems are tuned to provide high throughput performance, they are inefficient at and sometimes incapable of retrieving the information that decision makers need to have for planning and problem solving. Organizations with significant volumes of transactional information could need to reorganize and unify operational data from several sources, and provide friendly but powerful analysis tools that allow decision makers to trawl the raw data for strategic insight, so that, for example, they can

discover patterns and opportunities buried in the lodes of data about customer transactions or service calls. The information assets of an organization are not confined to the transactional; they vary from the highly ordered to the ephemeral, and some of the most valuable information may be hiding in sales reports, office memos, study reports, project documents, photographs, audio recordings, and so on. The organization, storage, and retrieval of textual and unstructured information will become a critical component of information management. The learning organization needs to be able to find the specific information that best answer a query, and to collate information that describes the current state and recent history of the organization. Well integrated archival policies and records management systems will enable the organization to create and preserve its corporate memory and learn from its history.

The potentially severe consequences of the loss or inability to find vital documents are driving organizations to seek more versatile information storage and retrieval systems that can capture, store and retrieve text and other unstructured data. Instead of efficiency, the overall system requirement now becomes flexibility – the system should capture hard and soft information, support multiple user views of the data, link together items that are functionally or logically related, permit users to harvest the knowledge that is buried in these resources, and so on. Because the same information can be relevant to a range of different problem situations, it becomes necessary to represent and index the unstructured information by several methods. The development of automated indexing systems makes it increasingly feasible to adopt a user-centered approach to indexing, over and above document-oriented indexing that represents the document's content. In the user-centered approach, indexing can be done on two levels: the first reflects topic and other predetermined features; the second is tailored to situational requirements such as the level of treatment, whether general or specific (Fidel 1994). User-centered indexing may also be request-oriented, in which case the index language is built from an analysis of

user requirements and is then used as a checklist to index documents (Soergel 1985). The underlying idea is to anticipate user requests and check each document when it is being indexed against a list of anticipated requests. A combination of document-oriented and user-oriented indexing approaches has the potential to significantly improve information retrieval performance as well as user satisfaction. Given the amount of textual material in any organization, text information management will become as important as database management, and text retrieval applications will one day be as commonplace as word processing or spreadsheets. Today's text retrieval engines and development tools have attained new levels of functionality and versatility. Some of the newer systems make use of semantic networks of word meanings and links derived from dictionaries and thesaurii to allow users to search by querying in natural language, choosing concepts and specific word meanings, and controlling the closeness of match. Other systems simplify the development of text retrieval applications across heterogeneous database environments using a common access and programming interface based on industry standards.

## 6 Information Products and Services

In developing information products and services, the objective is not only to provide information that is relevant to the users' areas of interest, but also to provide information in a form that increases their useability. In other words, information products and services should deliver and present information so that their content, format, orientation, and other attributes address the situational requirements which affect the resolution of the problem or class of problems. This represents a value-added approach to the design of information products and services. The potential usefulness of messages is enhanced by increasing their ease of use, reducing noise, improving data quality, adapting the information to increase its pertinence, and saving the user time and money. Information services need to be constantly innovating, in a continual effort to move closer to satisfying the many

facets of the users' information needs.

To stay well-informed and build up its knowledge base, the intelligent organization needs to feed on a balanced diet of high quality information supplied through a varied menu of information products and services. These products and services should cover a range of time horizons and provide different levels of focus or detail (Fig. 3). Some information products disseminate urgent news that require immediate attention; others report developments that would take time to unfurl over the short term; while others still peer into the more distant future. For each of these time horizons, the information provided may be sharply focused, describing particular events, objects or organizations; or the information may be general and broad, surveying the terrain on which the organization's future will make its course. The guiding principle is that each information product must be of value to the end user. Information products or services should not rely only on information that happens to arrive in "convenient" packages - where it adds value to the user, incoming information may have to be reassembled, summarized, cross-referenced, compared, and so on.

Users want information not just to give answers to questions ("What is happening here?") but also to lead to solutions for problems ("What can we do about this?"). Moving from questions to problems means moving from a subject-based orientation in which knowing is a sufficient end state to an action orientation in which information is being used to formulate decisions and behaviors. To be relevant and consequential, information products and services should therefore be designed to address not only the subject matter of the problem but also the specific contingencies that affect the resolution of each problem or each class of problems.

Table 2. Knowledge Experts in the Intelligent Organization

<i>Groups of Experts</i>	<i>Goal</i>	<i>Primary Activity</i>	<i>Focus</i>
<b>Domain Experts</b>	Knowledge Creation and Use	To engage in organizational learning, innovation, and adaptation.	Organizational Effectiveness
<b>Information Experts</b>	Knowledge Organization	To facilitate the productive use of information and knowledge resources.	Enlightenment
<b>IT Experts</b>	Knowledge Infrastructure Building	To facilitate the accurate, reliable, efficient processing of data and communication of information.	Process Efficiency

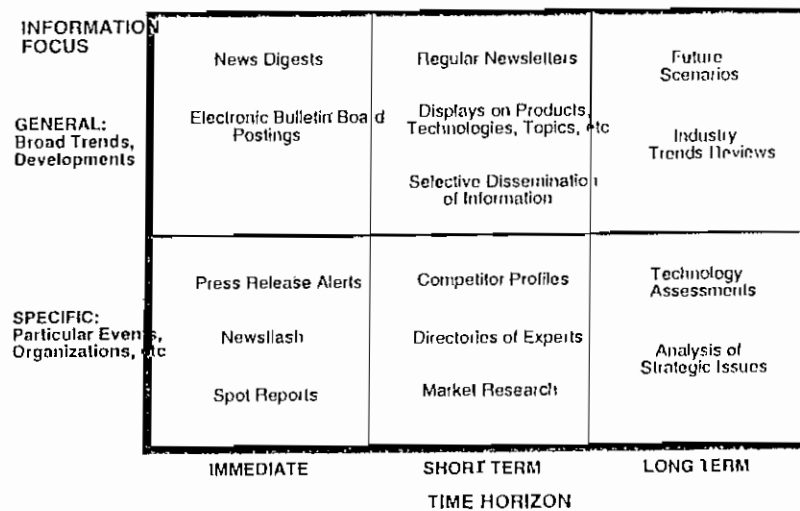


Fig. 3. A Topology of Information Products and Services

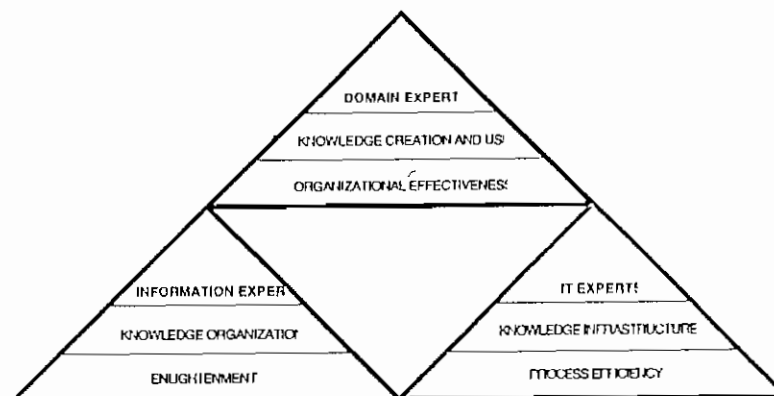


Figure 4. Knowledge Pyramid of the Intelligent Organization

## 7 Information Distribution

The purpose of distributing information is to encourage the sharing of information. A wider distribution of information promotes more widespread and more frequent learning, makes the retrieval of relevant information more likely, and allows new insights to be created by relating disparate items of information. The delivery of information should be done through vehicles and in formats that dovetail well with the work habits and preferences of the users. The separation between information provider and information user should be dissolved: both ought to collaborate as partners in the dissemination and value-adding of information to help ensure that the best information is seen by the right persons in the organization. To encourage users to be active participants, it should be made easy for them to comment on, evaluate, and re-direct the information they have received.

How might information distribution be designed to induce the creation of new knowledge? One answer may be to dismantle the wall between information providers and end users, to co-opt users themselves into the distribution network as active, contributing participants. For a model of how this could work, we might look at a hugely popular form of information sharing – Usenet newsgroups on the Internet. In newsgroups, information is posted onto what is essentially an electronic bulletin board that is seen by everyone in the group. Each article has a subject heading, and users can scan these titles quickly to pick out items to read. After reading, users themselves participate by posting new messages that answer questions, add commentary, suggest interpretations, and so on. Related messages are sewn together into threads of discussions about particular topics. From time to time, replies and discussion threads may be summarized and then re-posted. It is tempting to consider a similar model for organizational information dissemination. New items are given informative subject titles and broadcast promptly. Users scan, read, and discuss each other's messages. Multiple perspectives and representations are likely

to emerge that reflect users' different experiences and knowledge. Discussion threads may then be summarized by a user or moderator with special knowledge or interest. Information digests of the discussion threads may be posted electronically, or packaged into information products in their own right. Electronic exchanges may occasionally lead to face-to-face focus group discussions or the forming of special interest groups.

The electronic bulletin board serves as the shared collaboration space in which participants actively create shared understandings (Schrage 1990). Unlike meetings and formal gatherings, the electronic collaborative space and its tools are interactive and responsive, many participants have equal and voluntary access, conversations are spontaneous, multiple conversations develop in parallel, and the focus is on the content of the messages on the communal space rather than a competition of personal egos. As a medium for information distribution and sharing, well managed discussion groups of motivated users seem capable of adding considerable depth to the knowledge base of the organization.

## 8 Information Use

Information use is a dynamic, interactive social process of inquiry that may result in the making of meaning or the making of decisions. The inquiry cycles between consideration of parts and the whole, and between practical details and general assumptions. Participants clarify and challenge each other's representations and beliefs. Choices may be made by personal intuition, political advocacy, as well as by rational analysis. Managers as information users, for example, work in an environment that has been described as informationally overloaded, socially constrained, and politically laden. As new information is received and as the manager reflects and acts on the problem situation, the perception of the situation changes, giving rise to new uncertainties. The problem situation is redefined, the manager seeks new information, and the cycle iterates until the problem is considered resolved in the manager's mind.

The organization's information structures and processes will have to be as open, flexible, and vigorous as the processes of inquiry and decision making they support. Information managers and specialists should be participants in decision processes so that they have a first-hand understanding of the information needs that emerge as the process unfolds and the extent that these needs are satisfied.

In organizational learning, information is used by individuals to create knowledge, knowledge not just in the sense of data and facts, but knowledge in the form of representations that provide meaning and context for purposive action. People in organizations therefore behave as sense makers who use information in action (Weick 1979), and information use becomes a hermeneutic process of inquiry, in which understanding is realized through interpretation and dialogue (Winoograd and Flores 1987, Boland et al 1994). The theory of hermeneutics (Gadamer 1975) describes the interpretive process by which an individual gives meaning to organizational experience, while the theory of inquiring systems (Churchman 1971) describes how a community of inquirers build and test knowledge through dialogue. The hermeneutic interpretive process is an interplay of the part and the whole in a hermeneutic circle (Gadamer 1975): we depend on our comprehension of the whole to identify and understand the parts, but at the same time, we depend on our knowledge of the parts to validate our comprehension of the whole (Boland et al 1994). As a result, we continually move back and forth between theory and details, and between vision and specifics, in our attempt to construct interpretations. How is the validity of these interpretations to be judged? Churchman (1971) portrays human inquirers as producers of knowledge who test their interpretations through dialogue and debate. In a community of inquirers, individuals see the same situation through different *weltanschauungen* shaped by their beliefs and values. Inquiry then proceeds by vigorous debate as thesis and antithesis confront each other. The inquiry changes its direction and style frequently as new concepts and elements are introduced from outside the presently accept ways of understand-

ing a situation. Like the hermeneutic circle, there is constant movement between views of a situation that simplify and views that complicate, between close-up examination of details and reflection about general assumptions, categories and concepts (Boland et al 1994).

Organizational information continuously vacillates between the fine-grained and the broad-brushed, between components and the whole, between immediate instances and general policies. In the act of knowledge creation, organizational information weaves through layers of tacit, rule-based, and background knowledge that stitch the cognitive fabric of the organization. In summary, information use for the making of meaning and understanding requires information processes and methods that provide for a high degree of flexibility in information representation and that facilitate the vigorous exchange and evaluation of multiple representations among individuals. Labelling or naming of concepts and categories has to be relevant to the users' interpretive discourse, and be flexible and easy to change. Information is needed about specific events and instances as well as about new theories and frameworks that dispute current norms and beliefs. Assumptions made should be surfaced for review. Information is to be shared easily but without loss of cognitive richness. Through the exchange and interpretation of information, the organization blends its tacit and explicit knowledge to extract new meanings for action.

## 9 Information Partnerships for the Intelligent Organization

Information and information skills have a tendency to become fragmented in the organization as the organization specializes in its functions. Traditionally, librarians would look after the organization's collection of printed information, record managers would maintain internal files and documents, while information technologists would design and build computer-based systems to process operational data. The information user, the *raison d'être* for all this flurry of information activity,

is often only episodically or peripherally involved, and a gap results between their real information needs for decision making and the information captured and delivered through the organization's information systems and services.

The intelligent organization breaks away from this functional fragmentation and forges new partnerships that bring together the organization's capabilities to create and use knowledge, organize knowledge, and build infrastructures that enable the effective management of knowledge. At the heart of the intelligent organization are three groups of experts who need to work together as teams of knowledge partners: the domain experts; the information experts; and the information technology experts (Table 2). The domain experts are the individuals in the organization who are personally engaged in the act of creating and using knowledge: the operators, professionals, technologists, managers, and many others. The domain experts possess and apply the tacit knowledge, rule-based knowledge and background knowledge that we have discussed earlier in their day-to-day work, interpreting situations, solving problems, and making decisions. The knowledge and expertise they have is specialized and focused on the organization's domain of activity. Through their coordinated effort the organization as a whole performs its role and attains its goals. Through their knowledge creation and use, the organization learns, makes discoveries, creates innovations, and undergoes adaptation. The information experts are the individuals in the organization who have the skills, training and know-how to organize knowledge into systems and structures that facilitate the productive use of information and knowledge resources. They include librarians, records managers, archivists, and other information specialists. In organizing knowledge, their tasks encompass the representation of the various kinds of organizational information; developing methods and systems of structuring and accessing information; information distribution and delivery; amplifying the usefulness and value of information; information storage and retrieval; and so on. Their general focus is to enhance the accessibility and quality of

information so that the organization will have an enlightened view of itself and its environment. The information experts design and develop information products and services that promote learning and awareness; they preserve the organization's memory to provide the continuity and context for action and interpretation. The information technology experts are the individuals in the organization who have the specialized expertise to fashion the information infrastructure of the organization. The information technology experts include the system analysts, system designers, software engineers, programmers, data administrators, network managers, and other specialists who develop computer-based information systems and networks. Their general focus is to establish and maintain an information infrastructure that models the flow and transaction of information, and accelerates the processing of data and communication of messages. The information technology experts build applications, databases, networks that allow the organization to do its work with accuracy, reliability, and speed. In the intelligent organization, the knowledge of the three groups of domain experts, information experts, and IT experts congeal into a superstructure for organizational learning and growth.

In order to work together in teams of domain experts, information experts, and information technology experts, each group will need to reorientate its traditional mindset. Users as domain experts will need to separate the management of information from the management of information technology. Information technology in most cases has been heavily managed, whereas the management of information processes – identifying needs, acquiring information, organizing and storing information, developing information products and services, distributing information, and using information – has been largely neglected. Users need to understand that the goals and principles of information management are quite different from the objectives and methods of information technology management. Users could participate fully in these information processes, not just as end-consumers of information prod-

ucts or services, but as active agents in every activity of the information management cycle, especially in clarifying information needs, collecting information, sharing information, and transforming raw data into useable information. Users should share the responsibility of identifying and communicating their information needs, and not abdicate this work completely to the information or information technology experts. The most valuable information sources in the organization are the people themselves, and they should participate actively in an organizationwide information collection and information sharing network.

IT experts are the most prominent group in today's technology-dominated environment. The management of information technology has remained in the media's spotlight for many years now, with no signs of diminishing interest. Academics, businesses, consultants, and government all continue to extol the strategic application of information technology. IT experts have indeed become proficient at fashioning computer-based information systems that dramatically increase operational efficiency and task productivity. At the same time, the very same systems that are so remarkable for their speed and throughput are equally well known for their inability to satisfy the information needs of the decision makers. By representing and manipulating information at the data-element level, many systems do not provide more holistic information about processes, subject areas, or even documents. Thus, an information system that processes vast numbers of transactions per minute may be unable to answer key questions like how long does the company take to develop new products, what is the firm's current market share, and what is the turnaround time for a customer order. Computer-based information systems concentrate on formal, structured, internal data, leaving out the informal, unstructured, external information that most decision makers require. Their operating criterion is efficiency over flexibility, and they are designed to optimize resource utilization rather than to simplify knowledge discovery or problem solving. IT experts need to move the user to the center of their focus –

develop a behavior-based, process-oriented understanding of the information user in terms of their needs and information use dispositions. People in organizations are not content with structured transactional data, they also want information technology to simplify the use of the informal, unstructured information that forms the bulk of the organization's information resources. They also want external data: information to help them understand how the external environment is changing, what other organizations are doing, and how the organization is doing vis-a-vis its peers. In other words, users want a seamless web of formal and informal data, internal and external data, represented in structures and models that are meaningful to them for cultivating insight and developing choices.

Information experts, the librarians and specialists who work in corporate libraries or information centers, the records managers, the archivists, and so on, have long been regarded as part of the support staff of the organization, working quietly in the background, often uninvolved in any of the critical functions of the organization. Yet as the individuals who have the skills that are most needed to effectively acquire, organize, and distribute information, the intelligent organization cannot afford to do without their contribution and participation in its strategic activities. Information experts have to break out of their cocoons and recast their roles. Their roles are not limited to being the custodians or gatekeepers of information. They could provide training, advice, and consultation to users about the selection of information sources, the design of information search strategies, and the evaluation of information. They could participate in planning and decision making activities, where they can help ensure vigilant information gathering and processing, and develop an intimate understanding of how information is actually used. This feedback will in turn suggest ways of improving the acquisition, organization, and distribution of relevant information. Information experts need to understand how information is bestowed meaning and purpose by people interacting at the cognitive, affective, and social levels. They can then

add value to the information they provide so that the information addresses both the content-related and contextual requirements of the information use situation. Information experts also need a firm grasp of the business and agenda of the organization, and they should be early adopters and sophisticated users of new information technologies.

Paradoxically, in the so-called "information age," the information experts, and the functions they perform (corporate libraries, information centers, records centers, archives), are in danger of being left behind. Davenport and Prusak (1993) feel that librarians often operate under an obsolete conceptual model of what an information service should be today. In the 1920s and 1930s, the earliest model of operation of the corporate library was as a "warehouse," whose main objective was to build up a collection of printed information, and to establish formal systems to control and store the acquired material. Information distribution was limited, for it was the duty of the library to ensure that resources do not leave the library illegally. Later the operational model became one of an "expertise centre," a place where one could find human subject matter experts who could answer questions and direct them to library resources. While this model was an improvement over the warehouse concept, the fact is that there are many more subject matter experts in an organization who are not information professionals working in the library. For Davenport and Prusak, the warehouse model must be "blown up," librarians must not see themselves as warehouse custodians, or even as centralized providers of expertise, but rather as overseers of an organizationwide multi-media network that connects information providers and resources with the users of information:

*They must be concerned with the structure and quality of the content that goes out over the network (programming), in what format it is distributed (media selection), to what audience it is directed (broadcasting vs. narrowcasting), and how the receiver's behavior changes in response to the content (advertising re-*

*sponse). However, just as television networks do not produce all of the programs they broadcast, the role of the information network executive in firms should be to encourage wide participation in information creation and dissemination. Broadly speaking, the role of the information professional becomes the establishment of connections between those who have information, and those who want it.*

(Davenport and Prusak 1993, p. 408)

An alternative frame of reference for the role of the information experts is sketched by a recent study of corporate libraries and information centres in eight large Japanese companies in banking, electronics, insurance, manufacturing, research services, and telecommunications (Prusak and Matarazzo 1991). The study's principal findings highlight the differences in approach towards information management between these successful Japanese firms and the conventional view of corporate libraries in western companies. First, Japanese firms place a tremendous value on information and do not feel the need to justify information management expenditures. Information management is considered an essential cost of doing business, and there is little concern about how to justify the investment or measure the payback of an information center. Second, business information, events, and situations are perceived and presented in their contextual settings. All the information centers visited had large and well-used collections of corporate histories and biographies. Incoming information is almost always discussed in their contextual settings, which may be historical, political, technical, or cultural/sociological. Third, the mission of the information function is closely aligned with the strategic thrust of the organization. The information centers understood clearly the company's direction and their role in moving the organization towards its goals. Fourth, information technology is seen as an enabler of information management, not the primary com-

ponent. Information management is not viewed as a subset of a technological function. Fifth, the management of the information function is alternated among all company managers. The manager of the information function rotates every three to five years, allowing many managers to learn how information is used and valued in the organization, and to appreciate the need for a consolidated information management strategy. The information management function is seen as being as important as the other managerial functions. Sixth, Japanese management reads. The researchers saw senior executives actually reading in their corporate information centers and libraries. Japanese executives regard reading as a necessary component of managerial work, and are not embarrassed to be seen reading during the business day.

The intelligent organization understands that the discovery and use of knowledge can best be achieved through strategic information partnerships that combine the skills and expertise of its domain experts, information experts, and IT experts. This collective synergy is necessary to weave an information tapestry that draws together structured and unstructured, internal and external, as well as historical, current, and future-oriented information; to create the tools and methods to access information and select the best available information sources; to design information architectures based on a rich understanding of users' information and communication requirements; and to integrate the organization's information processes into a springboard for organizational learning and development. Collaborative vigor is needed to plough the organization's information homelands in order to transfigure data into knowledge. Through strategic information partnerships, the intelligent organization can significantly enhance each of the information processes that make up the information management cycle. Already organizations are reaping the benefits of synergistic information partnerships.

The Toshiba Business Information Center has successfully integrated the use of computer, networking, and electronic media technologies to en-

large its role from simply storing information to gathering, value-adding, and distributing information (Mori 1994). The Center provides an electronic information tool on the end-users' desktops that allows them to access the latest news, journal articles, government reports, and many other sources. All the information in this database is customized by the Center staff who know which information should be directed to which group of users. The Center staff read articles and reports as soon as they are available to select relevant items, assign key words, and add them to the database – with a turnaround time that is much shorter than any commercial database service. Press releases, overseas news, and government announcements and reports are faxed to the center immediately after release. Their headlines are captured by an optical character reader, and original images and charts are kept in an optical file system. Users scan the headlines and request for needed images which are then transmitted by fax, allowing them to obtain information even before it appears in newspapers. Mori concludes that the Center could not have been successful without two elements: “professional expertise and technology. The Center staff's intensive knowledge and ability enables them to establish a ‘filter’ to select and organize information on behalf of the Center's users. The Center staff consistently strives to identify information needs within the Toshiba Group or even in respective divisions. . . . Secondly, the [Center] would not function without today's technologies such as OCRs, optical filing systems, LANs, and e-mail systems.” (Mori 1994, p. 279-280)

The current crop of workgroup computing platforms provides functions to simplify the tracking, sharing, and accessing of information across many internal and external sources by several groups of users in the organization. Companies like Price Waterhouse, Lotus Development Corporation, and MCI Communications have all combined the talents of information experts and information technology experts to implement successful workgroup applications. Consider the experience of MCI Communications' Corporate Information Re-

sources Center in Washington, DC (Bates and Allen 1994). Using Lotus Notes as the platform, the Center has developed a database that serves as the institutional memory holding information that staff members have learned and other staff should know about; a discussion database to post questions on policy, the status of ongoing projects and so on; databases of press releases, speeches, and related materials; a customized news-filtering service from selected external news sources and online database sources; a central database on journal subscribers, experienced searchers, market research reports, and so on; and a capability to access newsgroup discussions on the Internet, including the functionality to scan for items of interest or to search back items using keywords. In designing these databases, the Center needed to work with technical experts with detailed knowledge of Notes. As for the information experts, their role was summarized thus:

*Information professionals are ideal "internal information consultants" – we understand how to organize information, we know how to take advantage of Notes' features, and we recognize the information needs of each work group. ... A trained information professional can review a department's information needs and help the system administrator develop databases to best organize that information. The skill set of a librarian experienced in database design and information management is an excellent fit for the needs of Notes information content administration. ... In some organizations, librarians have become "information trustees," overseeing the establish and maintenance of databases on Notes. They set standards for database construction and documentation, ensure consistency among databases, and identify the person responsible for regularly updating the databases. They review all databases before they are made available to users, ensuring that the information is up-to-date*

*and will be adequately managed by the originating organization.*

(Bates and Allen 1994, p. 34-35, 38)

Another form of information alliance levers the domain knowledge of the users with the information experts' knowledge of information sources and content. As an example, take the case of Bell-Northern Research (BNR), a company jointly owned by Northern Telecom and Bell Canada that is a global leader in the design and development of advanced telecommunications systems. In 1993, the BNR Information Resource Center in Ottawa launched its Strategic Program Support Service, an information partnership program to support new product development (Birks 1995). When a product development project is initiated, the IRC dedicates professional and clerical resources to the project. The assigned information specialist joins the development team and works with senior management and team members to define an information profile for the project: "This profile builds a complete information context for the emerging product design, covering technical, competitive and market information from internal and external sources. Typically, the information specialist scans incoming electronic and print information, filters it according to the project requirements and issues a weekly report to the entire development team. Critical technical or marketplace events are announced to the team immediately and there may be a need for focused information research in specific areas such as competitor analysis." (Birks 1995, p. 24) The information specialist is thus collaborating with the domain experts during the most critical phases of the product development, in the building up of the business case and in defining the features and functionality of the new product.

At Upjohn, staff from clinical pharmacology and two internal libraries formed a Products and Markets Information Research Team (Dommer 1991). The team synthesized information from commercial databases and internal sources to provide timely and accurate information to assist management decision making about resource alloca-

tion in response to competitors' actions. At McDonnell Douglas, corporate librarians and competitor intelligence analysts teamed successfully to analyze the advanced manufacturing capability of a competitor in order to present to management an assessment of the competitor's probability of launching a certain product within a time frame and attaining a set of design and technology objectives (Gib and Walraven 1992). The participants concluded that the multidisciplinary approach multiplied the respective strengths of both the information specialists and the intelligence analysts and provided the firm with a competitive advantage. At 3M, the Business Library decided that, instead of trying to track all of 3M's thousands of competitors on its own, it would package its knowledge about intelligence gathering as a training workshop on "Gathering Competitor Intelligence" (Anderson 1992). The workshop proved to be extremely successful, playing to sellout crowds for four years, over which time more than 500 3M employees attended the seminar. The workshop, prepared with input from 3M's competitive intelligence practitioners, covered sources of competitive information, methods of collecting information and doing research, and the principles of creating an intelligence system. At Digital Equipment Corporation, one corporate library evolved into a Marketing Information Services Group that consisted of a team of librarians, other information professionals, and marketing consultants who develop corporate intelligence, conduct their own market research, and provide insight on strategic marketing issues (Linder 1992). The group also established a videotext information system that linked more than 10,000 sales and marketing staff throughout the US.

Given the widespread recognition that people, and not the printed materials nor the online databases, are the organization's most precious information sources, it is surprising that so little has been done to help users find people who have the desired expertise or knowledge. To fill this gap, corporate librarians are well-placed to act as human switching exchanges who can help users connect with human sources:

*The modern librarian will catalogue not only printed materials or even knowledgeable information professionals, but also that Jane Smith is working on a sales force compensation project, and that Joe Bloggs knows a lot about the metallurgical properties of wheel bearings. When another division or customer calls to find out this sort of information, they will finally have a place to go. Several of the firms we have worked with already feel that this is a valid role for librarians; at one telecommunications firms, for example, librarians were referred to as "human PBXs" because of their ability to make connections between people requiring information and people possessing it.*

(Davenport and Prusak 1993, p. 411)

In summary, the intelligent organization bridges the knowledge of its domain experts, information content experts, and information technology experts. Probably the least developed of these resources are the information content experts, who have hitherto largely confined themselves to a reactive, supporting role. We believe that the knowledge and skills of these information experts are an indispensable cornerstone of the intelligent organization's knowledge pyramid. However, information experts will have to move from the background to the center of the organizational stage, to jointly hold the reins of information management with users and the technology experts, to help steer and shape the information policies, structures, processes, and systems that will nurture organizational learning. We have seen how several successful organizations have learned to draw upon the skills of the information content experts to extract, filter and disseminate vital external information; to design and develop workgroup application suites that are effectively platforms for information sharing and information management; to work side by side with domain experts in collecting and analyzing strategic intelligence; and to act as trainers and consultants who transfer information gathering and research skills through-

out the organization. Much more can be done, and the creation of effective information partnerships will be among the most important steps towards the intelligent organization.

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