R-07-7706
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Strategic Analysis Report
18 March 1999

The Knowledge Management Scenario: Trends and Directions for 1998-2003

Management Summary

As the 20th century is exited, business competition is taking on a new dimension. Enterprises will be required to compete not only on the basis of product, service and operational excellence, but also through formal management and leverage of their corporate memory and intellectual capital. As competition intensifies in areas that include product innovation, customer relationship management and global service delivery, the ability of an enterprise to capture and share knowledge and its ability to reuse, reinvent and innovate using that knowledge will become a key determinant and predictor of value.

Strategic Planning Assumption: By 2003, Type A (leading-edge adopters of new technology) enterprises will incorporate accounting practices that formally measure and value their intellectual capital, as well as their financial and physical assets (0.7 probability).

Knowledge management (KM) has emerged as a strategy for managing corporate memory and intellectual capital, but enterprises (including users, vendors and service providers of KM) do not share a common definition of KM, and are confused by the concept. Multiple definitions are competing in the marketplace, some broad enough to permit any form of information management to be renamed KM, and any vendor whose products deal with digitized information to claim that these are KM products. In this report, the GartnerGroup definition is used as a benchmark to assess KM trends, management practices, technology directions, service provider directions and applications.

- "Knowledge management is a discipline that promotes an integrated approach to the creation, capture, organization, access and use of an enterprise's information assets. These assets include structured databases, textual information such as policy and procedure documents, and most importantly, the tacit knowledge and expertise resident in the heads of individual employees."

KM is not the implementation of a technology; rather, it is a multidisciplined approach that integrates business strategy, cultural values and work processes. KM programs perform best when enabled with sophisticated and elegant technology, but an emphasis on technology alone will achieve very little progress toward KM; conversely, even the strongest KM culture that is not supported with robust technology also will falter. Our research has identified three frameworks that form the foundations for enterprises to manage the value, culture and process disciplines of KM and their integration into a coordinated KM program. An analysis of these three frameworks is presented in this report.

Best practices in building and sustaining KM are emerging. KM is broad in scope – it can encompass all information assets of the enterprise, all knowledge activities from creation to use, and potentially, all the people in the enterprise. The scale of KM challenges human and automated systems. KM technology is developing at a rapid pace, but no vendor yet provides a single integrated KM product. Many enterprises

are successfully assembling multiple products into sophisticated full-function KM; however, these solutions must be complemented and supplemented with significant human infrastructure. In this report, best practices in human and technology processes for KM are analyzed.

The methodologies for building KM programs are also emerging, but are complicated by the multiple disciplines of KM (i.e., business, culture and process) and by the lack of a proving ground of mature KM programs. A simple extension of project management methodology to encompass KM is not a viable approach; KM methodology and leadership require a deep understanding of KM-specific methods and activities. Consequently, external services provider support and KM consulting practices are, on the whole, immature and in their formative state. Our research has identified an ESP competency model presented in this report.

Despite its emerging status, KM applications have produced documented success in more than 100 leading enterprises. The misperception that KM benefits only a limited range of enterprises (e.g., consulting or research organizations) has faded. Our research identifies KM programs that address a diverse set of business objectives in nearly every industry segment. Additionally, the application of KM ranges from specific tactical programs to broad ranging, enterprisewide programs. However, these successes are clearly tied to business goals and few programs have moved beyond the formative stages with objectives generally categorized as “knowledge for the sake of knowledge” or as "organizational learning.” This report includes discussion of nine enterprises and their approaches to KM.

Our scenario presents a view to the future of KM: its emergence as a mainstream business practice, as a cultural model for the 21st century enterprise, and as a structured approach to managing information and intellectual assets. This *Strategic Analysis Report* presents a scenario for KM by examining five key issues:

- When and how will KM evolve from academic principles to full implementation as a fundamental business practice?
- What organizational structures, processes, and management practices will overcome cultural and other barriers and ensure success for KM?
- What technologies will enable effective KM?
- What factors will distinguish leading-edge consulting in KM design and implementation?
- What KM applications will provide the most significant payoff through 2003?

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FIGURES

1.0 Introduction: Why Knowledge Management is in Your Future

Key Issue: How and when will KM evolve from academic principles to full implementation as a fundamental business practice?

Radical changes are occurring in three fundamental building blocks of all enterprises, and these changes have converged to create a new opportunity for enterprises to compete and prosper. KM offers a means to aggregate the collective intellect and knowledge of the enterprise into a framework through which learning, collaboration and innovation can be enhanced.

The three fundamental changes that drive KM are the increasing value of highly capable people, rising job complexity, and the universal availability of information.

- *Increasing Value of Highly Capable People:* Human beings have a great capacity to learn, create and innovate. They are also motivated by the challenge of unsolved problems, competitive environments and new frontiers. Human experience, education, analytical ability and passion for challenge have reached a level where the gap between entry-level and expert employees is too wide for enterprises to easily close, and too time-critical to wait for individual expertise to develop. Further, there is a shortage of experts, and their financial and intellectual value is rising rapidly. Enterprises need KM to close knowledge gaps quickly and reliably when employees are added, to capture and retain the knowledge of employees who leave the enterprise, and to bring the collective knowledge of the enterprise to bear on problems and opportunities.

- *Job Complexity:* Jobs have evolved from management-directed, specific assignments with documented tasks, to self-directed, flexible assignments that involve generating new ideas, simplifying complexity into feasible processes, and synthesizing masses of information into informed decisions and actions. These jobs are not easy to learn because the ratio of defined activities to undefined activities is falling. In addition, generating ideas and solving complex problems are activities often best performed by groups through brainstorming, case studies and other collaborative techniques. Enterprises can no longer rely on written procedures and documents that capture only a percentage of job activities; instead, they must integrate knowledge transfer and reuse into their learning processes by including individual on-the-job experience, along with the mining and internalization of the experience of others.

Strategic Planning Assumption: By 2001, all managers and knowledge workers will hold jobs where more than 50 percent of their activities are undefined and are dynamically determined by the employee based on the events and knowledge at hand (0.8 probability).

(Additional research on the challenges of dealing with rising intellect and job complexity is available in Management Strategies & Directions (MSD) *Top VIEW* TV-000-084, 30 Jan. 1997, MSD *Top VIEW* TV-000-084, 30 Jan. 1997, and Customer Service and Support Strategies (CS3) *Research Note* QA-520-074, 15 July 1997.)

- *Universal Availability of, and Desire for, Knowledge:* Technology advances and popularization of the Internet have stimulated human intellect and the desire for knowledge by making digitally stored information almost universally available. However, two issues persist. First, the volume of digital information is massive, and to render it useful enterprises must identify and separate the high-value, high-utility data from the low-value data. Second, the higher-value information (i.e., the intellectual knowledge of people and undefined job activities) is largely uncaptured and exists only in the minds of the experts. Enterprises must create a culture and a technical environment where knowledge is convertible to digital form.

While these fundamental changes support KM as a strategic discipline, enterprises are also continually subjected to a stream of business trends that amplify the importance of KM as a tactical instrument of change, examples include:

- *The Flattening of Enterprises:* Downsizing reduces the population of middle managers and increases the ratio of staff to managers. A KM discipline can ease the transition from a culture where managers provide direction and expertise, to one of self-direction and shared, leveraged knowledge.
- *Knowledge as an Asset:* Financial analysts are beginning to consider intellectual and knowledge capital as assets that contribute to the total value of an organization. Enterprises, especially in businesses where intellectual capital is a high portion of overall assets, will be compelled to manage, measure and maintain a valuation of their knowledge and other intellectual assets. Examples of such enterprises include engineering, consulting, high technology and even manufacturing.
- *Globalization and Virtualization:* Enterprises extending their global reach or assembling virtual organizations can leverage KM to maintain corporate culture and philosophy, speed new development, integrate organizational learning, and enable collaborative processes.

Enterprises can benefit from increasing human intellect, rising job complexity and universal information availability by implementing a strong KM discipline. Enterprises that develop such a discipline gain a competitive edge in speed of innovation, response to problems or opportunities, and the leveraging of corporate intellect.

Strategic Planning Assumption: By 2001, enterprises that lack ongoing KM programs and infrastructure will lag KM-enabled competitors by between 30 percent and 40 percent in speed of deployment for new competitive programs and products (0.8 probability).

1.1 The Enterprise Frameworks for Knowledge Management

As the market value of enterprises is increasingly vested in corporate memory and intellectual capital, enterprises must develop a discipline and corporate skills aimed at managing these intangible assets. Among the skills are:

- Identifying the linkages in the enterprise between the cultural foundation and the conversion of intellectual capital into business value
- Influencing and managing cultural change; eliminating obstacles and implementing motivators; and directing cultural change toward achieving business value
- Viewing intellectual capital as an earning asset; identifying and protecting these assets; and measuring the value of intellectual capital
- Designing and building processes to capture and share intellectual capital across the people and the business activities of the enterprise
- Stimulating collaboration and innovation to convert intellectual capital into products, services, reusable components, idea bases and best practices
- Building a business strategy, a cultural environment, and KM processes that operate in concert to manage intellectual capital

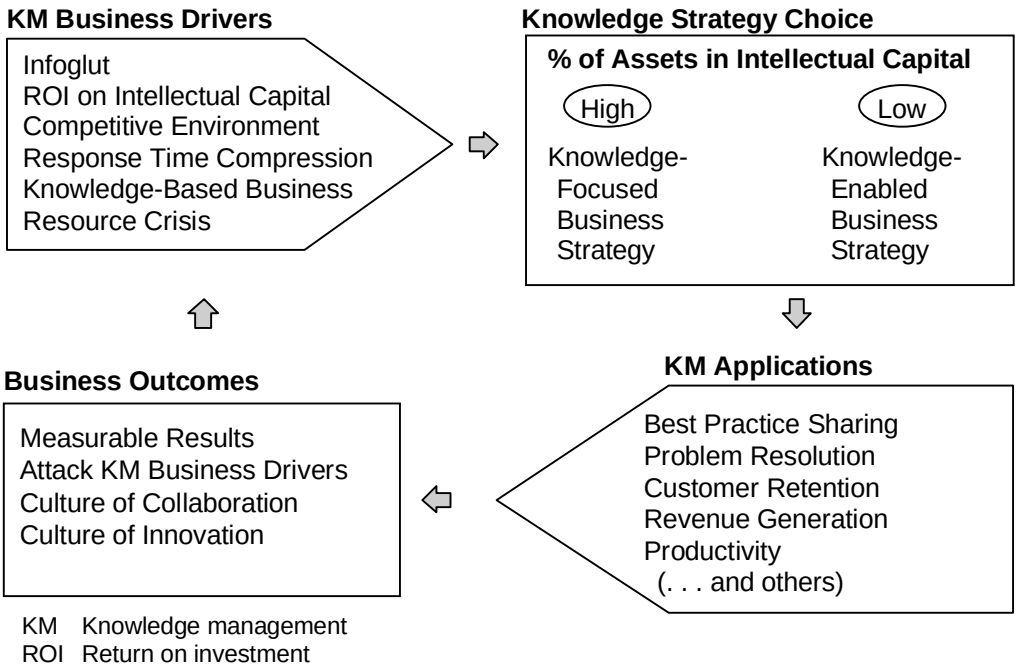
The discipline of KM is accomplished through vigorous integration of three enterprise frameworks:

- The KM Value Framework
- The KM Cultural Framework
- The KM Process Framework

Enterprises must understand, design and sustain the frameworks individually, but must integrate them tightly to achieve the full benefits of KM.

1.1.1 The KM Value Framework

KM is not an end in itself, and KM programs built on "knowledge for the sake of knowledge" rarely succeed. KM programs must emanate from a value framework that links knowledge strategy to business strategy and results. GartnerGroup defines the KM value framework as a continuous, four-stage cycle (see Figure 1).



KM Knowledge management
ROI Return on investment

Source: GartnerGroup

Figure 1. KM Value Framework

Stage 1 — KM Business Drivers: KM is a response to the evolving business environment of the information-rich but knowledge-challenged enterprises of the 21st century. Characteristics of this environment include "infoglut," increased investment in intellectual capital, and resource shortages. Stage 1 assesses the impact of these drivers on the enterprise:

- *Infoglut* — Infoglut describes the impact on enterprises of having access to virtually unlimited information. The sheer volume overwhelms the user and obscures the relevance and reliability of individual information assets.
- *Return on Investment (ROI) in Intellectual Capital* — Enterprises are increasing their investment in intellectual assets (e.g., hiring and cultivating experts; digitizing information; and automating algorithms and expert processes). The investment in these intangible assets is growing at a faster rate

than the ROI gained from them. Intellectual assets include the knowledge of employees; data and information about processes, experts, products, customers and competitors; brand names and image; and intellectual property such as patents, trademarks, copyrights or regulatory licenses.

The trend of decreasing returns on investment in intellectual assets is documented in various GartnerGroup research:

- A GartnerGroup ITEP survey found that the failure rate of strategic IT projects is more than 50 percent, and of those that were successful, the best cases only broke even on ROI. Moreover, the life of these strategic solutions is decreasing and is frequently three years or less. Finally, the investment in IT for North American enterprises is rising; it is expected to peak at 9 percent of revenue by 2003 before dropping to lower levels of 5 percent to 6 percent.
- The cost of experts and expertise in IT is at a crisis level in many enterprises. (See COM-04-7041 for an analysis of the labor market for IT.)

- *The New Competitive Environment* — Business environments are increasingly chaotic and complex. They are characterized by globalization, response-time compression, resource shortages and nontraditional business models (e.g., knowledge-based enterprises that are absent any physical products, or virtual enterprises that produce and deliver their services or products through a confederation of multiple physical enterprises). Skills and expertise in most enterprises are being diluted at an increasing rate, and the need for new kinds of skills and expertise is growing. (See Industry Trends & Directions (ITD) *Strategic Analysis Report* R-ITD-120, 29 January 1998, for additional research and insight into the challenges of the enterprise in 2003.)

Stage 2 — Knowledge Strategy: Stage 2 requires developing a knowledge strategy that defines how the enterprise uses knowledge to compete and address business drivers. A knowledge strategy must be customized to the enterprise and its business. The strategy spans a continuum from a knowledge-focused business strategy to a knowledge-enabled one (see DF-06-4478). The enterprise with a high ratio of its market value in knowledge and intellectual capital benefits most from a knowledge-focused business strategy (knowledge is a mission-critical asset that should be leveraged internally and packaged into products and services). An enterprise with a relatively lower ratio of its market value in knowledge capital should rely instead on operational competencies or tangible assets as the primary sources of competitive advantage. In such enterprises, a knowledge-enabled business strategy may be more appropriate (e.g., enhance operational competencies and tangible assets with KM to improve competitive value through higher operational effectiveness, and leveraging of expertise for reuse or innovation).

Stage 3 — Knowledge Applications: Stage 3 requires building KM applications and business processes focused on goals directed toward the knowledge strategy and attacking business drivers. Knowledge-focused enterprises should make the development of applications that are enterprisewide in scope their highest priority. Knowledge-enabled enterprises should work within an enterprisewide vision but focus initial implementation on solutions that use KM to strengthen operational competencies or tangible asset management. (See additional research on approaches to choosing the initial target application for KM in COM-03-9743). Section 5.0 of this report profiles a diverse set of business applications and industries with successful KM programs. (Additional case studies are found in CS-05-1732, 27 July 1998, and CS-05-0548, 03 November 1998.)

Stage 4 — Measurable Results: Stage 4 requires measuring the results of the KM program. This includes measuring the progress against the KM business drivers and against the KM strategy and goals, along with nontraditional business measures such as progress toward a culture of collaboration and innovation. These results are used to adjust the other value framework components. This last stage

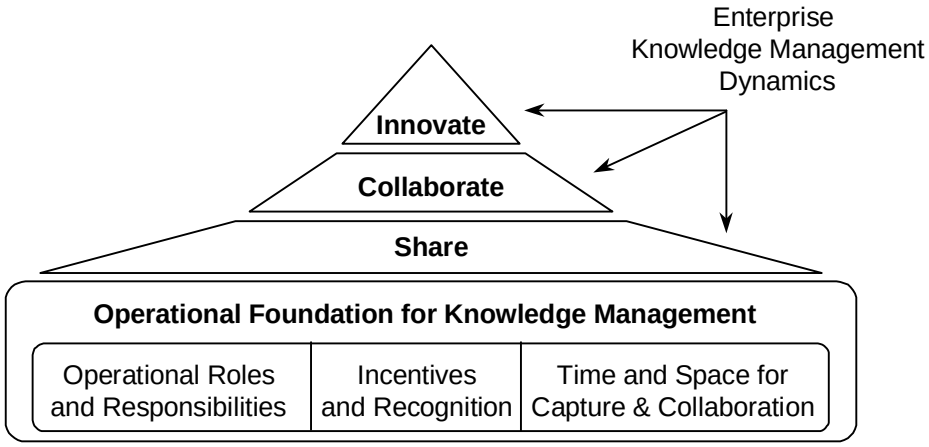
initiates the ongoing cycle of assessing the impact of KM business drivers, adjusting the knowledge strategy to attack the drivers, applying knowledge assets with robust applications, and measuring the value achieved. (Research describing measurements for the nontraditional area of collaboration is in DF-05-2801, 23 July 1998.)

Strategic Planning Assumption: Through 2003, more than two thirds of KM programs that fail to tie their existence to specific business strategy and goals will fail in their first year of existence (0.7 probability).

1.1.2 The KM Cultural Framework

KM is also a cultural discipline; the KM cultural framework activates knowledge sharing, collaboration and innovation, activities that occur within the human processes and social structure of the enterprise. While instilling a KM cultural discipline is a critical success factor for KM, implementing cultural change is the most demanding, yet least understood, work effort. GartnerGroup clients report that cultural changes require 50 percent to 70 percent of the overall KM implementation effort, and failure to change culture accounts for at least 50 percent of KM project failures.

Most enterprises operate within a cultural framework that encourages and rewards competition and individual achievement. Most employees perform their work and advance their careers by keeping their knowledge to themselves (for their own benefit) rather than sharing it with others. KM demands a shift to a culture where collaboration, knowledge sharing and team achievement are valued equally with competition and individual achievement. A KM cultural framework achieves this shift by operationalizing KM (see Figure 2).



Source: GartnerGroup

Figure 2. KM Cultural Framework

The operational foundation for KM requires three components:

- *Operational Roles and Responsibilities:* KM requires people and technology to structure and maintain an environment that:
  - Assures content quality and integrity
  - Delivers knowledge appropriate to individual users
  - Eases program contribution and use

  Operational roles for KM include a chief knowledge officer and other enterprisewide and business-area-specific roles (see KA-03-8437). Lessons from enterprises' programs include findings about

operational roles. For example: Chrysler's EBOK program found that the *reader's* role must be part of the operational structure (see Business Process Re-engineering (BPR) *Research Note* CS-KGMT-1651, 29 January 1997); Bank of Montreal formally defined roles and responsibilities for each activity in its knowledge cycle (see CS-06-0548).

- *Incentives and Recognition:* The enterprise must promote an enterprisewide belief that
  - Knowledge sharing is the source of employee power
  - Reliance on knowledge content can return value to those that use it
  - Collaboration and shared development are rewarded.

  Incentives, rewards and recognition are critical to motivating the cultural values and behavior required for KM (see DF-05-7473).

- *Time and Space for Capture and Collaboration:* KM relies on people interacting (e.g., experts, work task communities and interest communities) and performing their work with knowledge-enabled processes. The enterprise must allocate the physical time and the mental space (a sense of freedom to participate) for employees to actively share, collaborate and innovate. Successful KM programs allocate time for knowledge creation, capture, access and use. For example, American Management Systems gives persons elected as Associates of the Knowledge Center a typical allotment of 40 hours to document the knowledge that got them nominated. At the World Bank, every employee is charged with creation of cutting-edge knowledge, which is estimated to be 80 percent of the ongoing time requirements for KM. At Chrysler, the user has an operational role to use available content and to contribute new content.

The operational foundation for KM drives and promotes three enterprise dynamics — sharing, collaboration and innovation — that are the source of KM business value.

- *Sharing* is the lowest-level dynamic. To achieve effective sharing, employees must do more than just contribute their knowledge to be shared with others; they also must access, rely on and apply the collective knowledge in their own work tasks.

Collaboration is the second-level dynamic. In addition to sharing knowledge, employees must share the activities, processes, development of work products, and accountability for work tasks. (A process to identify areas for measurement of collaborative activity is presented in DF-05-2801. A foundation overview of collaboration and collaborative tools is found in Advanced Technologies & Applications (ATA) *Research Note* T-ATT-430, 1 August 1996.)

- *Innovation* is the final dynamic, it is highest in complexity and value. Innovation occurs when employees and teams use knowledge and collaborative activities as a source of ideas and reusable components to innovate processes, products and services.

Enterprises cannot drive the cultural dynamics of KM through management directives. The operational foundation and KM enterprise dynamics are interlinked; as the operational foundation is strengthened, so is the progress toward sharing, collaboration and innovation.

Strategic Planning Assumptions:

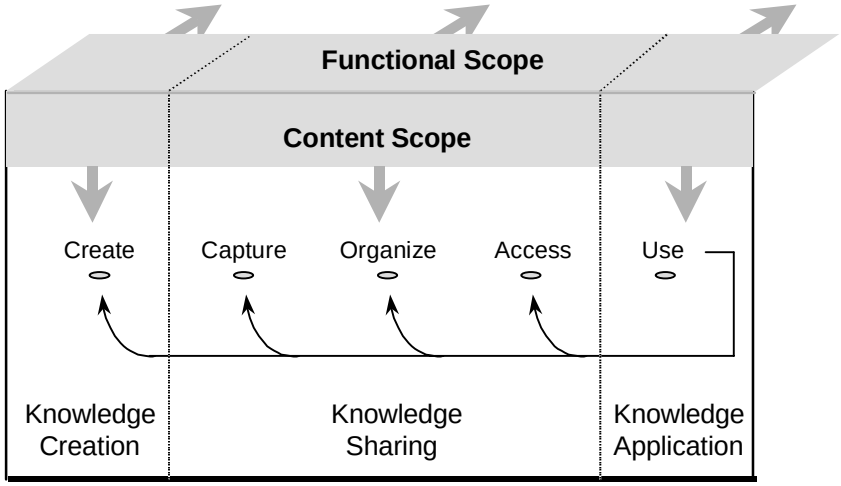
- *Through 2003, enterprises lacking a strong KM cultural foundation, including operationalizing KM, will fail to achieve their KM business objectives (0.7 probability).*
- *Through 2003, more than 50 percent of the effort in implementing KM programs will be spent on building a culture of sharing and collaboration (0.7 probability).*

*Tactical Planning Guideline***:** *An enterprise-level KM program that is not supported by formal incentives aimed at encouraging sharing behavior will fail within two years (0.8 probability).*

1.1.3 The KM Process Framework

Among the issues that enterprises face in defining and building KM is that multiple definitions of KM are competing in the marketplace — some broad enough to permit any vendor whose products deal with digitized information, in any form, to claim they are selling a "knowledge management" product. Examples abound: a leading relational database management system vendor claims that its product is a KM product; a vendor of an enterprise financial application is repositioning the product as a "knowledge processing" application; and many vendors with the word "information" in their mission statements or product definitions have simply changed it to the word "knowledge."

The GartnerGroup KM process framework (see Figure 3) is a way to structure thinking and planning around KM. It also provides a means to position user programs, and to evaluate the functionality of vendor products and service provider offerings for KM. GartnerGroup helps clear the confusion with a process framework and recommendations for enterprise action.



Source: GartnerGroup

Figure 3. KM Process Framework

This final framework prescribes a three dimensional process model for the enterprise to construct the process, functional and content scope of a KM program. The first dimension, *activities*, brings the most business value; the second dimension, *functional scope*, enables these activities, and the third dimension, *content scope*, enables the processes.

GartnerGroup research has identified five fundamental activities of KM that comprise the first process, or activities dimension:

- *Create:* The activities that result in new knowledge.
- *Capture:* The activities that enable capture and representation of tacit knowledge in explicit form, thereby collecting knowledge from the individual and making it available across the enterprise.
- *Organize:* The activities that classify and categorize knowledge for storage and retrieval purposes; this includes maintenance of knowledge data as well as the indices, maps and processes that manage it.
- *Access:* The activities through which knowledge is disseminated to or requested by users.
- *Use:* The application of knowledge to work activities, decisions and opportunities. *Use* is recursive — i.e., it generates feedback that affects the other activities, and this feedback may be injected into the KM process through any of the other four activities.

The two additional dimensions to the KM Process Framework are:

- *Scope of Content* is the breadth of knowledge contained within or acted on by a KM technology or program. Section 2.0 of this report addresses content scope and management.
- *Depth of Functionality* is a technology's functional coverage of any of the knowledge activities – the coverage may be deep or shallow. Section 3.0 of this report addresses functional scope.

The five KM activities can be further grouped into three subprocesses of KM*: knowledge creation, knowledge sharing* and *knowledge application.* The three activities that comprise knowledge sharing — *capture, organization* and *access* — are the core of KM. Most KM programs have their roots in knowledge sharing programs. Note that knowledge sharing includes the capture of tacit knowledge, which is critical to the definition of KM.

Finally, knowledge creation and application rely heavily on the cross-process activity of collaboration, which is generally recognized as intrinsic to KM, but is not in itself sufficient to constitute KM. (A full analysis of the future of collaboration through 2006 is found in ATA *Research Note* T-ATT-430, 1 August 1996.)

Using the KM Process Framework*:*

What immediate value does the process framework bring to KM users, technology vendors and service providers caught in the confusion surrounding KM? The framework provides a holistic view of the full scope and scale of the KM process:

- Basic definitions
- Identification of the core activities and subprocesses (and their relationships to each other)
- The management of content in KM programs
- The functional roles of KM-supporting technology

As such, user enterprises, vendors and service providers can employ its strong visual representations and specific definitions to clarify the scope of their programs, set the targets for future work, and compare their own KM vision to those of others. A vendor service offering, a vendor technology or tool, or a KM user program may be described in terms of *which* of the five knowledge activities it addresses, *which* of the

knowledge subprocesses are supported*, what* scope of content is included, and *how deep* the functionality provided is in terms of its scope.

Examples of the Process Framework Applied to User KM Programs*:*

It is possible for KM programs to focus on one or more subprocesses or activities while ignoring the others more or less completely, or the program can work within a narrow band of content and functionality and still return tremendous value to the enterprise.

For example, *British Petroleum* (BP) has a KM program that addresses a narrow slice of the framework. BP's program can be classified as knowledge sharing to enable collaborative, real-time application of knowledge. Knowledge sharing at BP was built around the capture, organization and access of two categories of project information:

- A collection of site-specific data and project expertise, including the names of project managers, geologists, contracting partners, site managers and financial managers.
- Project progress reports, providing information about individual problems or issues and their resolution (including everything from weather and process delays to construction problems).

These information assets provide a knowledge source for quick identification and assembly of collective expertise and information. This enables a second process of real-time collaboration through a videoconferencing link between engineers and experts working on widely dispersed sites (e.g., BP deep-sea drilling platforms, other BP sites, and contractor or partner locations). The time necessary to solve a problem on a drilling platform can be drastically reduced and simplified because physically moving engineers to the problem site is no longer necessary. The scope of content is narrow (compared to the full scope of knowledge involved in BP's business), the depth of functionality is minimal, and KM includes only a modest, yet valuable, program of knowledge sharing.

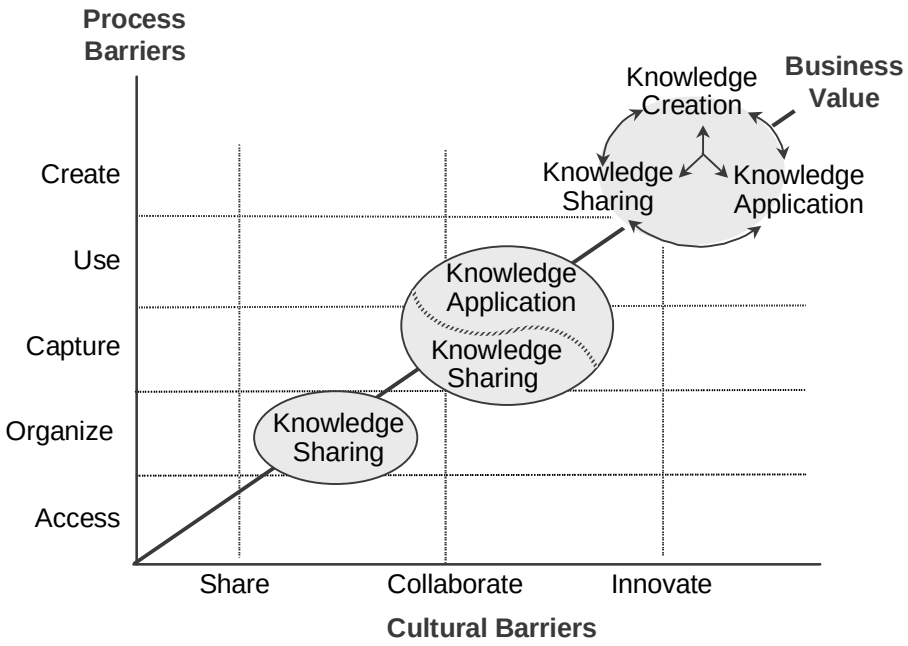
Most highly successful programs, however, display a high degree of coverage of the KM Process Framework, and emphasize all three KM subprocesses — knowledge sharing, knowledge creation and knowledge application — as equally critical to success.

Ernst & Young (E&Y), widely recognized as an aggressive user of KM, provides a good example of a full-process, enterprisewide KM program. Its KM efforts were initiated to leverage the intellectual capital of a large, global, multidisciplinary enterprise. As such, its program focuses equally on all three subprocesses: knowledge creation, sharing and application. Knowledge sharing is at the core of the program, and E&Y provides an infrastructure to capture and organize its collective intellectual assets, and also ensures that all employees have access. The work environment is based on four employee work characteristics: employees work electronically, work remotely, work in teams and rely on content. All employees practice knowledge application in that they use the knowledge environment as a touch point to collaborate with experts, to access relevant knowledge, to speed project work and to resolve issues. In addition, knowledge creation is emphasized in the expectation that all employees contribute their own experience and expertise to the collective knowledge base, and that they also utilize it to stimulate ideas for problem solutions, new services and new business. This program is very deep in content scope (the target is to manage all the enterprise's intellectual assets) and is wide in functionality (with a strong infrastructure and technology to provide global support for all employees).

Strategic Planning Assumption: Through 2003, KM programs that address and integrate all five fundamental activities of the KM process will achieve significantly higher business benefit than those that exclude one or more of the activities (0.8 probability).

1.2 Integration of the Enterprise KM Frameworks: The Knowledge Managing Enterprise

The target state of KM is the knowledge managing enterprise. It is accomplished when all three frameworks operate in concert and all receive equal focus in the enterprise. The three frameworks cannot be implemented sequentially or independently – they must be built concurrently, operate cooperatively, and their processes must be continuously integrated. The enterprise must progress through a matrix of process and cultural barriers; these must be overcome in concert to achieve the highest-level enterprise dynamics. This matrix of barriers and the enterprise's path of progression are represented graphically in Figure 4.



Source: GartnerGroup

Figure 4. The Knowledge Managing Enterprise

The barriers are plotted on the axes of the matrix:

- On the vertical axis, the KM activities represent the barriers to achieving the fully integrated KM process. The barriers are plotted from lowest difficulty (access) to highest difficulty (create) on the process barrier axis. Note that the innermost KM process activities (access, organize, and capture – or knowledge sharing) appear lowest on the process barriers axis and are the easiest to overcome.
- On the horizontal axis, the cultural barriers are represented by the enterprise dynamics. Sharing is easiest to accomplish, followed by collaboration and innovation.

As the enterprise navigates the matrix and overcomes interlinked process and cultural barriers, the level of business value increases. This is represented on the diagonal line that dissects the two axes. The highest return occurs when all three enterprise dynamics and all five KM activities are successfully activated.

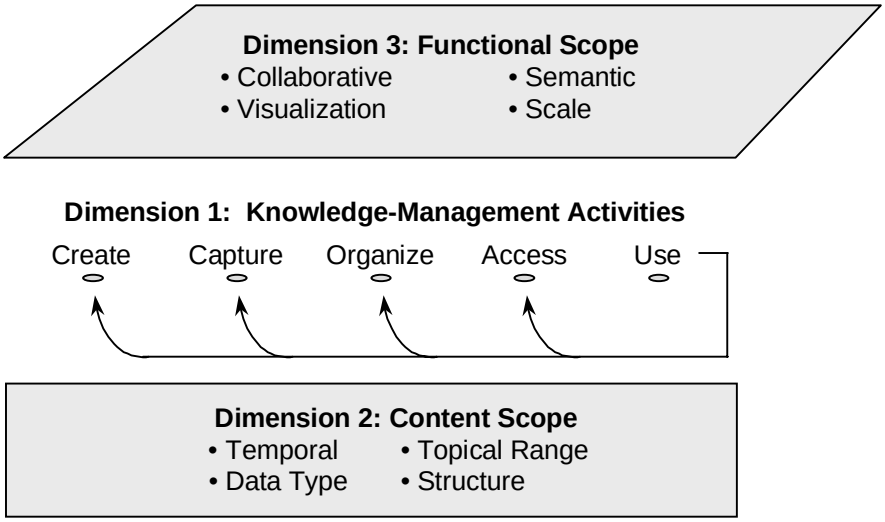
- Knowledge sharing is achieved by overcoming the cultural barriers to sharing and technical barriers of access, organization and capture.
- Knowledge application is added when the enterprise overcomes cultural barriers to collaboration, identifies/relates individuals to their knowledge assets and work communities, and links knowledge to all primary job responsibilities.
- Finally, the enterprise begins to function in an unbounded environment where knowledge sharing, application and creation all interact to drive enterprise decisions and development of new products and services. Achieving this final level of KM discipline requires the enterprise to overcome the cultural barriers to reuse, reinvention and innovation, and to overcome the technical barriers to knowledge creation.

Strategic Planning Assumption: Through 2003, KM systems that focus on the simultaneous improvement of the whole system – technology tools and human practices – will be measurably more successful than programs that focus on one or the other (0.8 probability).

2.0 The Content Dimension of the KM Process Framework

Key Issue: What organizational structures, processes and management practices will overcome cultural and other barriers and ensure success for KM?

Section 1.2.3 introduced the KM process framework and its three dimensions: activities, content scope, and functional scope (see Figure 5). Dimension 1, activities, is analyzed in Section 1.2.3; dimension 3, functional scope is analyzed in Section 3.0; here, dimension 2, content scope, is introduced.



Source: GartnerGroup

Figure 5. Content Dimension of the KM Process Framework

Enterprises must determine the content scope (i.e., breadth of knowledge content) that is:

- Required by KM program participants
- Relevant to the business strategies
- Needed to drive the KM applications

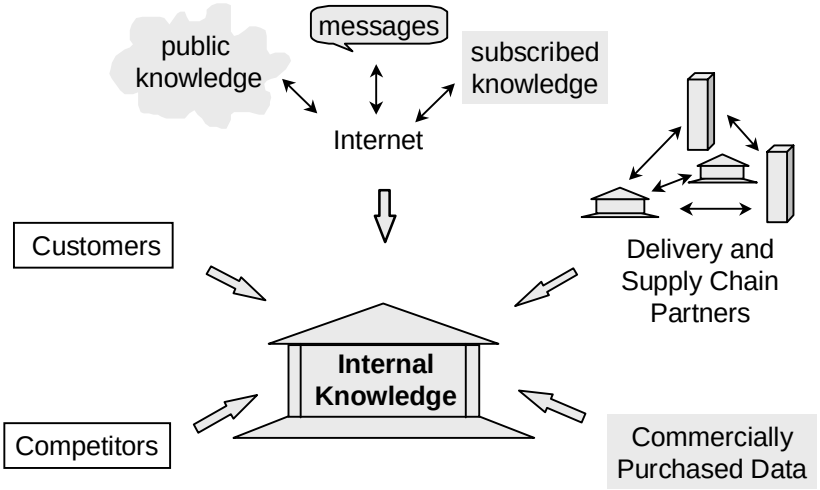
The enterprise must build the operational foundation for KM to ensure the capture, organization and access of this knowledge. KM content scope is defined by addressing four knowledge characteristics of the content that enables each KM activity:

- The *topical* coverage of knowledge content; coverage may range from a single competency or area of expertise to all competencies of the enterprise.
- The *temporal* characteristics of content, which has two facets.
  - The retention period of content, which may range from very short term such as a message or E-mail (which are acknowledged, used and deleted) to near permanent retention as in the examples of corporate policies or methodologies.
  - The currency of content, i.e., indications of when the content was created, whether the most current version only is retained, or whether all past versions are retained as a historical trail of the content.
- The *data types* to be included. These data types may range from video, digitized messages, documents, and E-mail, to business application data and audio.
- The *structural* characteristics of the content, which may include classification into levels of ownership, application or usage, or other enterprise structural requirements. For example, content ownership might be classified into multiple levels such as enterprisewide, departmental, individual or team.

2.1 Sources of Enterprise Knowledge

Enterprises and their knowledge workers require broad information access and diversity; it must match the reach and range of their job responsibilities. The sources for this information can be grouped into two broad categories – *internal* (those information assets owned and managed within the physical enterprise of the knowledge worker) and *external* (all the knowledge and information from external sources). Enterprises and knowledge workers have access to an almost unlimited supply of information from internal and external sources. The reliance on external knowledge is growing because of expanding user needs and because of availability of information – e.g., from the Internet, strategic partnerships (e.g., outsourcing, delivery chain and supply chain partners), numerous subscription news and research services. Therefore, an enterprise's vision for KM programs must encompass the extended enterprise (see Figure 6).

With this expanded "universe" of information and expertise, enterprises must extend the vision for their KM program to include all external sources of information and all external employees. The primary external sources of information content needed by enterprises and their knowledge workers include:



Source: GartnerGroup

Figure 6. Sources of Enterprise Knowledge

- Commercially purchased information from sources such as subscription services and news providers. This information is increasingly used to supplement the internal expertise, research and communication programs of enterprises.
- Information from external business partners which are participants in the supply chains or delivery chains of an enterprise. In these partnerships, components of the processes (including the information, process tasks and experts) reside outside the physical boundaries of the process-owning enterprise.
- Internet provided information, including messages, public information available to all users, and commercially purchased information that relies on the Internet as the delivery channel.
- Customer and competitor information acquired from external sources such as market intelligence providers.

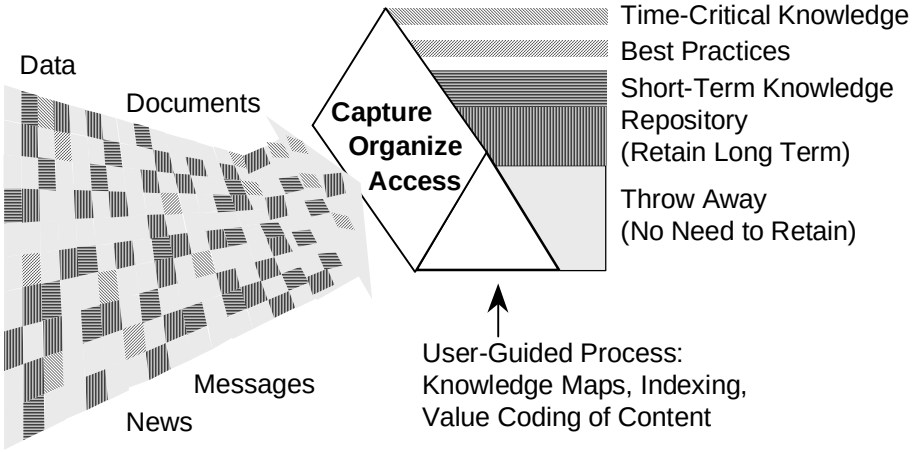
This expansive vision for KM may require that enterprises implement their vision in stages and that technology solutions must be assembled using what is viable. However, the most successful enterprises define and maintain this expansive view of their knowledge needs, employees, processes and knowledge sources.

Strategic Planning Assumptions:

- *By 2003, KM programs will rely on extensive use of external content and more than 50 percent of required content will come from external sources (0.7 probability).*
- *Through 2003, the extensive use of external content will elevate interoperability among and across physical and technical boundaries, to the primary requirement for KM technology solutions (0.7 probability).*

2.2 The Enterprise View of Managing Knowledge

The enterprise's role in managing knowledge content is to provide the operational foundation (see Section 1.1.2) the cultural framework for KM. This operational foundation for KM behaves somewhat like a prism (which takes in white light – an aggregation of all colors – and separates it into the component colors). The operational processes that capture, organize and enable access to information, form the operational prism for knowledge content (see Figure 7).



Source: GartnerGroup

Figure 7. The Enterprise View of Managing Knowledge

The objective of the content management prism is to filter and classify enterprise information from all sources so that the collective set provided to knowledge users is highly relevant to their tasks and to the enterprise's business values. This requires the enterprise to build user guidance to drive the processes. This guidance includes:

- Knowledge maps or taxonomies that are used to organize content and processes according to the enterprise's business usage of knowledge. (See KM *Research Note* T-03-3125, 9 February 1998, for an analysis of knowledge mapping.)
- Indexes of the physical information assets to the business and user knowledge maps.
- Value codes for content, e.g., which content is most valued by a user or by the enterprise business purpose.
- Identifying knowledge experts and communities according to their expertise, interests or responsibilities. (See KM *Research Note* T-03-2188, 12 January 1998, for an analysis of the processes and technology for value coding, identifying experts, and affiliating users with communities.)

The operational processes of the content management prism are performed by a combination of people and technology, which work in concert to manage knowledge content according to the user guidance. The infoglut – e.g., documents, pushed messages, E-mail, news feeds, data records and other content required by the enterprise and its knowledge users – from internal and external sources are interrogated to determine their properties. Based on this interrogation, the content management prism filters, sorts, classifies, organizes and makes the information accessible in the context, structure and format that is relevant to and applicable to the user's task, work environment or preferences.

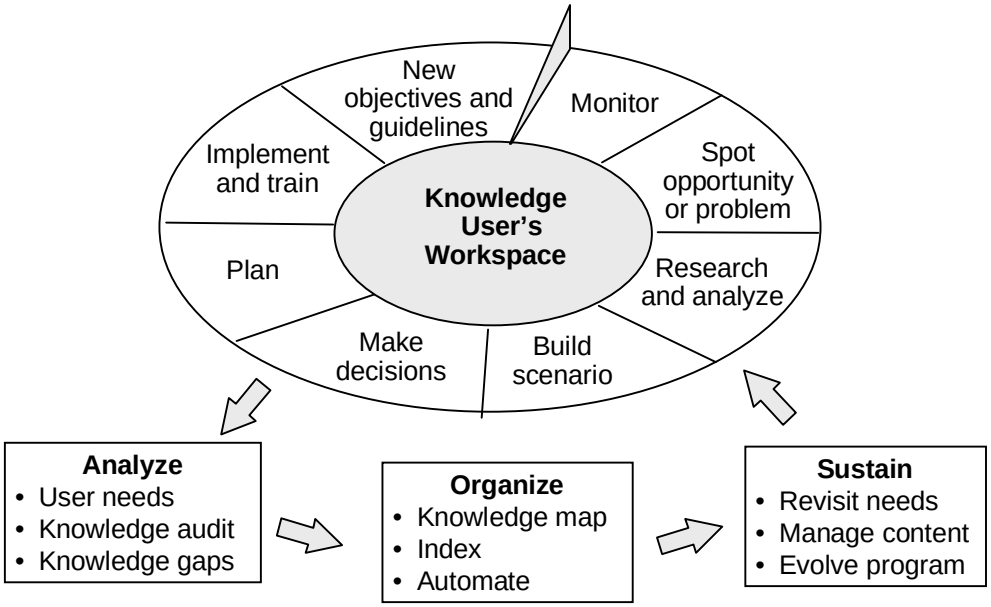
Strategic Planning Assumption: The technology that identifies and delivers mission-critical structured data based on user need and profiles will be available by 2000; however, technology that precisely evaluates and routes unstructured, textual content will not be available until 2003 (0.7 probability).

Consequently, through 2003, significant human infrastructure – content experts and content management experts – must be included as part of the operations to manage the prism content management functions and support the application of technology.

2.3 The Users View of Knowledge

The chaos and complexity in the business environment has not only produced the infoglut, but has changed the structure of most jobs within enterprises. More employees are classified as knowledge workers and their jobs are best described as decision cycles, rather than a fixed sequence or series of well-defined tasks. The tasks they perform are not prescribed in advance but are defined ad hoc in response to the issues, opportunities or problems arising from the chaos. This decision cycle job structure and the knowledge user workspace that supports it are represented in Figure 8.

Knowledge workers are provided with a set of independent processes that comprise the decision cycle, and with access to knowledge that is relevant to their responsibilities. This knowledge user workspace enables workers to assemble the tasks and knowledge content required to respond to business events. The knowledge workers continually scan the environment for opportunities, select one or more for action, find the relevant information or experts, build scenarios, and make decisions. Each opportunity requires a customized response, collaboration with others, and a tailored execution of the processes in the decision cycle.



Source: GartnerGroup

Figure 8. Users' View of Knowledge

To enable this just-in-time customization of work processes, the enterprise must build the knowledge work space to include:

- The full range of information and knowledge content that may be required for each user's areas of responsibility, interest and work or task affiliation
- Technology and human processes that allow a knowledge user to control when and what is accessed, and to make this decision at the point of need
- A means to affiliate a knowledge worker with communities of experts, interest groups, and work teams to accomplish the collaboration and sharing required of these unstructured jobs

Maintenance of the workspace requires a continual cycle of support from the enterprise operational foundation, including:

- Analyzing continuously user needs for knowledge content, affiliations and expertise
- Mapping, indexing and integrating content and processes into the knowledge workspace
- Sustaining the KM program (e.g., the currency and integrity of content, the dynamics of participation, and the sophistication of technology and processes) in concert with changing user needs

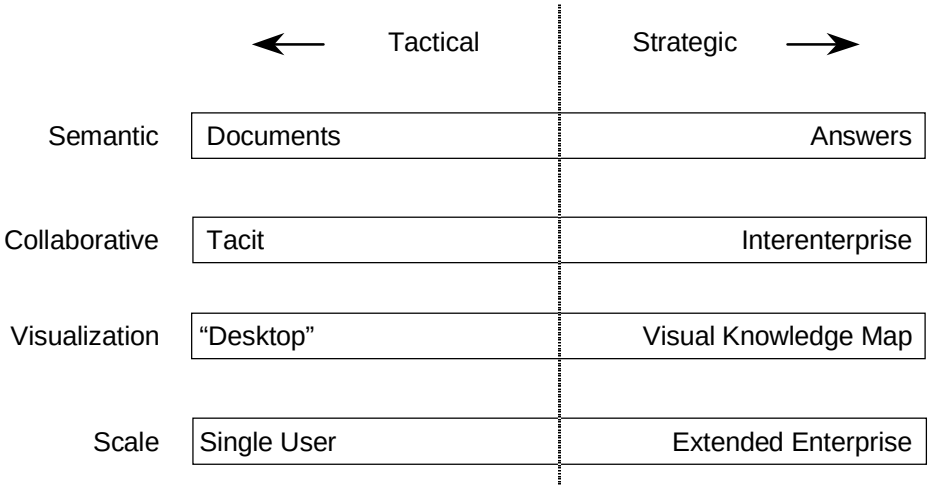
3.0 The Functional Dimension of the KM Process Framework

Key Issue: What technologies will enable effective KM?

The final dimension of the KM process framework is functional scope, which is the depth of automation and technology applied to the KM activities and to content management. The functional scope may range from shallow coverage in a single KM activity with narrow content scope, to deep coverage across all KM activities with broad content scope.

3.1 The Role of Technology in KM

There are four underlying technologies that comprise KM functionality: collaborative, semantic, visualization and scale. A brief introduction to the definition of these four technologies and their application from tactical to strategic is provided (see Figure 9).



Source: GartnerGroup

Figure 9. Functional Requirements for KM Technology

- *Semantic* functionality represents relationships between the user terms (the knowledge map or taxonomy and the index terms) and those of the information resources. Semantic functionality utilizes technologies such as clustering, categorization, linguistic analysis, data extraction, and semantic networks to support the relevance of information delivered to the knowledge user. Tactical implementations of semantic functionality may simply enable search for occurrences of terms and return a selection of documents that contain them; strategic implementations provide high relevancy of responses through the use of more-sophisticated mapping and indexing to provide more-exact answers to queries or requests.
- *Collaborative* functionality supports the selection of knowledge by and for the user by matching knowledge content and experts to users specific needs and interests. Collaborative technology includes filters, identification of experts, and alignment of users into communities (established by groupware – net groups, threaded conversations, and network directories). Collaborative functionality ranges from the tactical (user has access only to his own knowledge sources) to strategic, where the user has access to extended enterprise knowledge, communities, networks and experts.
- *Visualization* addresses navigation and speed of retrieval within the KM environment and also supports analysis of knowledge content. Visualization ranges from tactical navigation using today's desktop metaphor to select an application as entry point to knowledge content; to strategic navigation using visual knowledge maps to guide navigation among all information assets without regard to their originating application or location.
- *Scale* addresses the range of data types and the physical locations accessible to the KM user. Data types include relational databases, audio content, video content, and workgroup application data. Physical locations include those internal to the enterprise and external locations (including Internet and supply and delivery chain partners). Tactical scale functionality may be as limited as accessing a single repository and a single data format. In its broadest strategic implementation, KM technology

includes the scale to access all formats from video to text to audio, and to access or receive information whether it resides internal to the enterprise or in external data stores.

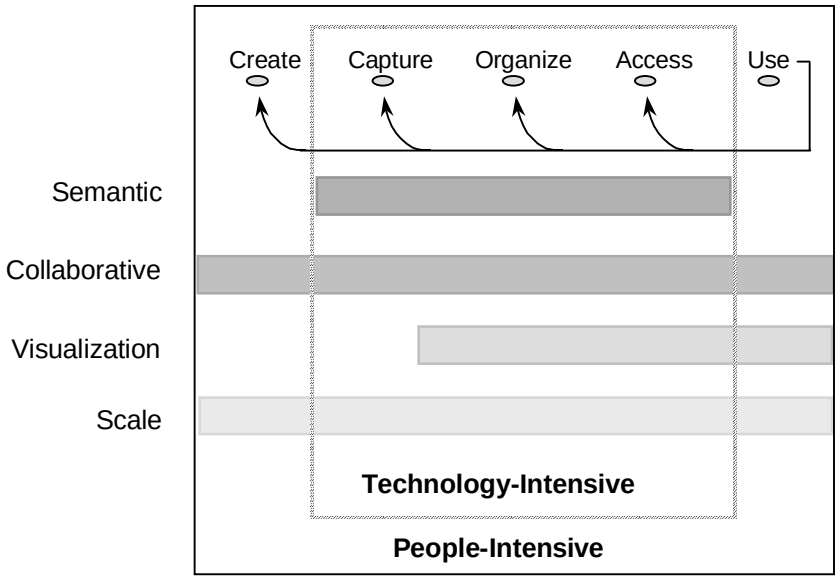
These technologies will not evolve at the same rate; specifically the following *Strategic Planning Assumptions* apply:

- *By 2000, semantic functionality (resident in information retrieval technology) will converge with collaborative functionality (extensions of groupware) to capture the meaning of and users' evaluations of information value in KM environments (0.8 probability).*
- *By 2001, technology products that support knowledge mapping will employ visualization to represent the similarity and closeness of meaning among information objects (0.7 probability).*
- *By 2001, uniform access to information from disparate sources – including documents, databases and applications inside and outside the enterprise – will be available through a single, Yahoo-like interface offered by each leading KM solution vendor (0.7 probability).*

Consequently, a good choice for initial KM programs is to focus on knowledge sharing (the activities of capture, organize and access) to leverage information assets. The technologies for these activities are more mature and offer more assurance of early success. However, as knowledge sharing and information organization/access gain momentum within an enterprise, more-complex capture of tacit knowledge and more-advanced dynamics and knowledge activities must be integrated to maintain the momentum. At that point, enterprises must perform more-diligent analysis of their needs and provide solutions using best-of-breed technology from multiple vendors.

3.2 Technology Coverage of the KM Process

The five KM activities are supported in part or in whole by the four emerging KM technology functions (semantic, collaborative, visualization and scale). A representation of the four functional requirements of KM and the KM activities supported are shown in Figure 10.



Source: GartnerGroup

Figure 10. Technology Coverage of the KM Process

Technology is most critical to knowledge sharing (capture, organize and access), the activities categorized as “technology-intensive.” Technology requirements of these activities include:

- *Capture* relies heavily on semantic functionality to interrogate, analyze and represent knowledge in a reusable form. Collaborative technology enables the alignment of knowledge to the enterprise's knowledge maps, to other related knowledge, and to interested users. Scale functionality is applicable to capture activities that span such things as disparate information sources, physical locations and enterprise boundaries.
- *Organize and Access* require the support of all four technologies. Semantic and collaborative technologies are used for organizing knowledge content (indexing), accessing (retrieving or pushing knowledge to users), and organizing user relationships (by aligning users with work communities, experts and knowledge content). Visualization mainly assists the access activity by improving user's navigation within the KM environment; however, visualization plays a second role in the organize activity where it simplifies the process of linking knowledge assets to the knowledge map. Scale functionality applies to these activities to support disparate information sources and user dispersion.

Capture, organize and access also have a corresponding people-intensive character because they require substantial human infrastructure to invoke the functionality of these technologies.

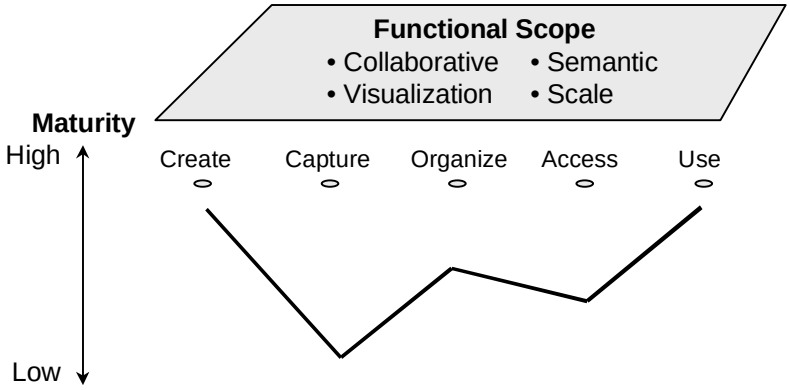
Create and use are the KM activities that drive collaboration and innovation. These activities are performed by people, the knowledge users, and are less technology-intensive.

- *Use:* is primarily a human decision-making activity with technology playing an important, but secondary role. Collaborative technology supports the ability of users to find experts and to work in a collaborative fashion with teammates to share the responsibility for completing work tasks and deliverables. Visualization aids the user in finding and analyzing knowledge. Scale enables access to people, content and processes that are geographically dispersed.
- *Create:* is a mostly human activity of using knowledge as the source of ideas, reuse and innovation. This activity requires collaborative technologies to interact with other people in the creation activity. Scale is also critical to creation when collaborating users are physically dispersed.

This view of the technology- and people-intensive characteristics of KM activities exposes an issue. The initial KM program of many enterprises is a best-practice application (which implements the knowledge sharing activities of capture, organize and access). Knowledge sharing requires an enterprise to implement some aspects of all four technologies, supplement the technology with significant human infrastructure, and develop strong cultural initiatives to drive knowledge sharing. What's the message in all this? KM is complex from the beginning, and even enterprises that implement relatively simple knowledge-sharing programs must build complex cultural programs, human infrastructure and technology at the outset.

3.3 Maturity of Technology for KM

Technologies for the five KM activities are not created equal. They are in different states of maturity and are evolving at different rates. If the maturity level of KM technologies is plotted across the KM activities (see Figure 11), another challenge becomes clear – the technology-intensive KM activities are, as a group, immature.



Source: GartnerGroup

Figure 11. Maturity of KM Technology

There are several key implications of this variation in the maturity levels:

- The lower-level and often tactical programs of knowledge sharing will not be strongly supported by technology in the near term (by 2002). Consequently, knowledge sharing requires an offsetting human infrastructure that is more robust than many enterprises are prepared to implement.
- The least-mature technologies are those that enable the capture of tacit knowledge, the defining requirement, if not the heart, of KM. Therefore, the cultural changes to encourage a commitment by individual employees to contribute knowledge are critical to the success of KM.
- Organization and access technology is adequate for small implementations, but requires high infrastructure in larger enterprise programs.

There are no integrated KM solutions, and there is no vendor on the horizon trying to automate all KM activities, provide deep content support, and provide full functional capability (semantic, collaborative, visualization and scale). However, there is progress: The most recent, valuable technology advances are in *organize* technologies that enable KM advances in mapping, indexing and linking people to communities. System integrators are assembling best-of-class niche tools in solutions and customizing them to client needs. Finally, large vendors are declaring strong KM strategies, building KM support into products, and forming partnerships with small, innovative vendors. A few vendors have a full KM vision, but it will be 2001 before full function solutions and vendors are predominant.

Strategic Planning Assumptions:

- *Low-risk, mature KM systems (covering all KM activities) will not appear in the marketplace before 2001 (0.7 probability).*
- *Through 2001, programs that incrementally incorporate KM software advances will be more successful than those that depend on revolutionary product releases (0.7 probability).*

Consequently, for the foreseeable future, enterprises must assemble a KM solution by selecting best-of-class tools that collectively span the full range of KM activities. Enterprises should:

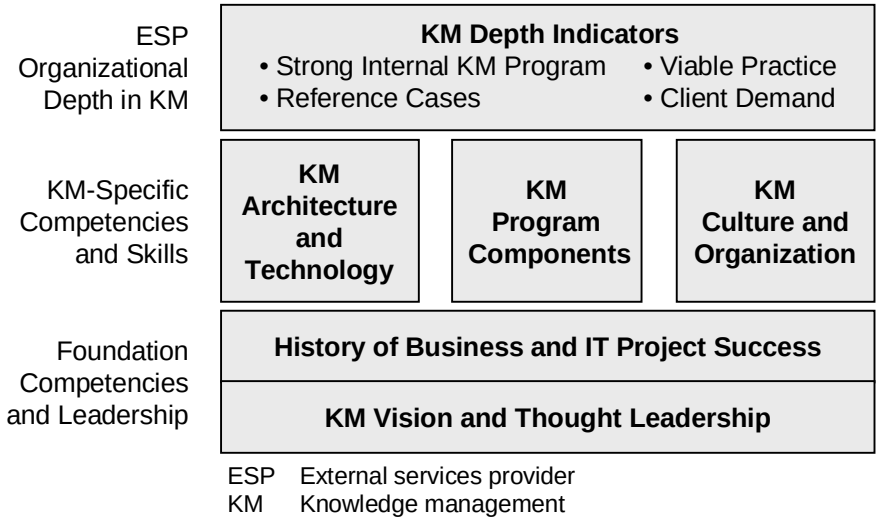
- Start simply
- Focus on the highest-value activities for the enterprise
- Buy the best technology for that purpose
- Improve the performance of the technology with education, preparation (e.g., knowledge audits and mapping) and with adequate human infrastructure

4.0 KM External Services Provider Competency Requirements

Key Issue: What factors will distinguish leading-edge consulting in KM design and implementation?

Service providers are building KM practices. When evaluating these external services providers (ESPs), a strong history of success in project management and business engagements is a necessary (but not by itself sufficient) predictor of success in KM.

(GartnerGroup collectively refers to consultants, contract employees, systems integrators and outsourcers as ESPs. Evaluation of the capability of an ESP to deliver projects and business process designs has been the subject of extensive GartnerGroup research, see External Services Providers (ESP) *Research Note* KA-CON-257, 6 June 1997; *Research Note* TU-03-5521, 20 February 1998; and Delivery System Applications and Vendors (DSAV) *Research Note* KA-ENT-048, 30 October 1997.)



Source: GartnerGroup

Figure 12. Competency Model for KM ESPs

Enterprises selecting KM ESPs should look beyond the project and business experience and also require KM-specific performance, skill and expertise as represented in Figure 12:

- *Strength of the ESP's Internal KM Implementation:* If the ESP has no program for managing its intellectual assets, go no further; this signal of the ESP commitment to KM is an entry-level qualifier. Assessing the ESP's KM program requires a structural view and a cultural view. The structural view is how long the program has been in place, program scope (enterprisewide or a narrower implementation), the metrics established to gauge program performance, and the infrastructure supporting the program. The cultural view is an evaluation of the success with employee participation, incentives the ESP provides for employees to participate, and future plans for the program. The ESP should demonstrate its KM technology, provide an overview of the architecture, and identify several employees to discuss their use of the program and its value to their work.

Completeness of KM Vision: The ESP should present a vision for KM that is different from information management (see Integrated Document & Output Management (IDOM) *Research Note* TU-KM-458, 17 December 1997). The GartnerGroup KM process framework (Section 1.1.3) is a reliable yardstick for the scope of the vision across process, content and functionality. The ESP's vision should span KM subprocesses and activities (knowledge creation, sharing and application) and the increasing intertwining

of knowledge work and technology tools. The ability of individual consultants to present the vision is an indicator of an ESP's ability to lead clients toward support of the complete KM process.

- *Reference Cases:* The ESP should provide reference cases/clients: at least one with an enterprisewide KM program; one with KM as a tightly integrated component of a key business process; and one that addresses all subprocesses of KM (knowledge creation, sharing and application). Enterprises should ask for references with demographics similar to their own, make site visits, and use the visits to evaluate the reference programs and to validate their own KM objectives and vision.
- *KM Technology-Specific Expertise:* ESPs should demonstrate expertise on three levels:
  - An understanding of the technical components of a KM architecture and its deployment of integrated semantic, collaborative and visualization technology
  - An understanding of the foundation technologies of KM and their roles in delivering overall architectural requirements

Proficiency at assessing the needs of knowledge workers to communicate, capture and retrieve explicit knowledge and manage relationships. (Key research on KM technology and architecture techniques in which ESPs should demonstrate skill and expertise is included in Intranets & Electronic Workplace (IEW) *Research Note* KA-KMGT-1738, 21 August 1997, and IEW *Research Note* T-KM-1758, 24 October 1997.)

- *KM Program-Specific Expertise:* ESPs should have a formal methodology for KM program development and should demonstrate proficiency in six KM-specific techniques:
  - Defining a KM strategy for how and where the enterprise will use knowledge to compete
  - Identifying the explicit and tacit intellectual assets critical to the KM strategy
  - Organizing and completing a knowledge audit
  - Designing a knowledge map of the business usage of knowledge assets
  - Designing the KM administration function (roles, responsibilities and jobs), including organizational placement of a chief knowledge officer, KM program ownership and knowledge content ownership
  - Managing the enterprise transition to a culture of collaboration and knowledge sharing

(For more information about KM program-specific techniques in which ESPs should demonstrate skill and expertise, see KM *Research Notes* T-03-3125, 9 February 1998, COM-03-9743, 19 March 1998, SPA-04-7138, 4 June 1998, and SPA-04-7063, 4 June 1998).

- *KM Cultural and Organizational Skills Transfer:* ESPs should have a strong track record in leading/influencing their clients to develop internal capability for KM programs; to build KM solutions and infrastructure that will evolve; and to continually increase the value of their knowledge content. A good test is to ask reference clients the following question: If the ESP walks away, will the KM team, program and culture survive and continue to gain momentum?

The hiring enterprise should interview individual members of the primary ESP KM team. At a minimum, this should include the project manager and the team leaders or lead analysts (e.g., the technical implementation leader, the KM system architecture/design leader and the cultural change team leader) to assess the depth of their experience with KM cultural and technology challenges, as well as their fit with the hiring enterprise’s style and values.

ESPs must exhibit a KM vision (not a "repurposed" vision from the past), competence in advanced KM technology and a thorough grasp of the need to develop a sharing culture. Failure to perform in any of these competencies by an ESP diminishes the ability to add the value needed to implement a real KM program.

Enterprises should evaluate ESPs at this level of detail until organizational depth in KM is prevalent in the leading consulting companies and in a number of midsize and niche consulting companies.

Strategic Planning Assumption: By 2001, all consulting and integration firms will have some level of external practice competency in KM (0.8 probability).

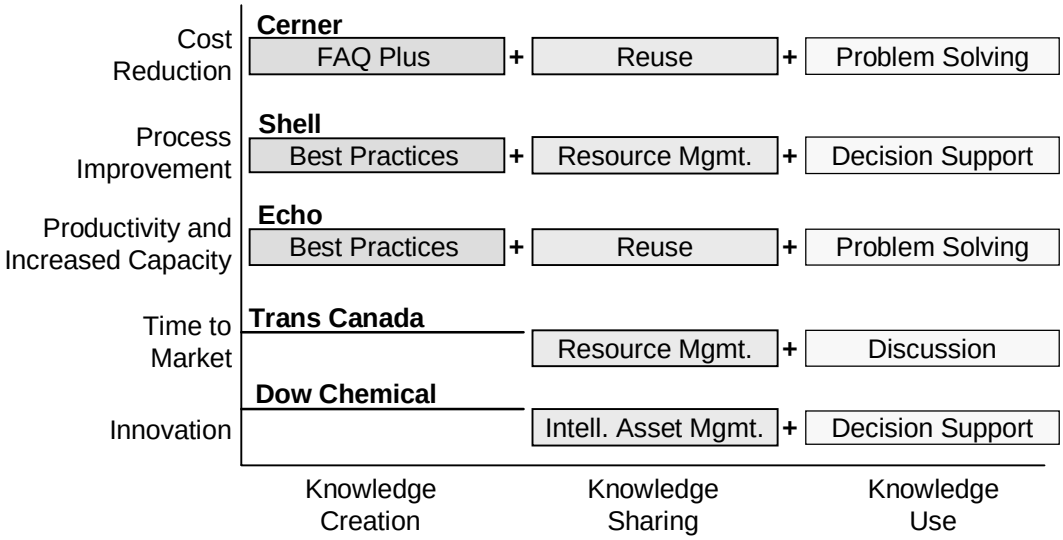
5.0 Knowledge Management Applications

Key Issue: What KM applications will provide the most significant payoff through 2003?

Successes in KM are being reported at an accelerating rate, although no successful enterprise would classify their program as mature or completed – KM takes time and is a program and a process, not a project. This section of the report analyzes five KM tactical programs (departmental or process specific) and two enterprisewide programs.

5.1 High-Value Tactical Applications of KM

GartnerGroup applied the KM process framework and value framework to several tactical or limited scope KM programs to evaluate their fit to our KM frameworks. Our analysis of these tactical programs is not based exclusively on GartnerGroup contact with the company, but is instead based on a combination of our own research plus published, public information from various sources. Using a sampling of five programs, they were mapped on Figure 13 to the three subprocesses of KM on the horizontal axis (knowledge creation, sharing and application); on the vertical axis, we identified the programs by primary area of benefits. Note that no attempt was made to evaluate the cultural framework attributes of these tactical programs.



FAQ Frequently asked questions

Source: GartnerGroup

Figure 13. Tactical Solutions and Coverage of KM Process

The highlights of these programs and the practices that have made them successful follows.

5.1.1 Cerner

Cerner Corp. is a leading supplier of clinical, management information, and knowledge systems for more than 1,000 healthcare organizations worldwide. Cerner is a relatively small company with only 2,500 employees and was selected among the "Best Companies to Work for in America" by Fortune magazine in 1998. Cerner built an internal KM program with the goal of managing costs by avoiding duplication of effort and maximizing the application of lessons learned. Its KM program supports external customers and internal users in help desk and customer-service applications. Its KM process captures and organizes the frequently asked questions of customers and users, and provides help desk agents a knowledge base of solutions to be accessed and reused in future customer interactions. The program and content continually evolves via a knowledge creation segment (labeled "FAQ plus" in Figure 13). GartnerGroup classifies this as knowledge creation because Cerner's help desk agents take the initiative and are provided the tools to add new knowledge or questions to the database as they are encountered. Cerner has met its initial goals of managing cost with an environment that emphasizes knowledge sharing as a means to maximize reuse and minimize duplicate effort.

5.1.2 Shell

Shell's business goal is to become "The Premier Company" and believes this is achievable by tapping the intellectual capabilities of more than 20,000 employees to transform the company. Their Shell Learning Center is the focal point for sharing information and ideas on business performance, is a vehicle for developing leadership skills in defining and implementing business strategies, and is the corporate platform for bringing employees together as the human "glue" that leverages Shell's capabilities into new ideas and innovation. Among Shell's specific goals are process improvement through knowledge sharing; KM is the company's vehicle to multiply and leverage the knowledge of each person across all employees. KM is accomplished through three key operational structures:

- An infrastructure team of experts find and document best practices (from internal and external sources) that support the company's business goals and strategies.
- The Shell Learning Center has systematized models to help employees understand complexity and interconnectedness of business performance, strategy and the human glue.
- KM includes a set of groupware and tools that enable employees to collaborate and establish dialogue with colleagues across the organization.

More than 75 percent of Shell's employees are now involved in programs that accomplish knowledge sharing, application and creation. As for whether Shell is transforming as intended, this change will occur over the long term. Some evidence of success is that in 1996 and 1997, the company reported record income levels; then-president Phillip J. Carroll said, "Changes in the Shell Oil organization have continued at remarkable speed, driven by our people."

5.1.3 Echo

Echo is a Canadian manufacturer of outdoor power equipment. Echo was dealing with staffing shortages: fewer people were being trained by technical schools in the engine technology used by Echo and the company often lost people with many years of expertise. The loss of expertise with fewer prospects to fill the gap was creating a significant drain of intellectual assets and impacting the quality and speed of customer service. Their KM program was built using a product called "Top of Mind" (Malloy Group) and focused on capturing and organizing the collective knowledge about Echo's products into a problem resolution system. The overall goal is to increase productivity of Echo's customer service people and

specifically, to expand the capacity of less-experienced people to handle all customer questions and problems. Echo preserves its equipment-related intellectual capital in the form of slides, videos, parts, serial numbers, and most importantly, the insight captured from experts across the company. The system addresses problems from many perspectives including specific solutions, proper operating instructions (in case the customer is misusing the equipment), and maintenance or preventative measures. The knowledge base is becoming all-inclusive with the addition of information about dealer disputes and capture of all problems, even if no resolution is available. Echo's KM program has mitigated most issues related to retention of know-how when people leave the company, and enabling inexperienced people to effectively support customers. Their long-term goals are to continue to build on the program to enable any person to resolve any problem. Echo is also actively expanding KM to other departments within the company (e.g., engineering) with the goal of focusing on leveraging all knowledge and preventing problems before they occur.

5.1.4 TransCanada

TransCanada is a pipeline/energy company using knowledge sharing to reduce time-to-market for major projects. TransCanada's project history showed that project technology work was usually easy to accomplish (its people were very competent), but overall project management and communication needed improvement. Further, there was no strong linkage of the islands of people and information from multiple locations who shared responsibility for projects. TransCanada initiated KM with the goal of improving project management by capturing, organizing and providing broad access to the lessons learned in past projects and leveraging this knowledge to future projects. The solution uses the corporate intranet as a common vehicle to focus on supporting and improving the sociology of projects including teamwork and collaboration, as well as, capture and sharing of management lessons learned. In reviewing this program, GartnerGroup notes the absence of specific elements that focus on new knowledge creation; however business benefits have been substantial. TransCanada's efforts to improve collaboration and to share collective project knowledge have reduced time and cost on key projects, with one early success reported at 50 percent reduction.

5.1.5 Dow Chemical

Dow has multiple programs but one we focused on is intellectual property management – this highly publicized program involves patent administration. The business purpose is innovation as well as cost reduction and management. By managing its patent information in a KM program, Dow was able to identify obsolete patents (stop paying registration fees and even donate the patents to worthy recipients), manage legal protection of these patents, make the past research work available, and identify opportunities for new partnerships using past research work and patents. Much use was made of automation, and future work will integrate capture of employee know-how in this program. Dow has reported outstanding financial results including savings in tax obligations and on the administration of obsolete patents of $50 million during a 10-year period, and 400-percent increases in licensing revenue on active patents from $25 million in 1994 to more than $125 million by 1997.

The bottom line on this example set of programs is that we have identified five diverse industries, programs and business goals, all of which are achieving success. None of these companies have full enterprisewide programs at this stage; however, all are achieving business results, addressing cultural challenges, operationalizing KM, and each is addressing at least the knowledge sharing activities (capture, organize and access) of the KM process framework.

5.2 Enterprisewide Application of KM

Next, attention is turned to enterprisewide KM. Presented are two in-depth examples of large enterprises (Xerox Corp. and the World Bank) that are building KM as an enterprise competency and strategy. Also offered are two *Strategic Planning Assumptions* that are supported by the results of these two programs.

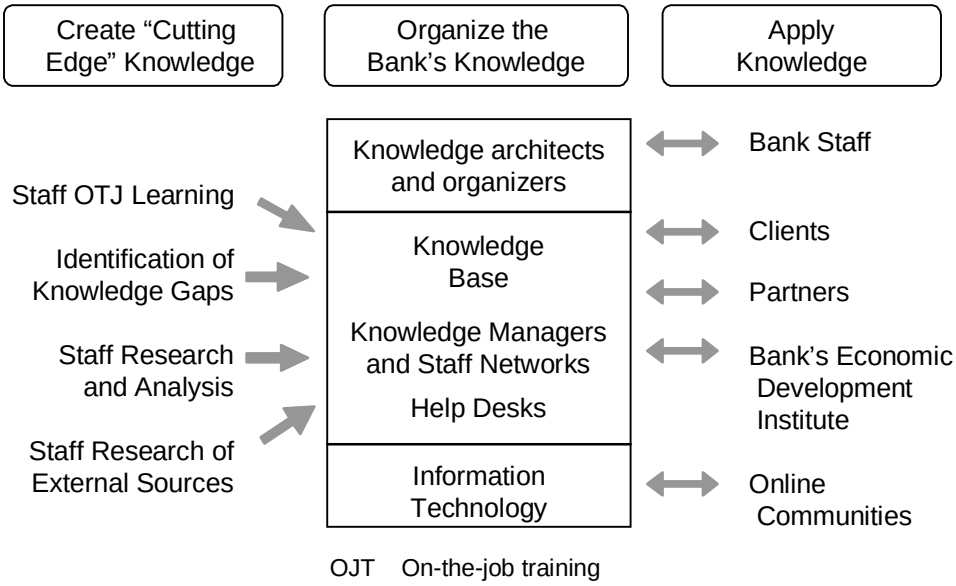
Strategic Planning Assumptions:

- *By 2003, more than half of the Fortune 1,000 companies will implement KM, and KM will be a mainstream business management practice among market leaders in all industries (0.7 probability).*
- *By 2001, more than half of Type A enterprises will have KM programs that fully integrate the people, processes and content of external partners and customers (0.8 probability).*

5.2.1 The World Bank – KM as Transformation

The World Bank is owned by more than 180 member countries. Its mission is to reduce global poverty and improve living standards by promoting sustained economic growth and investment in people. The World Bank was an early adopter of KM, and today its program exhibits the value, cultural and process components of a viable, sustainable program.

The World Bank transformed its business with KM by revisiting its mission and redefining knowledge as its primary product. Its program addresses knowledge creation and application, and is built on an infrastructure of knowledge sharing (see Figure 14).



Source: GartnerGroup

Figure 14. The World Bank: KM as Transformation

The center of Figure 14 identifies the components of the operational foundation for the KM program. The World Bank built a strong infrastructure early on to support KM; however, despite this emphasis on operationalizing KM, it estimates this consumes only 20 percent of the effort in the program. The other 80 percent of the program effort is focused on the creation of cutting-edge knowledge – the capture of tacit knowledge and human brainpower. Knowledge is captured from employees and research partners through the use of stories – employees and other participants capture their experience and learnings to be shared with others.

The most powerful aspect of this program is the inclusion of all stakeholders. The World Bank's program envelops its employees, clients, research partners and other agencies. This is a true and strong view of an extended enterprise. Value is achieved by leveraging the investment in knowledge by sharing it throughout the World Bank enterprise, with their clients, partners, informal online communities and internal staff.

Additionally, the World Bank's program addresses:

- All KM activities - create, capture, organize, access and use
- Deep content scope – across all processes and all topical areas – and strong use of communities of practice and experts
- Good infrastructure – specialists, dedicated staff and diverse participants
- Broad use of technology

An important aspect of this program is that the World Bank faces many difficult issues such as language differences, political differences, access problems and confidentiality. These are challenges that any global, large enterprise faces.

The World Bank's 1998/99 World Development Report is subtitled "Knowledge For Development." The report "examines the role of knowledge in advancing economic and social well-being. Because knowledge is at the heart of economic growth and sustainable development, understanding how people and societies acquire and use it – and why they sometimes fail to do so – is essential to improving people's lives, especially the lives of the poor." This acknowledgement of the role of knowledge in achieving its mission is another indication of how the World Bank is transforming through knowledge.

5.2.2 Xerox – The Knowledge Link

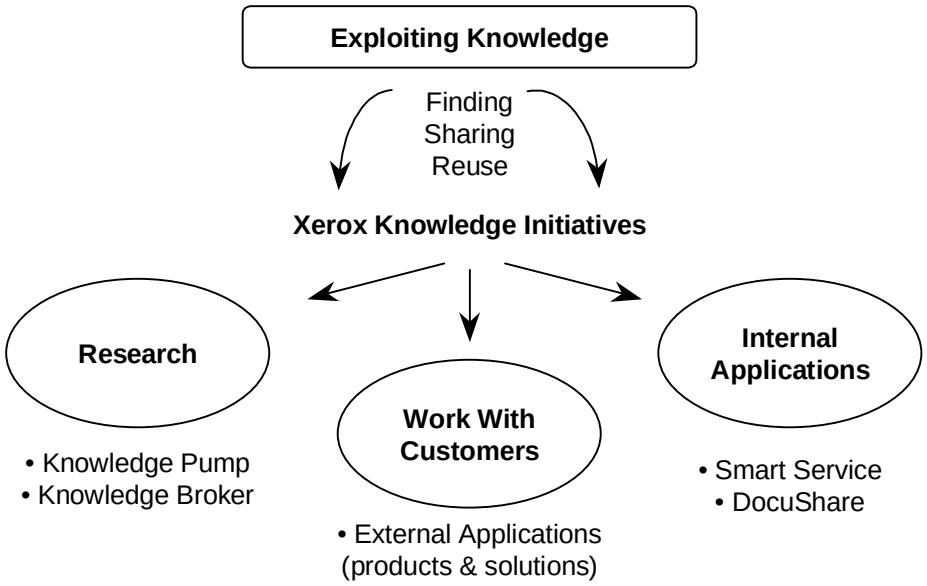
Enterprisewide KM programs are inherently more complex in highly diversified organizations. In such enterprises, KM must address the unique knowledge needs of each business segment, while promoting synergy across all segments. Global reach and a large number of employees also complicate the implementation of KM processes.

Xerox is a megaenterprise with more than 90,000 employees and offices in more than 70 countries. Its KM strategy encompasses internal employee programs and external customer strategies; however, the integration of this strategy was challenging for such an expansive enterprise (see Figure 15).

In 1999, Xerox is a knowledge-focused enterprise. KM programs extend across the enterprise, and many processes and applications exist for the sole purpose of linking knowledge, processes and people. However, this evolution to a knowledge-focused enterprise did not begin as a cohesive effort. In the mid-1990s, internal grassroots KM efforts existed in several islands of the enterprise and concurrently, top management of Xerox recognized that an external KM market opportunity existed. There was a large gap between the grass-roots efforts and the external market strategy that had to be filled before a cohesive enterprise KM strategy emerged.

The mission for Xerox's knowledge link is to exploit knowledge by finding, sharing and reusing it. This drives a series of knowledge initiatives – among them are two programs supporting enterprisewide research (sophisticated environments to gather, organize and enable access to knowledge) and internal applications (knowledge work spaces with processes to share informal and formal contributions among communities of practice or interest, and processes to enable collaboration and flexible access to disparate

information types). The final initiatives are to enable customers to increase their knowledge-based value and redefining the vision of a “document” to include video, images, voice and other media.



Source:

Figure 15. Xerox: The Knowledge Link

KM was recognized by the CEO of Xerox as an emerging business trend in the mid-1990s. KM was added to the "Xerox 2005" strategy in 1996 as a new opportunity in emerging markets and technologies. Six key actions have continued this momentum since KM was added to Xerox 2005:

- *Research Formalization* – Xerox formalized research efforts so that KM products and services could be put into effect when market opportunities emerged. Research was initiated on KM tools and architecture at Xerox-Grenoble and on "knowledge ecologies" at the company's Palo Alto Research Center (PARC).
- *Expansion of Internal Grass-Roots Efforts* – Actions were taken to assist and support, but not disrupt, grass-roots KM efforts. Actions included technology support, benchmarking and measurement of results.
- *Building a Foundation for Enterprisewide Collaboration* – Early KM efforts grew from collaboration, so enterprisewide processes and technology were implemented to enable dynamic, self-supporting formation of work communities.
- *Infrastructure Building* – A knowledge network was built to sustain and support KM.
- *Identifying Needs for Enterprise-Class Programs* – Xerox began formal analysis and design of programs with enterprisewide focus and robustness.
- *Recycling Learning* – As concepts are developed and proven in research or internal pilots, they have been adapted for the field and for customers.

In summary, Xerox adopted a dual strategy to encompass internal and external KM. Much of Xerox's internal KM infrastructure, taxonomies and processes resulted from employees discovering better ways of doing things, rather than from top-down management vision and directives. From these grass-roots

beginnings, Xerox has optimized and achieved measurable success with past efforts, learned strong lessons, gained control of the internal direction, and is tackling enterprise-class internal programs with strong planning, research and infrastructure. Its program direction is to aggressively address the integration of business strategy and KM. Xerox appears poised to provide integrated, high-value, enterprisewide KM for employees, as well as a foundation that will supply the same to its customers.

Overall, Xerox's KM challenges (linking grass-roots KM efforts, enterprisewide internal KM programs, and the enterprise's external market opportunities into a single cohesive strategy) are representative of the KM challenges in all large, diversified enterprises.

6.0 Summary of the Five-Year Scenario for KM

The key trends identified in this report are:

- Successful KM programs are integrating three enterprise frameworks to forge a KM discipline:
  - A KM value framework
  - A KM cultural framework
  - A KM process framework
- KM is enterprisewide in scope, yet user-centric in focus. Enterprises must continually analyze enterprise and individual user needs; adjust, acquire and organize knowledge content to meet those needs; and evolve KM to integrate increasing technical sophistication and changing enterprise values.
- Technology support for KM is a critical success factor. Sophisticated technology is evolving but not yet mature. Technology support of the five KM activities varies in maturity and rate of evolution. Low-risk, mature KM systems will not emerge before 2001.
- ESPs are quickly developing KM practices. Their overall KM expertise is still shallow, but the depth and breadth of KM competency are steadily increasing. By 2000, viable and robust KM practices will be in place in the major ESPs.
- Applications emphasizing business value, cultural dynamics and user-centric processes are advancing competitive advantage for their enterprises. KM will increase in importance through 2003 as a contributor to the market value and earning assets of enterprises.

The *Strategic Planning Assumptions* presented in this report are:

- By 2003, Type A enterprises will incorporate accounting practices that formally measure and value their intellectual capital, as well as, their financial and physical assets (0.7 probability).
- By 2001, all managers and knowledge workers will hold jobs where more than 50 percent of their activities are undefined and are dynamically determined by the employee based on the events and knowledge at hand (0.8 probability).
- By 2001, enterprises that lack ongoing KM programs and infrastructure will lag KM-enabled competitors by between 30 percent and 40 percent in speed of deployment for new competitive programs and products (0.8 probability).

- Through 2003, more than two thirds of KM programs that fail to tie their existence to specific business strategy and goals will fail in their first year of existence (0.7 probability).
- Through 2003, enterprises lacking a strong KM cultural foundation, including operationalizing KM, will fail to achieve their KM business objectives (0.7 probability).
- Through 2003, more than 50 percent of the effort in implementing KM programs will be spent on building a culture of sharing and collaboration (0.7 probability).
- An enterprise-level KM program that is not supported by formal incentives aimed at encouraging sharing behavior will fail within two years (0.8 probability).
- Through 2003, KM programs that address and integrate all five fundamental activities of the KM process will achieve significantly higher business benefit than those that exclude one or more of the activities (0.8 probability).
- Through 2003, KM systems that focus on the simultaneous improvement of the whole system, technology tools and human practices, will be measurably more successful than programs that focus on one or the other (0.8 probability).
- By 2003, KM programs will rely on extensive use of external content and more than 50 percent of required content will come from external sources (0.7 probability).
- Through 2003, the extensive use of external content will elevate interoperability among and across physical and technical boundaries to the primary requirement for KM technology solutions (0.7 probability).
- The technology that identifies and delivers mission-critical structured data based on user need and profiles will be available by 2000; however, technology that precisely evaluates and routes unstructured, textual content will not be available until 2003 (0.7 probability).
- By 2000, semantic functionality (resident in information retrieval technology) will converge with collaborative functionality (extensions of groupware) to capture the meaning of and users' evaluations of information value in KM environments (0.8 probability).
- By 2001, technology products that support knowledge mapping will employ visualization to represent the similarity and closeness of meaning among information objects (0.7 probability)
- By 2001, uniform access to information from disparate sources, including documents, databases, and applications, inside and outside the enterprise, will be available through a single, Yahoo-like interface offered by each of the leading KM solution vendors (0.7 probability).
- Low-risk, mature KM systems (covering all KM activities) will not appear in the marketplace before 2001 (0.7 probability).
- Through 2001, programs that incrementally incorporate KM software advances will be more successful than those that depend on revolutionary product releases (0.7 probability).
- By 2001, all consulting and integration firms will have some level of external practice competency in KM (0.8 probability).

- By 2003, more than half of the Fortune 1,000 companies will implement KM, and KM will be a mainstream business management practice among market leaders in all industries (0.7 probability).
- By 2001, more than half of Type A enterprises will have KM programs that fully integrate the people, processes and content of external partners and customers (0.8 probability).

Appendix A: Acronym Key

BP	British Petroleum
E&Y	Ernst & Young
ESP	External services provider
KM	Knowledge management
ROI	Return on investment