1 Process and Product Approaches in Knowledge Management

1.1 Knowledge and Knowledge Management

The twenty-first century marks the beginning of an era in which the traditional pillars of economic power – capital, land, materials and labor – are no longer the main determinants of business success; instead, achievement will be essentially determined by our ability to use knowledge, a precious global resource, wisely. This is due to the constant and overwhelming change in the business environment, from one in which the market assumptions were stable, the business rules were rigid, the command-and-control management model was adequate, competitors and customers were known and the future was almost predictable, to an environment in which the only thing that can be predicted is unpredictability itself.

Most companies of today are primarily run on the basis of insights gained from the successes of the manufacturing-based, capital-intensive industrial economy of the past. These companies have fallen or are rapidly falling out of alignment with the evolutionary direction of the future, as the economy transits from the post-industrial era to what is rapidly becoming a global knowledge economy.

In this knowledge economy most organizations depend for their value and competitiveness on the development, use and distribution of knowledge-based competences. As knowledge increasingly becomes the key strategic resource of the future, the need of organizations to develop a comprehensive understanding of knowledge strategies, processes and tools for the creation, transfer and deployment of this unique asset is becoming critical. The challenge is to seek fundamental insights, to help organizations to nurture, harvest and manage the immense potential of their knowledge; to help them to create new maps and measures and reinvent themselves in order to innovate and excel in the context of the knowledge economy.

The task of developing and applying knowledge management (KM) as a new discipline is a challenging endeavour. This new discipline must respond successfully to the diverse needs of companies in a timely fashion. However, despite a wealth of books, reports and studies, neither researchers nor practitioners have an agreed definition of "knowledge management". The term is used loosely to refer to a broad collection of organizational practices and approaches related to generating, capturing and sharing knowledge that is relevant to the organization's business. There are many different interpretations as to what exactly it means and how best to address the emerging questions about how to use its potential power effectively (see for example Nonaka and Takeuchi, 1995; Davenport and Prusak, 1998; Edvinsson and Malone, 1997; Wiig, 1995). Some would even argue that "knowledge management" is

a contradiction in terms, being a hangover from an industrial era when control modes of thinking were dominant.

Whatever the term and the definition employed to describe it, KM is increasingly seen not merely as the latest management fashion, but as signalling the development of a more organic and holistic way of understanding and exploiting the role of organizational knowledge in the processes of managing and doing work.

But what would "knowledge" be in an organizational setting? Debates and discussions about the definition of knowledge abound. In everyday language, it has long been the practice to distinguish between information, i.e. data arranged in meaningful patterns, and knowledge, i.e. something that is believed, that is true (for pragmatic knowledge, that works) and that is reliable. The interchangeable use of information and knowledge can be confusing if it is not made clear that knowledge is being used in a new and unusual sense, and can seem unscrupulous insofar as the intent is to attach the prestige of knowledge to mere information. It also tends to obscure the fact that while it can be extremely easy and quick to transfer information from one place to another, it is often very difficult and slow to transfer knowledge from one person to another.

In the West, intuitive knowledge has often been devalued in favour of rational scientific knowledge, and the rise of science has even led to claims that intuitive knowledge is not really knowledge at all. However, recognition of the difficulties inherent in transferring knowledge from one person to another has tended to highlight the importance of tacit knowledge, notably in the writings of Polanyi (*The Tacit Dimension*, 1966) and Nonaka and Takeuchi (1995). In the East, the tradition has been to celebrate the importance of the intuitive, in comparison with the rational. The Upanishads, for instance, speak about a higher and a lower knowledge, and associate lower knowledge with the various sciences. Chinese philosophy has emphasized the complementary nature of the intuitive and the rational and has represented them by the archetypal pair yin and yang.

Similar debates about the meaning of knowledge have continued for thousands of years, and seem likely to continue for some time to come. In this book we do not intend to examine the various epistemological definitions of knowledge, nor to analyse the various perspectives taken by philosophers in this field. Our interest is not focused on what knowledge is, rather it is on what knowledge can do. Hence the focus of this book is not on discovery and truth, rather it is on effective business action and organizational performance.

A definition that is suitable for our purposes is the one given by Davenport and Prusak (1998), who define knowledge as "a fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information. It originates and is applied in the minds of knowers. In organisations, it often becomes embedded not only in documents or repositories but also in organisational routines, processes, practices, and norms". This definition highlights two important types of knowledge: explicit knowledge and tacit knowledge (see also Nonaka and Takeuchi, 1995).

Tacit knowledge refers to that knowledge which is embedded in individual experience such as perspective and inferential knowledge. Tacit knowledge includes insights, hunches, intuition and skills that are highly personal and hard to formalize, making them difficult to communicate or share with others. Tacit knowledge is also deeply rooted in an individual's commitment to a specific context as a craft or profession, a particular technology or product market, or the activities of a work

group or team. In other words tacit knowledge is deeply ingrained into the context, i.e. the owner's view and imagination of the world, and into his or her experience, which is previously acquired knowledge.

Explicit knowledge is knowledge that has been articulated in formal language and can be easily transmitted among individuals. It can be expressed in scientific formulae, codified procedures or a variety of other forms. It consists of three components: a language, information and a carrier. The language is used to express and code knowledge. Information is coded externalized knowledge. It is potential knowledge, which is realized when information is combined with context and the experience of humans to form new tacit knowledge. The carrier is capable of incorporating coded knowledge and storing, preserving and transporting knowledge through space and time independent of its human creators.

Both explicit knowledge and tacit knowledge are important for the organization. Both must be recognized as providing value to the organization. It is through the conversion of tacit to explicit knowledge and explicit to tacit knowledge in the organization that creativity and innovation are released and the potential for value creation arises. The goal, then, is to leverage both explicit knowledge and tacit knowledge and to reduce the size of the organizational knowledge gaps.

The business and popular press abound with real-world industrial examples of initiatives that attempt to address these goals. Such initiatives may be classified within three strands. First, some companies, such as Dow Chemical, address innovation in product development initiatives, either by making sure that knowledge is embedded in their products, or by identifying and reusing knowledge. Second, organizations such as Texas and Chevron develop process and operational improvement initiatives that focus on the transfer of best practices by creating best practice databases and organizing best practice sharing events. Third, many companies (e.g. in the telecommunications and the banking sectors) develop customer and market initiatives, in which they mine customer data to make sense of who buys and why, and how to keep clients buying.

KM has moved from an early premature phase, characterized by considerable hype and confusion, to a state of relative maturity, in which the value it brings to business and government organizations is not disputed. The adopters of this new discipline have followed different approaches with varying emphasis on technology, cultural, organizational and managerial issues. Nevertheless, if one looks into the research landscape as well as into the business applications of KM, it is easy to notice that two main perspectives for KM are usually employed (see e.g. Hansen *et al.*, 1999; Kühn and Abecker, 1997; Spek and Spijkevert, 1997). We will call them the "*product*" and the "*process*" approaches.

1.2 The Process and Product Approaches in KM

The "product" approach implies that knowledge is a thing that can be located and manipulated as an independent object. Proponents of this approach claim that it is possible to capture, distribute, measure and manage knowledge. This approach mainly focuses on products and artefacts containing and representing knowledge; usually, this means managing documents, their creation, storage and reuse in computer-based corporate memories. Examples include: best practice databases and lessons-learned archives, case-bases which preserve older business-case experiences,

knowledge taxonomies and formal knowledge structures. This approach is also referred to as "content-centred" or "codification" approach.

Adopting a product-centric approach to KM means treating knowledge as an entity rather separate from the people who create and use it. The typical goal is to take documents with explicit knowledge embedded in them (memos, reports, presentations, articles, etc.) and store them in a repository where they can be easily retrieved. Companies that aim at a continual enhancement of their knowledge base, in the collection of best practices, methods and reusable work products, include General Motors, Glaxo Wellcome and DaimlerChrysler.

The "process" approach puts emphasis on ways to promote, motivate, encourage, nurture or guide the process of knowing, and abolishes the idea of trying to capture and distribute knowledge. This view mainly understands KM as a social communication process, which can be improved by collaboration and cooperation support tools. In this approach, knowledge is closely tied to the person who developed it and is shared mainly through person-to-person contacts. The main purpose of Information and Communication Technology (ICT) in this case is to help people to communicate knowledge, not to store it. ICT tools in this case comprise e-mail, video-conferencing, workflow management systems, systems for the distributed authoring of hypertext documents, group-decision support systems, etc. This approach has also been referred to as the "collaboration" or "personalization" approach.

Firms adopting a "process-centric" approach in their KM initiatives focus on the creation of communities of interest or practice (self-organized groups that "naturally" communicate with one another because they have common work practices, interests or aims), to address knowledge generation and sharing. The emphasis in this case is on providing access to knowledge or facilitating its transfer among individuals. For example, companies such as British Petroleum, Skandia, Buckman Laboratories and Matsushita strive to create corporate environments that nurture knowledge communities, in order to facilitate the exchange of ideas and collaboration across the organization.

The existence of these two approaches in KM can be attributed no less to its different origins. Artificial intelligence (AI) and knowledge engineering, for instance, have historically focused on technologies for codification and organization, in contrast to organizational theory which has always treated knowledge independently for the people that own it. Table 1.1 groups the origins of KM according to the two approaches.

Table 1.2 summarizes the basic characteristics of the two approaches in terms of their strategic, technological and human resource-related directions.

Table 1.1 The origins of KM Based on Sveiby (1997a)

	Knowledge as a product	Knowledge as a process
Organization	Systems theory Computer science Business process re-engineering	Organizational theory Sociology
Individual	Artificial intelligence	Psychology Philosophy Pedagogy

Table 1.2 Characteristics of the process- and product-centric KM approaches

	Product-centric approach	Process-centric approach
Focus	Knowledge is represented as objects. The emphasis is on capturing, organizing and sharing knowledge objects. Utilization of products and systems that contain codified knowledge	Knowledge is associated with the individual that owns it. Knowledge sharing is accomplished through human contacts and relations
Strategy	Exploitation of organized, codified and easily reusable knowledge. Linking of people with systems that capture and disseminate knowledge	Exploitation and empowerment of individual and team knowledge. Development of networks for linking people, promotion and facilitation of discussions so that tacit knowledge can be shared
Human resources	Employment of professionals who are well suited to the reuse of knowledge. Training is facilitated passively (through courses, presentations and computer-based courses). Rewarding focuses on using and contributing to the organization's knowledge base	Employment of highly creative professionals who work in teams. Training is facilitated through on-the-job learning, group brainstorming sessions and one-to-one mentoring. Rewarding focuses on group performance and knowledge sharing between professionals
Information technology	Heavy investment in IT. Tools include document repositories, search and retrieval tools	Moderate investment in IT. Tools include discussions databases, real-time communication and collaboration tools, net conferencing and push technologies

The following sections examine further the particularities of the two approaches in the software tools that support KM efforts, in the consulting methodologies and services usually employed for the implementation of KM projects and in the specific directions of the KM initiatives themselves of early-adopter organizations.

1.3 The Process and Product Approaches in KM Software

KM-related software can be classified according to the type of approach (product or process centric) for which it is most suited for (Figure 1.1). As is evident from the figure, not all software tools can be classified as supporting only one or the other approach; rather they exhibit characteristics and functionalities that may be closer to the process or the product perspective.

Process-centric KM software tools provide rich, shared, virtual workspaces in which interactions occur between people who share a common goal. For example, groupware products provide a basic messaging infrastructure for ad hoc forms of information exchange in the form of e-mail services, and a range of collaborative features, such as discussion groups, shared folders or databases, and calendar and scheduling functions. While groupware products provide an informal environment for collaboration, other products have been used to create more formal collaborative applications. Workflow and document management systems have brought greater control to processes that require many people to work on a set of documents. Workflow, for example, has been used in the insurance industry to control the claims assessment process. In the pharmaceutical industry, document management

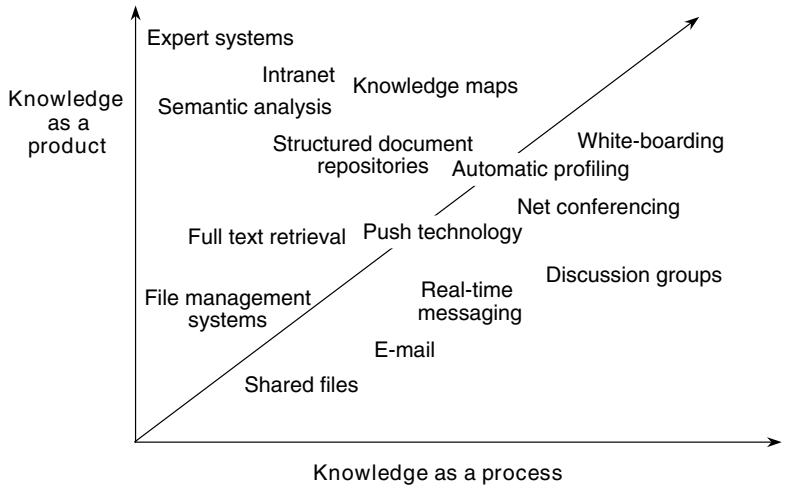

Figure 1.1 Process and product approaches in KM software. (Based on Ovum, 1998.)

applications have brought greater control over the submission of new drugs to regulatory authorities.

For well-defined, structured business applications, workflow and document management vendors have supported coordination between knowledge workers. In weakly structured business processes groupware tools have provided more ad hoc forms of information exchange, mainly through e-mail services. In both cases, collaboration software provides the virtual space, within which participants can share experiences and knowledge. Collaborative environments usually include facilities for both synchronous and asynchronous communication. Synchronous communication tools allow users to set up a conversation, hold conferencing and white-boarding sessions and work together on documents in real-time via an intranet or over the Internet. Concerning asynchronous communication, e-mail is still the dominant tool.

Of significant importance for the "knowledge as a process" approach are also technologies that facilitate the creation of communities of interest and/or practice. Recent improvements in the integration of directory services, based on the take-up of Lightweight Directory Access Protocol (LDAP) and improved automation of expert profiling and discovery, make it easier to find the right person across the network. Expert discovery systems have the goal of suggesting the names of persons who have knowledge in a particular area. Expert discovery systems work either based on user profiles or by automatically associating users with documents based on authorship. User profiling can be maintained manually or automatically. The problem with manual creation of user profiles is that users may not be motivated to keep their profile up to date. Automatic profiling of users is usually supported by creating explicit profiles based on evidence mined from existing databases and inferred from associations of persons and documents.

Software tools that mainly aim to support the "knowledge as a product" approach provide facilities for storing knowledge encapsulating artefacts to multiplatform,

heterogeneous sources, including Internet and intranet sites, file servers, databases and legacy information systems. Within such tools search facilities are essential for finding information relevant for some tasks.

Search has become important in the business environment because the total amount of potentially relevant information, including what is on the Internet and company intranets and what is available from commercial on-line publishers, has grown significantly in the past few years. The keyword searches that are provided by most Internet search engines offer a simple and easy way to access a wide range of documents. The effectiveness of such searches is inherently restricted to a relatively simple statistical analysis of the searched document, based on the occurrence of those key terms. The main problem with keyword searches is that not all documents are using the same words to refer to the same concept. Most information-retrieval vendors offer the capability of assigning metadata to documents. Metadata describe the concepts that the documents refer to in a controlled vocabulary. Metadata therefore allow the transition from keyword searching to concept searching. Thesaurus capabilities enable search terms to be expanded to cover a series of related terms. Expansion of a query with synonyms is known to improve the recall in a text search, but thesaurus-based searching is only effective in well-defined domains where the ambiguity of words, and the validity of term relationships, is not an issue. Improving precision in domain searching by reducing the ambiguity of ordinary words is also facilitated by the use of taxonomies, classification schemata and ontologies. These mechanisms allow for the organization of concepts based on a schema of concepts and relations between concepts. The value of these mechanisms is two-fold. First, it allows a user to navigate to pieces of information of interest without doing a search. Second, these mechanisms allow documents to be put in a context, which helps users to assess their applicability to the task in hand.

Manually assigning documents to the terms of an ontology requires significant effort and cost, but in recent years automatic document classification has helped in this direction. The two major techniques that are used to automate document classification are pattern matching, with tools using mainly AI-based techniques to provide comparisons of documents and grouping of documents, based on the similarity of the concepts used, and semantic analysis, which enables an understanding of the semantic relationships characteristic of a specific language and often of a specific domain, such as the medical or legal domain. These techniques are also used to enable large-scale automatic document classification (often called document clustering or document mining). Clustering can identify prevailing themes within a set of documents and then group the documents in relation to those themes. Automatic clustering does not replace the need for human understanding of the patterns identified, but it does help users to find patterns that may be overlooked within large volumes of information.

Expert systems and other knowledge-based systems that aim to replace human reasoning with AI are typical product-centric KM software tools. Such tools are used in stable, concentrated and well-defined domains. In such environments they can enable the knowledge of one or a few experts to be used by a much broader group of workers who need this knowledge. The user normally engages in a dialogue with the system, entering information about the problem or process in order to train the system so that it can act independently of the human. In this sense, expert systems reflect the product approach because their role is to substitute (partially at least) humans and human knowledge in performing specific tasks. It should

be noted, though, that the current capability of machine intelligence is such that, for the great majority of business applications, human knowledge will continue to be a valuable resource for the foreseeable future (Marwick, 2001).

1.4 The Process and Product Approaches in KM Methods and Services

The global consulting firms were among the first businesses to make heavy investments in the management of knowledge, their core asset, and are primary KM services and methodology providers. In their internal KM initiatives the bias towards the process or the product approach is evident (see e.g. the reviews of Hansen et al., 1999, Apostolou and Mentzas, 1999). In selling KM services to clients, most global consultancy firms are taking a long-term "programme" approach to implementation. In their KM assignments all major consultancies address strategy, people, process and technology issues, all considered as key factors that need to be altered so that they are aligned with the KM principles.

Nevertheless, despite the holistic consideration of KM, individual approaches show to a lesser or greater extent some bias towards the product or process approach (Figure 1.2). Ernst & Young (E & Y), for instance, considers community enablement as a key solution that runs across most of the company's KM implementations (Ovum, 1998). The firm focuses on the creation of communities of interest or communities of practice (self-organized groups that naturally communicate with one another because they have common work practices, interests or aims) to address knowledge generation and sharing. In contrast, although KPMG also claims the use of a holistic approach covering all "seven key knowledge processes" (creation, application, exploitation, sharing, encapsulation, sourcing and learning), its technology implementations are mainly based on knowledge repositories, such as document management systems for storing captured knowledge assets and data warehousing for knowledge discovery and decision support (Ovum, 1998, 1999). Similarly, PricewaterhouseCoopers' solutions, which target KM at key business areas within the organization, are often implemented as part of a wider Enterprise Resource Planning (ERP) or data warehouse project (Ovum, 1999).

In specialist knowledge consultancies, which usually provide expertise on niche areas, the focus on either the process or product view is relatively clear. For instance, Collaborative Strategies and NetForm are firms with expertise and methodologies for facilitating KM through collaboration and informal people-to-people interaction.

Figure 1.2 classifies the consulting methods of major consultancies as well as some knowledge analysis and modelling techniques. All these methods and techniques are described in the following sections. It should be noted that the analysis is based on data available before the recent mergers of consulting firms Cap Gemini and E&Y (which formed Cap Gemini Ernst and Young).

1.4.1 The KM Method of Ernst & Young

The KM practice of E&Y (pre-merger) provides a range of knowledge services and solutions that focus exclusively on strategy, process and change management. It

does not cover system integration or development services, which are usually outsourced to another part of the organization.

As shown in Figure 1.3, E&Y advocated a "pilot-first" approach consisting of three delivery phases: architect, integrate, operate (Ovum, 1999). The "architect" phase aligns the KM strategy and architecture with the organization's business objectives.

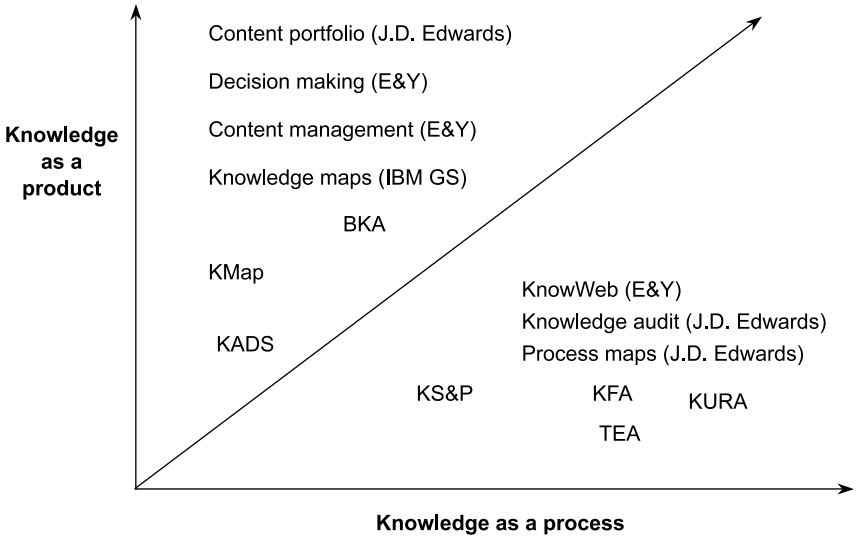

Figure 1.2 The process and product approaches in KM methods.

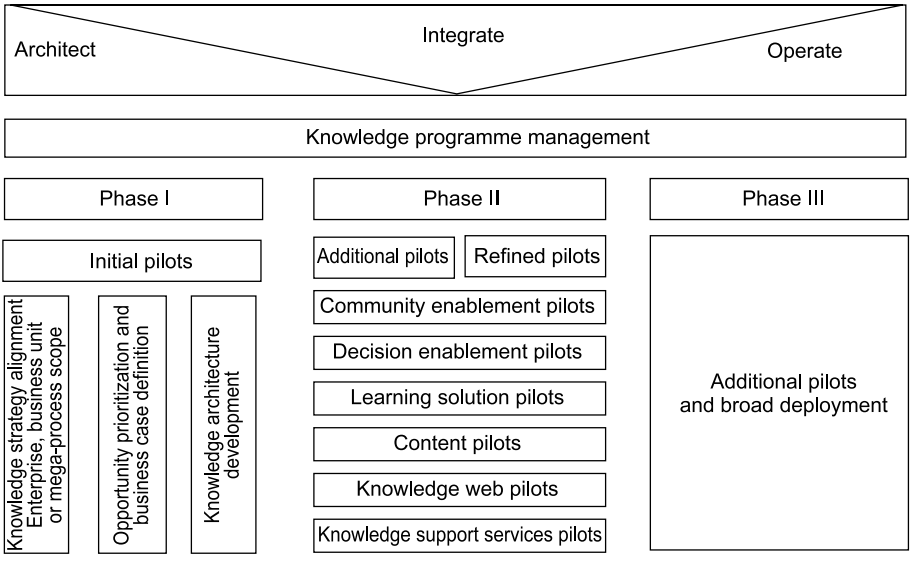

Figure 1.3 The KM method of Ernst & Young.

To a large extent, the services in this phase are aimed towards providing a blueprint for piloting and implementing KM solutions. It reflects making choices about where, when and how each type of available solution must be applied in order to realize the intended benefit.

The "integrate" phase involves piloting specific knowledge-based solutions. Community enablement is a key solution that runs across most of E&Y's knowledge management implementations. It focuses on the creation of communities of interest (COINs) or communities of practice (COPs) to address knowledge generation and sharing. Typically, these types of community are self-organized groups that naturally communicate with one another because they share common work practices, interests or aims. E&Y aimed to formalize the internal dynamics of the community by establishing a regular system of interchange. This includes not only the definition of community roles and responsibilities, but also important issues surrounding content design and management and technology enablement for collaboration. E&Y maintains prepackaged community enablers that can be used quickly to pilot new communities or enhance existing communities. The community enablement pilots are easily replicated to address other business problems in other organizational contexts, or they can be evolved into an enterprise standard for community enablement with links to the broader knowledge infrastructure.

Depending on the scope of the KM project, other distinct knowledge solutions can also be piloted. Examples include: content, which focuses on managing content generated externally (typically, this solution addresses the need to match content with business needs for research, analysis and business intelligence capabilities); decision, which addresses the needs of selected high-level decision-makers and is achieved through a combination of content management and the development of explicit decision models, decision workflow processes and data warehouse integration; and KnowledgeWeb, which provides a user-centric knowledge brokering system.

Finally, the "operate" phase involves wide-scale deployment of the KM system throughout the enterprise, and the development of additional pilot solutions outlined in the integrate phase.

1.4.2 The KM Method of Cap Gemini

The management consulting company Cap Gemini offered knowledge management services based on the Applied Knowledge Management Framework (Figure 1.4) (Cap Gemini, 1999a, b). This framework distinguishes between phases of operation and focused streams of activity.

The phases of operation provide the logical structure upon which the phases of the KM programme may be built. These can be effectively divided into two dominant phases of activity: the initial or "scoping" phase includes the business vision and business readiness phases; the second or "delivery" phase includes the iterative phases of solution design, solution development and solution deployment plus operation and evaluation. In "scoping" the business vision phase helps to identify the scale of the opportunity for a client and create a vision for a knowledge-enabled organization. The business readiness phase helps to establish the ability of an organization to deliver the vision, and determines the effective ambition level for delivery phases to implement elements of the vision. In solution design, the struc-

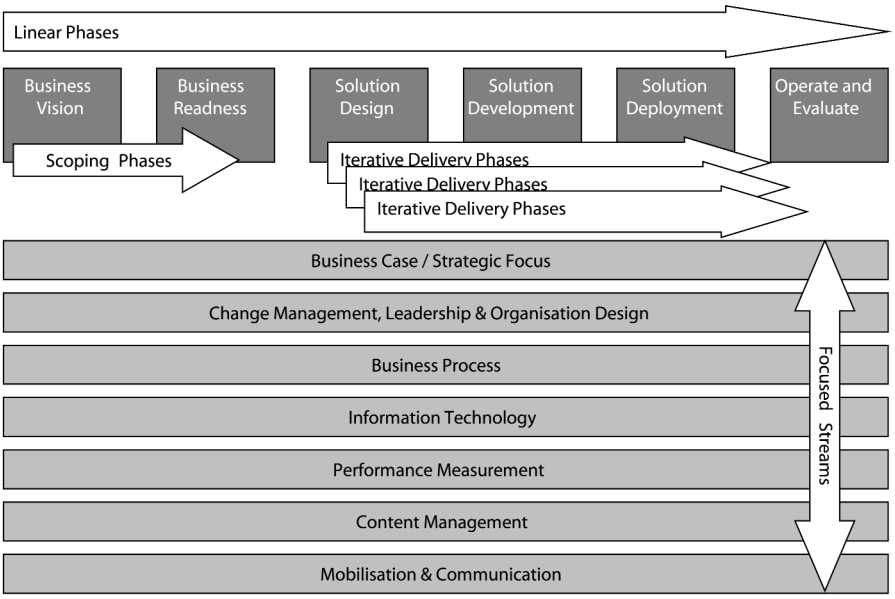

Figure 1.4 The KM method of Cap Gemini.

ture and design of the solution is finalized, building upon the design outlines in the scoping phases. Solution development creates the new functional capabilities laid out in the design phase. Key issues in solution deployment are to ensure that the dependent functional streams deploy their solutions in a logical sequence to ensure that the programme maintains its desired impact. In solutions operation and evaluation the impact of the delivery is measured against the forecast benefits and any insights or new knowledge captured during the programme are evaluated and measured.

The focused activity streams help to define the activities of the KM programme. Each stream exists in every phase of the programme; however, the influence of a stream can be more or less dominant depending on the phase of the programme and the needs of the user. Streams exist to address the key functional elements. In addition, streams convey the means to overcome issues created when dealing with a business programme on this scale. For each intersection of a phase and stream there is a number of activities. Each activity specifies the appropriate action to be taken at this point, together with hints and warnings arising from the experience of KM practitioners.

1.4.3 The KM Method of KPMG

KPMG focuses on optimizing the seven key knowledge processes within an organization: creation, application, exploitation, sharing, encapsulation, sourcing and learning (KPMG, 1999). Its services cover awareness raising, strategy, systems integration and development, business process engineering and change management.

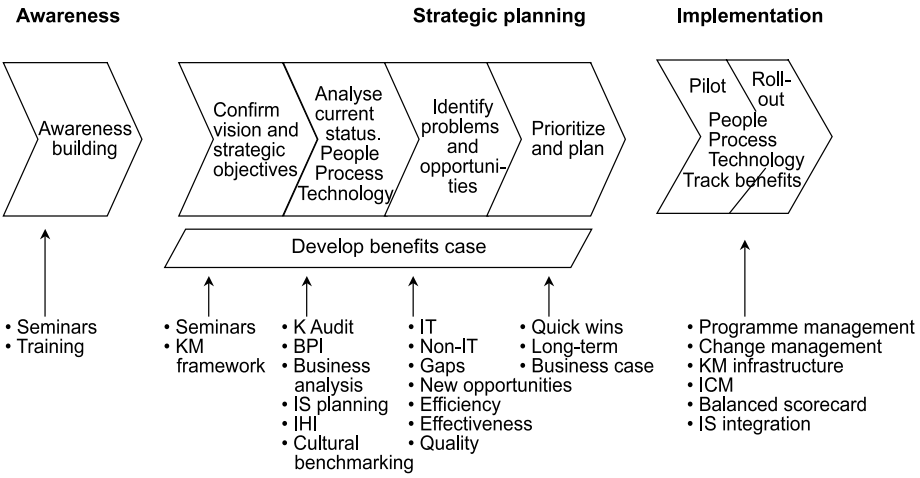

Figure 1.5 The KM method of KPMG.

KPMG regards KM as an ongoing process, consisting of a number of integrated projects, phased over time, rather than a single discrete project. KPMG favours a programme-management approach that involves the three principal service components (Figure 1.5).

During strategic planning the company uses a mixture of standard, in-house and specialist techniques:

- to confirm strategic objectives and the vision for KM using its KM framework tool
- to analyze and benchmark the current status of the organization's KM infrastructure, using knowledge audit and other analysis techniques
- to identify problems and opportunities, and agree on a measurement system for evaluating the effectiveness of, and the business benefits associated with, KM.
- to plan a series of quick win projects and longer term initiatives based on a clear business case.

KPMG's implementation activities cover information technology (IT) implementation and change management. KPMG does not develop its own software products for KM. Rather, its KM solutions are built using tools from Microsoft, with whom the company has a formal alliance, and from several specialist KM tool vendors.

1.4.4 The KM Method of IBM Global Services

The relation of Global Services to the rest of IBM and its position as a relative newcomer in the management consultancy business give it a different perspective to its main competitors. It has no single prescriptive method for KM projects, but it uses several techniques and metrics to help an organization to understand and develop its knowledge assets and intellectual capital (Figure 1.6) (Ovum, 1999).

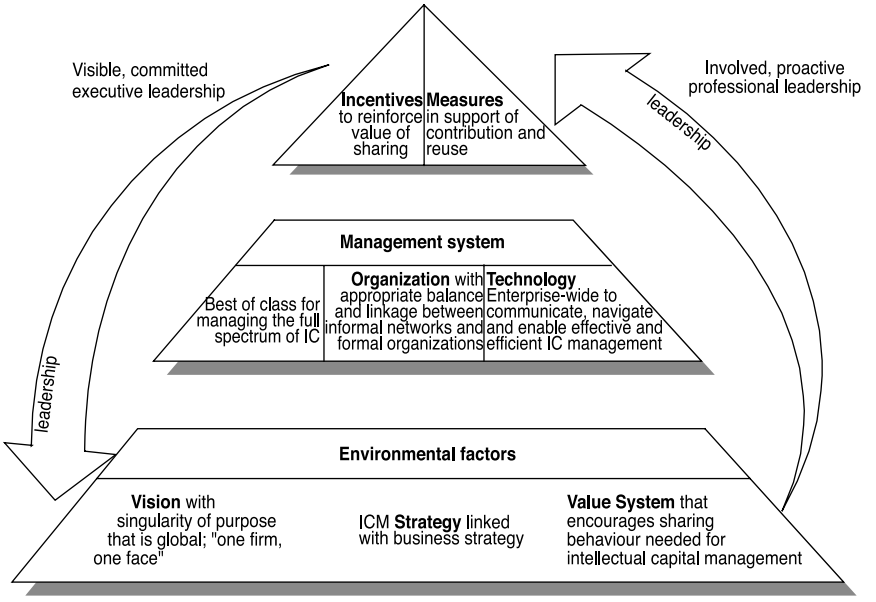

Figure 1.6 The KM method of IBM.

A key concept promoted by IBM is the knowledge map. The principle behind knowledge maps is that a company needs a high-level view of its existing knowledge before it can decide on a programme of business improvement. The overall approach is based on identifying an organization's key tacit and explicit knowledge assets and its current approaches for managing knowledge processes. These approaches are mapped to types of knowledge in order to identify knowledge "gaps". KM solutions, processes and tools are then clearly prioritized with reference to each approach and type. The result is an overall knowledge performance study that serves as the basis for system design. IBM Global Services uses KnowledgeX, a specialized software tool for the automatic creation of knowledge maps from data warehouses and database management systems.

1.4.5 The KM method of JD Edwards

Applehans et al., (1999) developed a KM method based on practical experience gained from the development of Web-based KM systems for J.D. Edwards. Their approach focuses on the design and development of "content centres" as the cornerstone of the knowledge architecture. The method supports the translation of content centres into a networked organization, including navigation strategies and other issues surrounding the deployment of people, content and technology. Concepts and tools used in this approach include the audit, the content portfolio and the knowledge architecture.

The purpose of the audit is to help to break KM down into manageable projects without losing sight of the "big picture". It supports the identification of the success

factors of the organization and the relevant business processes, the important points in these business processes where actions or decisions are taken, the people that act or use content and the content itself.

The content portfolio represents the specific pieces and types of content that the organization must effectively package and deliver to people who can act on them as knowledge. This may include documents, competitive intelligence, product specifications, case studies, etc.

The knowledge architecture represents the organization's formal recognition that it has important experience and expertise that it must preserve and use to its advantage. The knowledge architecture identifies the scope of the investment that will be made in managing knowledge in terms of people, technology and content.

These concepts and tools are used to design an infrastructure that organizes around knowledge by combining content and people. Two additional concepts that are key to this approach are knowledge storyboarding and knowledge networks. The purpose of knowledge storyboarding is to identify the relationships among people, processes and knowledge. It consists of four steps: specification of a business process and related steps within the process, identification of information leveraging points within the business process, identification of organizational roles and people that use information in each step, and identification of detailed content used in each step. An essential objective of this tool is to identify the information needs of users within specific business processes. This is accomplished with user-profiling techniques.

The objective of mapping the knowledge networks is to visualize the organization's knowledge and to assign responsibilities to people who maintain different kinds of content. It consists of three steps: identification of high-level centres of information, identification of content satellites (lower level centres), and staffing and assigning ownership to content.

1.4.6 Other KM Methods and Techniques

There exists a large number of techniques for auditing, surveying, eliciting, analyzing and modelling knowledge. Although these techniques are not stand-alone or complete methodologies they are widely used during KM implementations mainly for field knowledge analysis and modelling purposes. Wiig (1995) provides an extensive overview of such methods. Table 1.3 presents a summary of the most characteristic knowledge analysis and modelling techniques.

1.5 The Process and Product Approaches in KM Projects

Real-life KM projects are usually a combination of objectives and vary in terms of business focus, strategy direction and technological orientation. Most KM initiatives, especially in large organizations, consist of a number of smaller, clear-targeted subprojects. Subprojects typically develop experts' networks, document repositories or lessons-learned databases, or focus on rewarding and compensation schemes for knowledge-sharing and try to create knowledge-sharing cultures among employees.

Davenport and Prusak (1998) categorized KM projects and they consider that companies often pursue more than one type of subproject. For instance, the main

Table 1.3 Knowledge analysis and modeling techniques

Method	Key characteristics
Task Environment Analysis (TEA) (Wiig, 1995)	TEAs consist of in-depth investigations of how knowledge workers perform business tasks and the conditions under which they work. The focus is on knowledge, its presence and use of knowledge, how the task is performed at present, what its inputs are and what its deliverables are. TEA provides the added perspective of knowledge flows and uses
Basic Knowledge Analysis (BKA) (Wiig, 1995)	BKA refers to an analysis and a characterization of the knowledge in the task environment. It focuses on how knowledge is held, and used in decisions and other knowledge-intensive tasks
Knowledge Mapping (Kmap) (Newbern and Dansereau, 1995)	Kmap is used to develop concept maps as hierarchies or networks. Kmap systems are used for identifying relevant information from workers, displaying this information and presenting it for training, communicating, planning, problem-solving or decision-making purposes
Knowledge Use and Requirements Analysis (KURA) (Wiig, 1995)	KURA is performed to explicate knowledge use and proficiency requirements. The focus is on the use of knowledge in problem-solving, decision-making and other knowledge-intensive processes within the target business area
Knowledge Scripting and Profiling (KS&P) (Wiig, 1995)	KS&P is used for the detailed description of knowledge-intensive processes, tasks and scripts
Knowledge Flow Analysis (KFA) (Wiig, 1995)	KFA is used to gain overview of knowledge exchanges, losses, or inputs to the business process or the whole enterprise. It also determines characteristics, strengths and weaknesses of existing and potential knowledge exchanges
CommonKADS (Schreiber, 1999), Knowledge Metaprocess (Staab *et al.*, (2001)	These methods focus on the application-oriented development of ontologies and support all phases from the early stages of setting up a KM project to the final roll-out and maintenance of the ontology-based KM application

focus of a project may be the development of a best practices database, but the project may also address rewarding mechanisms and market knowledge organization. Indeed, careful examination of the types of KM subprojects reveals that they fall in one of the two main approaches: product and process (Figure 1.7).

Davenport and Prusak's categorization of KM projects includes four broad categories: creation of knowledge repositories, improvement of knowledge access, improving the culture and environment for knowledge exchange, and focus on knowledge as a corporate asset.

In KM projects that focus on the creation of knowledge repositories much of the energy has been spent on treating knowledge as a "product", an entity separate from the people who create and use it. The typical goal is to take documents with knowledge embedded in them, such as memos, reports, presentations and articles, and store them in a repository where they can be easily retrieved. Another less structured form of knowledge is the discussion database, in which participants record their own experiences on an issue and react to others' comments. Three common types of repository are for:

- external knowledge, e.g. competitive intelligence. External knowledge repositories range from information delivery "clipping services" that route articles and reports to executives to advanced customer intelligence systems

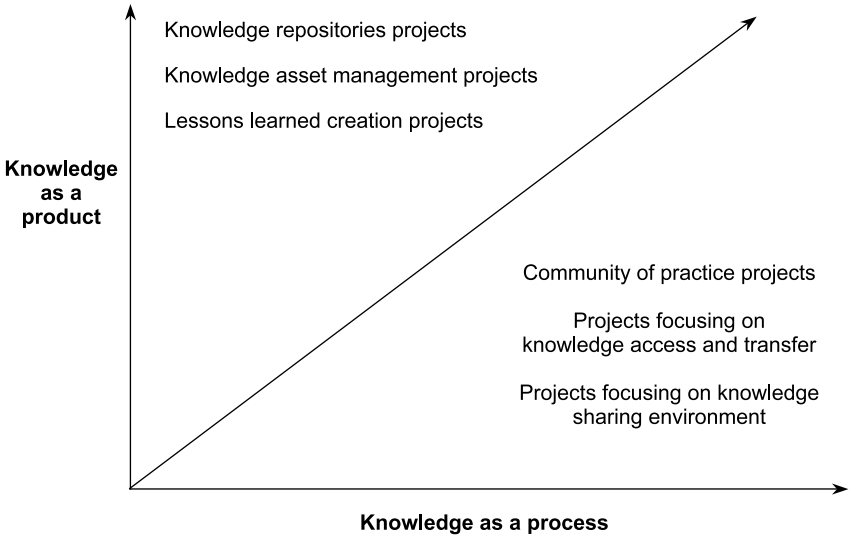

Figure 1.7 The process and product approaches in KM projects.

- structured internal knowledge, e.g. research reports, product-oriented marketing materials, and techniques and methods
- informal internal knowledge, e.g. discussion databases full of know-how, sometimes referred to as "lessons learned". This is softer, more experiential knowledge that must be interpreted and adapted by the user in a new context.

The second type of project focuses on providing access to knowledge or facilitating its transfer among individuals. Whereas knowledge repositories aim at capturing knowledge itself, knowledge access projects focus on the possessors and prospective users of knowledge. These projects recognize that finding the person with the knowledge one needs, and then successfully transferring it from one person to another, are difficult processes. If the metaphor of a library is useful for conceptualizing knowledge repository projects, then the Yellow Pages represents the purpose of knowledge access projects. The underlying strategy here is to facilitate connections between those people who possess and those who need knowledge. Technological implementations on these types of project focus primarily on databases of internal and external experts, who vary from company employees to outside consultants and collaborators.

The third type of KM project involves attempts to establish an environment conducive to more effective knowledge creation, transfer and use. In this category some projects intend to build awareness and cultural receptivity to knowledge, to change behaviour relating to knowledge and to improve the KM process. A large consulting firm was making significant inroads towards changing employee perceptions of their jobs, from deliverers of consulting services to creators and distributors of management knowledge. One way they did this was by making significant changes to the performance appraisal system so that contributions to the firm's structured knowledge base became a significant factor in compensation decisions.

The fourth type of project focuses on managing knowledge as a corporate asset. One way this is being done is by treating knowledge like any other asset on the organization's balance sheet. This approach focuses the organization's attention on how it is increasing or decreasing its effective use of knowledge assets over time.

1.6 The Need to Integrate the Two Approaches

The previous sections of this chapter have clearly shown that KM efforts may fall under one of two approaches: the product-centric and the process-centric approaches to KM. These two approaches are distinct in the sense that they imply different strategic focus, the use of different software tools, and so on.

The question that arises then is: which companies should adopt one or the other approach, and when? The choice of the overall approach to be followed by a KM initiative should be neither arbitrary nor ad hoc; it depends on the company characteristics, the ways in which the company delivers its products and services, its financial characteristics and its organizational culture.

A solution proposed in the literature is to relate the choice of the most appropriate approach to the vital characteristics of a company's product or service (Table 1.4). (Hansen et al., 1999).

The product-centric approach is more likely to be followed by those companies with a business strategy based on standardized and mature products. The processes for developing and selling such products involve well-understood and well-organised tasks, and the product knowledge is relatively rigid and thus more easily codified. In such cases, developing a strategy around the "knowledge as a product" approach seems more suitable.

The process-centric approach is more likely to be followed by those companies with a value proposition based on developing highly customized and/or extremely innovative products or services that meet unique customer needs. Because these needs vary dramatically, codified knowledge is of limited value. In those cases, adopting a "knowledge as a process" approach, which mainly supports the sharing of knowledge, expertise and judgement, seems more appropriate.

Such a roadmap may be useful for some extreme cases, but seems to be of limited value in supporting the decisions of companies that operate within the constantly challenging e-business world in which there is a clear need for delivering product–service hybrids with distinct characteristics: their lifetime is linked to the life of the customer need; their major cost element is the cost of design; their main revenue model is subscription and user fees; and their marketing objective is building communities of satisfied clients.

Hence the challenge faced by modern firms is to exploit effectively the intangibles that add value to these "offerings": technical know-how, design of the offering, marketing and presentation, understanding of the customer need, etc., so that they can

Table 1.4 Relation of the KM approach to product characteristics

	Standardization of product or service	Maturity of product or service
Knowledge as a "product"	Standardized	Mature
Knowledge as a "process"	Customized	Innovative

integrate knowledge in their offerings and create new value by designing and developing new offerings.

These challenges call for the integration of the "knowledge as a process" approach (which will facilitate the leveraging of tacit, intangible knowledge) with the "knowledge as a product" approach (which will enable the consistent management of explicit knowledge, e.g. best practices). So there is a real need for a balanced fusion of the two KM views. Such a fusion should clearly focus on the knowledge assets of the company, link strategic and operational issues in a consistent manner, and enable the key knowledge of the firm to be averaged at the individual, team and organizational levels.

The next chapter outlines the conceptual framework of the Know-Net KM solution, which aims explicitly to provide for such a fusion.