European Commission

IBM

IBM

IBM Business Consulting Services

IBM

Business Knowledge Management: A study on market prospects, business needs and technological trends

deeper

Final report

European Commission

Information Society

Introduction

This document summarises the results of the study on market prospects, business needs and technological trends for business Knowledge Management (KM). This study was awarded following an invitation to tender by the European Commission DG Information Society in December 2002. A team of five people led by Jonathan Sage of IBM Business Consulting Services, Belgium commenced the study in January 2003. The core team carrying out the study consisted of a European university with particular expertise in how Knowledge Management relates to small enterprises (University of Central England, Birmingham, UK), a small enterprise with expertise in Knowledge Management technologies and services (Korora Ltd, UK) and one of the leading European research centres in new approaches to Knowledge Management, the IBM Cynefin Centre. The team worked in close collaboration with the e-business Unit in the European Commission. The people who carried out the research and are primary authors of this report are Peter Stanbridge from Korora Ltd, Dr Rod Shelton from University of Central England, Jonathan Sage from IBM Business Consulting Services, Brussels and Dave Snowden from the IBM Cynefin Centre. Maxime Prévot from IBM Business Consulting Services was the Project Manager and Peter Fatelnig from the e-business Unit was the main contact person in the European Commission. In the finalisation of the study, Elmar Husman, who is currently on research leave with the European Institute of Technology Management[1] played an important role. Other people from each of these organisations have supported the study.

Many other people from different backgrounds and geographies have contributed to this study over the past nine months. We gratefully acknowledge the important part that these people have played in agreeing to be interviewed, providing input and comments to our working papers and answering the electronic survey. We are particularly grateful to the core team of Knowledge Management experts who agreed to be interviewed in-depth in the first phase of the study and the Knowledge Management practitioners within IBM who provided us with valuable input.

All contributors are listed at the end of this publication.

The main objective of the study was to provide the elements required to define a strategy for the development and promotion of Knowledge Management in Europe for the period 2003-2010, notably in the context of the upcoming 6th Framework Programme and related EU policies. In fact, the study commenced when the Work programme of FP6 had already been finalised so it was agreed that findings should provide input into the current FP6 programme in terms of potential research areas.

---

1   EITM is a joint initiative of technology- and innovation-management institutes from leading European universities - www-eitm.eng.cam.ac.uk

Key goals of the study

The key objectives of the study from the Terms of Reference[2] as follows:

Strategic Assessment of Organisational Knowledge Management in Europe.

The study investigates both the demand side and the technology product and service supply side of organisational Knowledge Management. One of the key questions posed was what is the potential for Europe to become a world leader in Organisational Knowledge Management, based on the Lisbon Objectives for Europe to become the most dynamic knowledge economy in the world by 2010.

Building on both empirical and quantitative data, the study identifies the current situation in Knowledge Management (Section 3). Following this, there is a section on the market trends in Knowledge Management products and services. Then, scenarios for Knowledge Management for 2010 are identified, closely linked with the potential for Europe to become a world leader in Knowledge Management (Section 4).

Following this an assessment is made of the European Commission 'Knowledge Management Made in Europe' initiative and associated projects that were funded in FP5 with Knowledge Management as a key characteristic (Section 5).

Finally we provide recommendations for specific initiatives relating to standards, how small and medium sized enterprises can benefit, what dissemination activities are relevant and how business communities can be created and supported and suggestions for specific projects (Section 6).

2   See Appendix 2 for reference.

Context of the study

The wider strategic context for this study is the Lisbon Summit's objective for Europe to become the most competitive and dynamic knowledge-based economy in the world by 2010. This study has therefore to identify on a very practical and actionable level how Europe can achieve this goal, namely:

- *To what extent do the current Knowledge Management Made in Europe (KMME) concept and the associated FP5 research projects support the building of a knowledge-based society in Europe? The KMME initiative, which is described in more detail in the Technical Description referenced at Appendix 2 and investigated in Section 5 of this report, was created in FP5 to encompass Knowledge Management projects under a common brand.*
- *What are the leading trends, key to transforming society into a knowledge-based economy?*
- *What impact will these have on business, society and the individual?*
- *What will this mean for the way we work, for collaborative models, for leadership, organisational forms, business models and value propositions?*
- *Within such a turbulent context, what are the appropriate Knowledge Management strategies for organisations to adopt in Europe?*

The overall intention is to provide useful guidelines to all stakeholders, as well as SMEs, as to how they might align their organisations culturally and socially to take advantage of the opportunities of knowledge sharing within and beyond their organisational boundaries.

Preliminary notes

A particularly intriguing characteristic of KM is that it has not faded as a serious management concern despite its shortcomings as a discipline in failing to provide organisations with all it has promised. It is our view that recent turbulence in politics as well as the global economy, combined with the uncertainty in global stock markets, has already started to erode many of the traditional views of organisational and strategic management.

This is especially true of the design metaphor which has dominated 'traditional' management thinking over the last decades. In equal measure, the degree of predictability which has been inherent in KM thinking, reflecting the general management belief in linearity is now being seriously questioned. The basis for this thinking is rooted in research done by the Sante Fee Institute in the area of complexity. In Europe, research has been conducted into how complexity relates to Knowledge Management, by initiatives led in Catalonia, Spain under Max Boisot, and the IBM Cynefin Centre in Cardiff, Wales led by David Snowden. Other interesting initiatives are underway at the e-business Management School-iSUFI University of Lecce in Italy, the SINTEF research programme in Oslo, Norway and the Finnish Futures Research programme in Helsinki, Finland. Several IST projects which were focused on Knowledge

Management have also explored this subject matter to a limited degree. For example, the IST RODEO project and IST DISRUPT IT project[3] are good illustrations. These programmes and projects demonstrate strong European-specific trends in management which have a significant impact on Knowledge Management and how a European school is evolving.

The ideas and trends inherent in this thinking have discouraged us from the 'traditional survey based approaches' which could have been used to carry out this study. Our anxiety, in fact shared by the European Commission in the study kick-off meeting, was that this would result in a compendium on Knowledge Management approaches and technologies, many of which are already available. Several other IST projects, notably VISION have carried out comprehensive traditional surveys on this topic and indeed there has been a major recent survey and other studies conducted by IBM, which have been available to the project. Hence the investment in this study would have been partly wasted.

Also, had we used traditional research methods, our results would have been less future oriented, less distinctive and more moderate. They may have demonstrated some benefits gained from current Knowledge Management practice, but they would not have demonstrated a motivation for the real achievements we believe are possible for European organisations, and necessary for radical competitive improvements, over the next decade.

We were less concerned to describe (and thereby entrain) current practice, especially given the history of partial failure in KM practice; instead we have focused in creating a map of the landscape and future possibilities in which Europe could build on current work (both funded under KMME and from other sources) in order to provide a road map which would allow Europe to differentiate itself for the US and provide a focus for emerging needs elsewhere in the world.

What we provide here is a combination of qualitative insights and substantiated views relating to user needs and the availability of technologies and services in Knowledge Management. We have avoided what we see as the pitfall of either providing comprehensive lists of Knowledge Management related technologies or client supported best practices approaches (typically from consultancy sector). A major report from the Institute of Knowledge-based Organisations (IKO) on Knowledge Management technology applications has been made available to the European Commission during the course of the study. This and other studies are listed at the study Web site (www.km2010.org).

---

3   Further information on these projects is provided in our overview of KM projects within the KMME initiative at Appendix 3.

At the outset of the study there was much debate and discussion within the team and with experts about firstly how we go about summarising the current state of Knowledge Management, secondly how we depict scenarios for 2010 and thirdly how we assess the Knowledge Management Made in Europe initiative. We describe our methodology in more detail in Section 2.

It seemed very important to us that we consider not only current technologies and business needs but also epistemological theory and current academic research. As J.C. Spender points out in his preface to Max Boisot's seminal work, Knowledge Assets, 'if there is to be a knowledge-based theory of the firm, it is highly likely that it will be based on the work of academics rather than only on the insights which practice provides'. We believe that the synthesis of academic research with practice has provided us with a view 'beyond the horizon', which was necessary to depict scenarios which are so distant in the future in information society terms. When we consider what advances the last ten years has seen in terms of information society technologies, which were unimaginable in the mid to late eighties, the challenge in forecasting nearly 10 years from now is daunting.

We have therefore not shied away from stimulating and controversial views. Our study is neither a survey of Knowledge Management and related best practices, nor is it a purely academic research paper, since it integrates academic research, expert views and positions from industry. Nor is it purely a result of the considerable consulting expertise that resided within the core team. It contains elements of each of these and represents an attempt to combine research and academic input with industrial practices and needs as well as technological trends. It also provides recommendations to the European Commission on how the KMME initiative can be taken forward.

In our extensive collaboration with experts from varying backgrounds, academics and business professionals, the wide divergence in views was obvious. On the one hand, practicing KM professionals were very surprised by the concepts and approaches in the straw man documents which we used for wide consultation and declared that there was only marginal relevance with what their day job entailed. On the other hand, academic researchers accused us of being too close to practice and thus vulnerable to academic scrutiny.
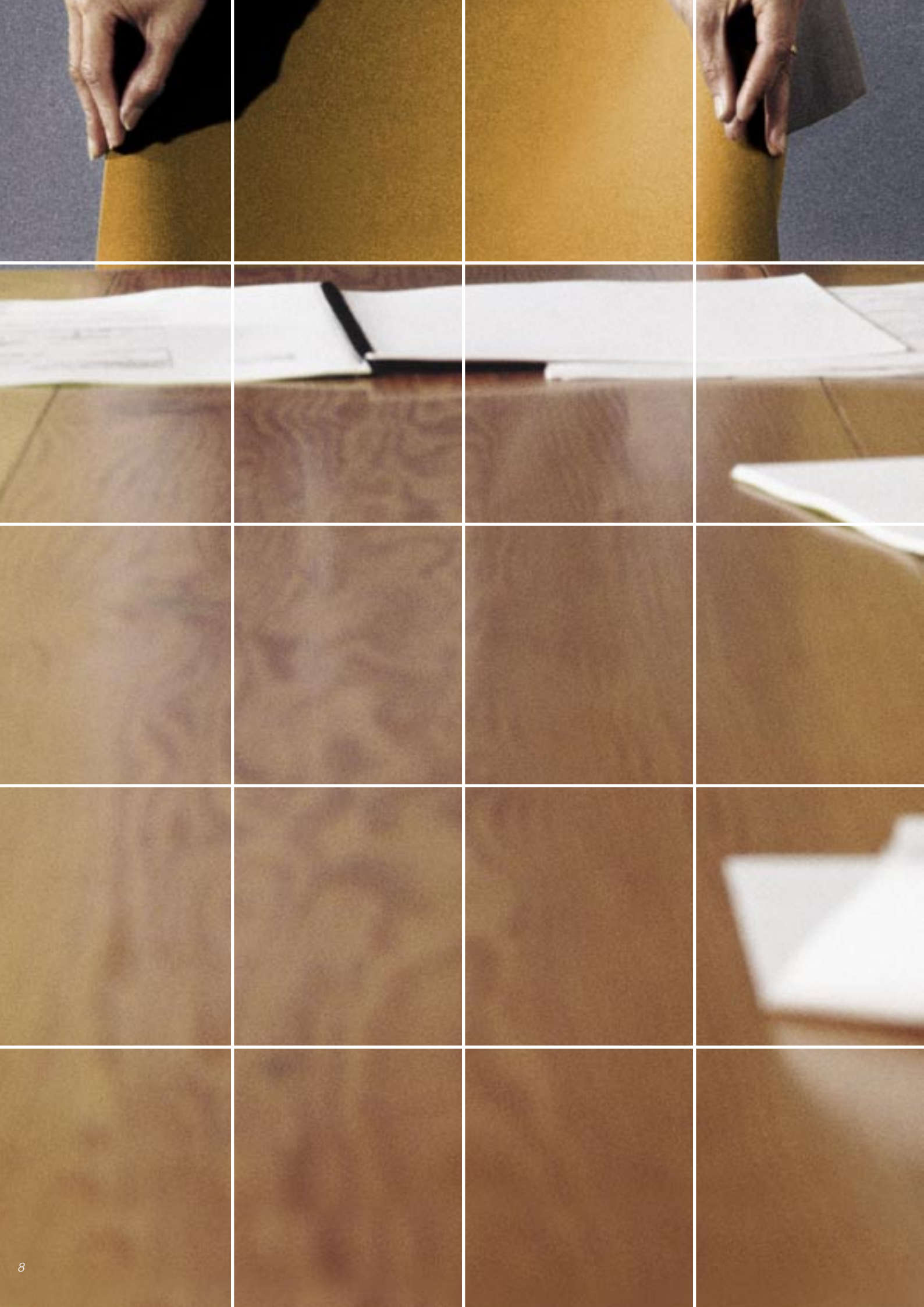
Executive summary

The study describes different perspectives on Knowledge Management, which form the result of the primary and secondary research we conducted in completing the study. In answer to the key question of where Knowledge Management is heading, our overall conclusion is that Knowledge Management is a subject which is still highly relevant to innovation in the twenty-first century business enterprise. In addition, Knowledge Management is an important underlying discipline to how a modern business operates.

However the term Knowledge Management covers a very broad school, which ranges from university research in philosophy, sociology, psychology and technology to business consulting and its associated methodologies and industry practice. In fact the subject is so broad that at its extremes it is difficult to reconcile views.

Knowledge Management in its early phases (mid-90's) attracted much attention as the panacea to many well-known business issues associated with the change in transitioning from old economy models/manufacturing to new economy models based on knowledge. A classical management approach was applied in many early Knowledge Management initiatives with heavy reliance on the Internet and associated technologies. Though in its very early phases, the critics of over-reliance on a linear approach and technology were present, these views were largely overlooked or drowned in the noise of the dot.com hype. In the last four years, more holistic views have emerged which take account of how humans behave in relation to what they know and how the power of knowledge can be effectively harnessed through a combination of social and humanist approaches and advanced technology.

Taking a European perspective, there has been an encouraging level of primary research and some technology development in Europe. However there is little doubt that Europe has failed to productise and exploit its research in this key area. The vast majority of Knowledge Management related technologies (hardware and software) as well as Knowledge Management related consulting have been developed tested and taken to market in the US. There is little surprise in the fact that often such products and services are less successful in the multilingual, multicultural European market than in the US and typically fail to succeed in a European environment.

However, the picture is not as black and white as the above statement might suggest. Though US based vendors and service providers dominate the global market, many of these have European research and development arms.

If you have a primary interest in the research and the academic approach to Knowledge Management, we suggest you fast track to Section 3 'Current state of Knowledge Management, business needs and technological trends' on page 21.

For a summary of Knowledge Management technologies and services from a market perspective, fast track to Section 4 'European competitiveness in Knowledge Management' on page 63; to Section 5 'An overview of the Knowledge Management Technology Market' on page 71; to Section 6 'Emerging Knowledge Management Technology Market Trends' on page 75 and, finally, to Section 9 'Product Vendors that enable KM' on page 91.

For the key section on where we think the future for Knowledge Management lies and a description of the conceptual model we developed, fast track to Section 10 - 2010 scenarios for Knowledge Management (page 95), and to Section 11 - Mapping approaches and technologies to the KM 2010 Model (page 109).

To read the results of the questionnaires we conducted, go to Section 12 - KM2010 questionnaire results (page 115), and to Section 13 - The Knowledge Management cluster in Framework programme 5 (KMME initiative) (page 145).

Our recommendations and conclusions are summarised in Section 14 (page 167).

Selecting an appropriate methodology for the KMME study

In preparing the study and selecting an appropriate methodology, we carried out an exploration of a range of existing programmes that attempt to predict the future in terms of the way in which society and the economy might be anticipated to change over a given period, in the light of new technologies and anticipated new socio-economic and demographic movements.

These programmes included the UK Foresight programme, set up in 1993 to develop a vision for the future across traditional subject divides; 2010 and 2020 US-based initiatives to identify how technology will change the way we do business in the future; Vision 2020 (Malaysia); Go West (China); RSA Futures (a UK and Europe-based initiative reviewing human resource management trends for the future) and the Finnish Futures Research programme.

The UK Foresight programme typifies those programmes developed by governments worldwide to respond to the pace of change and develop a vision of the future to aid policy-making. Most use the same process of an expert panel developing a set of issues to be tackled or questions to be raised which forms part of a larger consultation process leading to final reports and the setting up of taskforces to focus on the issues raised.

Key example - The Foresight programme

The Foresight programme was launched in 1993 after the publication of Realising our Potential, a white paper on science, engineering and technology. Representatives of business, government, the science base and other community members come together to identify the threats and opportunities that we are likely to face over the next 10 to 20 years. By doing this, Foresight aims to bring about a culture change in the way business and the science base relate to each other and to the future. It has a panel-based structure and operates on a five-year cycle. Foresight aims to provide challenging visions of the future, to ensure effective strategies now. It does this by providing a core of skills in science-based futures projects and unequalled access to leaders in government, business and science. Projects must tackle issues that require looking ahead at least 10 years, in areas where the outcomes are uncertain. This typically occurs where the future direction of change is rapid, current trends are uncertain or different trends may converge. They also:

- *Are not covered by work carried out elsewhere. However, they must build from areas of active research*
- *Have science and technology as the main drivers of change or are capable of impacting substantially on future scenarios*
- *Have outcomes that can be influenced, to an extent that is significant for one or more of the economy, society and the environment*
- *Require an inter-disciplinary approach to science, and bring together groups from academia, business and government*
- *Must not be capable of resolution by a single group*
- *Command the support of the groups most likely to be able to influence the future and be owned by a lead government department.*

The new round of Foresight began in April 1999. Three thematic and ten sectoral panels each looked at the future for a particular area. All panels have been asked to consider the implications of their findings for education, skills and training and sustainable development. Thematic panels take the focus ageing population, crime prevention and manufacturing 2020 while sectoral panels explore built environment and transport, chemicals, defence, aerospace and systems, energy and natural environment, financial services, food chain and crops for industry, healthcare, information, communications and media, materials, retail and consumer services.

The process - Example Foresight ageing population

The panel was asked to look at the social and economic impact of this change and to assess its implications for business, work and leisure, looking at the entire population, not just older people. The brief also included other drivers of change, which will operate over the next 20-30 years in parallel with the changing demography. The result was a consultation document including an overview plus key points. Views were solicited, via Web-based questionnaires and via community participation, during this consultation period leading up to a final report in which future recommendations were proposed.

Other routes to predicting the future

Those predicting economic future scenarios take an alternative approach. Here a more quantitative approach is adopted to analyse trends in key numerical indicators. Forecasts are obtained using these indicators with particular models built to map previous predominance. Linear models offer a simple picture of how the economy might develop or how a business might grow. Using short-term interest rates as the leading indicator, output might be predicted with declines in output in four of the six quarters with actual decline over the decade clearly identified. Here interest rates play a greater role for recessions than for expansions, with the impact of rate changes on output taking about a year to be felt. This result places additional significance on the decisions made by the Bank of England's Monetary Policy Committee (Osborn, 2001).

'Scenario planning is a discipline for rediscovering the original entrepreneurial power of creative foresight in contexts of accelerated change, greater complexity, and genuine uncertainty.'

Models may be conventional linear mappings but these have been criticised as performing well on average simply because the economy is generally expanding, but given the asymmetric nature of the business cycle, linear models cannot capture or predict accurately. Hence Osborn suggests a model whose structure changes as the economy moves from expansion to recession (and vice versa). This recognises that the economy has moved from one regime to another. However, doing so after the event is only the beginning. Forecasting when such a switch may occur in the future may be more important.

A leading indicator which contains information about future movements of output - that is, when it is time to switch - seems to be a key requirement of this model working effectively.

Given the nature of Knowledge Management the research approach suggested follows the wider programmes such as Foresight rather than the narrow focus offered by linear model formulation. Here it is suggested that the steps might adopt the same stages. For example:

1. *Engagement with a panel of experts to raise questions and explore possible issues*
2. *Involvement with groups of key stakeholder groups to develop the issues and explore the questions raised*
3. *Evolution of reports and other outputs to extend consultation, identify recommendations and explore further possibilities.*

The innovation proposed to this methodology is to use scenario building early in the process rather than rely on discussion and questioning. Similarly, rather than a reliance on questionnaires or on Web-based methods of consultation, it was decided to offer different approaches to consultation and virtual and non-virtual routes for views and visions to be included.

Stakeholder engagement

In the initial phase of the project, an elite group of leading Knowledge Management experts were engaged from academic, profit and not-for-profit organisations. The criteria for selecting this group of experts were that they were visionary thinkers and involved not only as Knowledge Management practitioners, but also in research.

A further group of stakeholders from academia and business organisations was involved in the second phase. Finally in the e-survey we were able to launch a survey to the public at large.

Consultation of a sample of
people represantative of the
wider business population
(large stakeholder audience)

Discussion with some key
stakeholders

Consultation of a panel of
well-known KM experts

Scenario

Scenario

Audience

Time
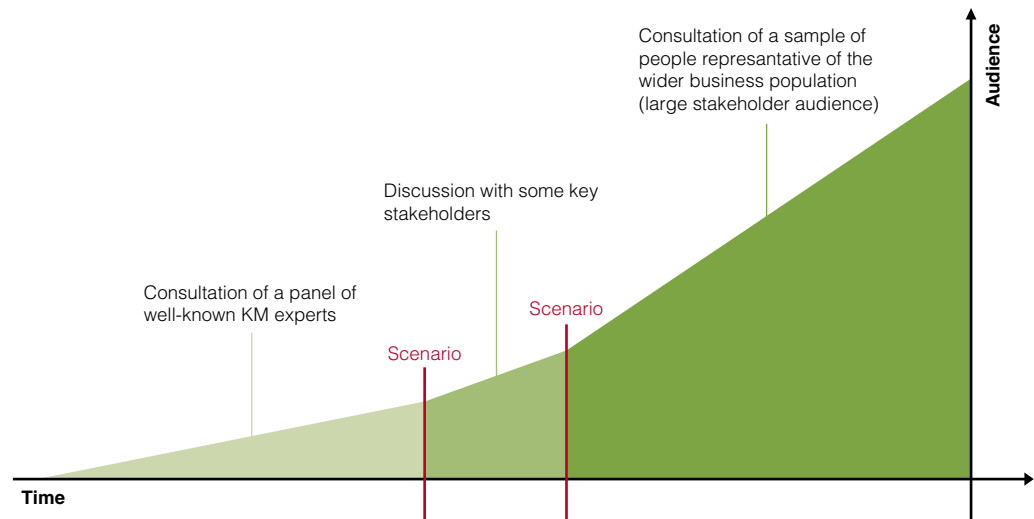
Process for completing the study

Our study was divided into three phases:

- *The first (January - July 2003) was the most critical in terms of analysis and research. In this phase, the exploration phase, we carried out desk research (analysing different academic and business sources, research papers and other leading publications on Knowledge Management). We also identified and interviewed leading thinkers in KM worldwide. The purpose of this was to review our findings and analysis with a network of KM experts and define the scenarios that emerged from all the analysis and discussions.*

- *The second (July- September 2003) survey phase involved launching our e-survey to a large stakeholder audience in order to obtain wide value-added feedback on the scenarios we had constructed. This phase was important in order to test the validity of our scenarios and to catch the various opinions and expectations from both the demand and supply sides.*

- *The third (September - October 2003), reporting phase was related to the presentation of our final conclusions and recommendations and the dissemination of our results.*

A comprehensive list of tasks and actions which were defined in our project management and were carried out in order to complete the study are provided in Appendix 3.

Knowledge Management: The current state of business needs and technological trends

Method

In this section, we outline the current situation in Knowledge Management in terms of business needs, conceptual approaches and related technologies - providing a brief account of development in the area of Knowledge Management. Through the team's collective experience and consultation with experts, we recognised early on in the survey that there is a high degree of diversity in all three of these categories. We believe that this very diversity is an important factor; in accepting this diversity, we were motivated in our hypotheses regarding future opportunities for organisational competitiveness in Europe.

Having mentioned these methodological points, our primary source for diagnosis of the current situation has been secondary research from:

- *Key Knowledge Management publications*
- *Knowledge Management papers, journals and white papers*
- *Knowledge Management vendor, academics, community and commercial Web sites*
- *Reviews from Knowledge Management academics and Knowledge Management practitioners and general business management.*

Findings

Background

Knowledge Management is a vast subject that has spawned three generations of thinking, engendered competing schools of thought, a myriad of commercial products, underlying technologies, research programmes, consulting practices and businesses.

But with all this recent history and diversity of research there is room for considerable doubt about whether either most European organisations involved in Knowledge Management, or the European Commission's 'Knowledge Management initiative in the Fifth Framework programme' (the Knowledge Management Made in Europe (KMME) initiative have really fulfilled expectations. And the under-performance of many KM initiatives is surprising when we consider that there have been significant advances in technological applications and infrastructures which - arguably - should support KM and make it more powerful and effective.

Europe cannot afford to fall behind in the knowledge economy. In view of the fact that other global regions are catching up and becoming very agile, there are genuine concerns that Europe, and organisations within Europe, may witness a rapidly weakening competitive position long before 2010 unless key steps are taken now to ensure that new ways of working based on the imperatives of the knowledge economy are brought into mainstream public and corporate life. The reasons for this are not at first sight clear, since Europe has made great progress in recent years: trade is flowing freely within the European Union; enlargement of the Union itself has taken place in 2004 nearly doubling membership, barriers are falling, monopolies are ending, industries are consolidating, public sectors are reforming, communication and technical infrastructure are consolidating and interest/inflation rates are low and have been falling. All this is being driven on by some key enablers, including the euro, harmonisation of financial reporting/accounting standards, Stock Exchange consolidation and crucially, through key EU initiatives like the Bologna Declaration, the Socrates-Erasmus programme, and the European Research Area, a freer cross-border movement of know-how and research.

Europe also has a very strong consumer base: before accession, 380 million people, now with accession, 500 million, protected by a powerful, inclusive social model. European countries are also top of the Human Development Index. This is coupled with a very strong consumer base: we had 19 million businesses before 2004 enlargement, exceptional R&D and applied high-tech innovation, as well as the world's highest levels of Foreign Direct Investment (FDI).

Europe is already witnessing a weakening competitive position. The relative fragility of the German economy, long regarded as the motor for European growth, is just one indication of this. The trend towards global resourcing, or off-shoring, to more competitive regions outside Europe such as India and China, not only for hardware, but increasingly for software development and services, is another sign. Action needs to be taken long before 2010 to ensure the proper flow of knowledge to wherever it is needed, whenever it is needed.

The imperative for Europe to become the most dynamic knowledge economy by the year 2010 (the Lisbon objective) is the main driver for this study. If Europe is to become the most dynamic Knowledge economy, how can the discipline of Knowledge Management contribute?

The study implies two key dimensions in considering European competitiveness in terms of Knowledge Management:

1. *To what extent are European players competitive as technology suppliers and service providers in KM in the global market?*
2. *To what extent are European organisations adopting and implementing KM strategies that make them more competitive in the global market?*

Why Knowledge Management? And, why now?
According to Gartner Group, "the ability of an enterprise to capture and share knowledge and its ability to reuse, re-invent and innovate using that knowledge will become a key determinant and predictor of value". Knowledge Management is quickly becoming a key link in the chain of organisational success. For those who understand the true practice of Knowledge Management and have seen some its benefits on desired business outcomes, we know that the practice of Knowledge Management is not just hype.

We believe that Knowledge Management is critical in the economy because it forms a basis for innovation and underpins effective decision making within modern organisations. A number of the factors supporting this are now considered:

There is almost universal agreement about the types of factors that have led to the current interest in Knowledge Management, intellectual capital and organisational learning. As a summary, we list:

1. *The globalised nature of business*
2. *Transformation from a product to service-based economy*
3. *Increased complexity involved in developing and deploying products and services*
4. *Changing demographics, leading to concerns about knowledge loss.*

In his book, Shifts in the World's Economy, Robert Grant provided a summary from the Knowledge Management literature of these factors[4]:

1. *The new primary factor of production in the new economy is knowledge, as opposed to that of labour, machinery and monetary capital in the industrial economy.*
2. *The concentration of intangibles over tangibles. Service, not goods, is the predominant value driver. Primary assets are therefore intangibles, such as technology, brands over land, buildings and machinery.*
3. *It is networked. Current communications technologies enable vast networks of people and machines, enhanced by the digitisation of data. This vastly expands the possibilities of coordinated action and collaboration within and outside the organisation, region, country and industry.*
4. *It is digital. Digitisation of data brings enormous possibilities and capacity for the transfer, storage and processing of information.*
5. *It is virtual. The growing role of virtual money, transactions and communities is dissolving the boundaries between the real and the imaginary.*
6. *It is fast moving. The economy is subject to rapid change. This is primarily the result of the rapid pace of innovation and also the impact of new communications technology. We have seen this in the huge reduction in product lifecycles.*

In summary, the following trends are recognised. These involve structural changes within the business sector such as:

1. *Dissolving boundaries between firms and markets through e-business*
2. *The growing role of collaborative organisational forms and the increasing realisation that small and medium sized enterprises (SMEs) are key to innovation and economic growth*
3. *The tendency for disintermediation*
4. *The growth in globalisation resulting from trade liberalisation and multinational organisations and the advent of the knowledge economy (knowledge has no boundaries)*
5. *A blurring of the produce/consumer distinction by such things as configurable products and interactive media.*

We find similar accounts in other literature on Knowledge Management (Choo and Bontis[5], Blackler[6] , Drucker[7], Boisot[8], Grant[9], Krogh and Grand[10], Garud and Kumaraswamy[11], Barabba, Pourdehnad and Ackoff[12], Karl Sveiby[13], Krishan Kumar[14] and Borghoff and Rareschi[15] who state in their introduction that knowledge is becoming increasingly relevant for organisation because of the, 'shift from an industrial economy based on assembly lines and hierarchical control to a global, decentralised, information-driven economy'. The current organisational climate is described as a 'global village' where decision making is participatory and decentralised and we are described as entering an age of 'Knowledge-Work'.

4   Grant, Robert. "Shifts in the World Economy: The Drivers of Knowledge Management" in Charles Despres and Daniele Chauvel (eds.) "Knowledge Horizons, The Present and the Promise of Knowledge Management" 2,000 page 27
5   Chun Wei Choo and Nick Bontis (eds) "The Strategic Management of Intellectual Capital and Organisational Knowledge", OUP, 2002
6   "Knowledge, Knowledge Work and Organisations" in Choo and Bontis, page 50,51
7   Drucker, P. "Post-Capitalist Society", 1993
8   Max Boisot, "The Creation and Sharing of Knowledge" in Choo and Bontis, page 66.
9   Robert. M. Grant, "The Knowledge-Based View of the Firm, in Choo and Bontis, page 134.
10   Georg von Krogh and Simon Grand, "From Economic Theory toward a Knowledge-Based Theory of the Firm, in Choo and Bontis, page 163
11   Raghu Garud and Arun Kumaraswamy, "Technological and Organisational Designs for Realising Economies of Substitution", in Choo and Bontis, page 233.
12   Vincent P. Barabba, John Pourdehnad and Ruseel L. Ackoff, "Above and Beyond Knowledge Management" in Choo and Bontis, page 359. This paper presents a strong scientific management perspective on KM.

However, not all writers agree on some or all of these explanations, and even Grant[16] has issued challenges. But our main apprehension is that we notice an endorsement within certain strands of Knowledge Management for an 'economics of knowledge packaging'[17] which is an extension of Taylorism and scientific management. It is far removed from a democratisation and personalisation of work power. It is instead a centralisation and standardisation of ever higher levels of management and knowledge-intensive work. This view is collaborated by Kumar[18], who, quoting various writers, has shown that much service work is as 'Taylorised' as work in manufacturing industries and that the information society is essentially the further application of Taylorism.

In terms of Europe, the implications of this are clear. Apart from the potentially negative impact on the European citizen and the further disempowerment of European SMEs, there is a real danger that Knowledge Management, which is supposed to create a more agile and innovative (and hence competitive) Europe, will in fact trigger the opposite. The European Commission's own synopsis of the new knowledge-based world written in the project Terms of Reference,[19] is in danger of backfiring as a result of an approach to KM that amounts to large corporate militancy. This will also leave SMEs in a subservient relationship with powerful corporate players dominating supply chain productivity to breaking point.[20]

A large proportion of European businesses are SMEs. SMEs in Europe are faced with competing in the new global markets but they are not traditionally geared toward a global perspective. While SMEs in Europe have a long tradition of understanding multiculturalism, they have not traditionally been required to work competitively or collaboratively on a global scale.[21] Knowledge Management, and the implications of intellectual capital, must work for SMEs in Europe. The SME market cannot be excluded from the Knowledge Management programme, but neither should they be enforced into adopting KM approaches that have been designed for the large corporate. Later in the study, in the scenarios for 2010 section, we explain why Knowledge Management is currently geared to the larger enterprise.

"... We can demonstrate that more-successful firms generally have a firmer understanding of Knowledge Management. They grasp that it requires a holistic approach that goes beyond changes in infrastructure and touches every aspect of a business, transcending divisions, functions, and hierarchies. In many companies, the need for active Knowledge Management is accepted, but all too often in practice this boils down to a belief that waving a sophisticated and expensive information technology wand is all that is needed for good Knowledge Management."

'Knowledge Unplugged, The McKinsey & Company global survey on Knowledge Management', Palgrave, 2001, page 5.

13   Karl Erik Sceiby, "The New Organisational Wealth: Managing and Measuring Knowledge-Based Assets", Berrett Koehler, 1997.
14   Krishan Kumar, "From Post-Industrial to Post-Modern Society: New Theories of the Contemporary World", Blackwell, 1995
15   Uwe M. Borghoff, Remo Preschi (eds) Information Technology for Knowledge Management, Springer, 1998
16   "Shifts in the World Economy", Page 31.
17   A term we have coined and illustrated, for example, in the way many consulting companies train and use graduates within their workforce.
18   Kumar Page 19
19   "Terms of Reference, Study on Market Prospects, Business Needs and Technological Trends for Business Knowledge Management" 2002, Page 5.
       "Organisations that are not able to create an environment where new ideas can flourish and in which creative solutions are co-created will lose key
       staff and key markets and may ultimately disappear"
20   This is often claimed by SME suppliers to UK supermarkets.
21   There are important exceptions to this, such as SMEs working in the automotive industry, although they frequently still rely on a single major customer.

A very brief history of Knowledge Management

Knowledge Management is a quite recent concern. It has evolved from its original conception in the mid-90s to what is often considered today to be its second or third generation. In this study, we are more concerned with various perspectives adopted toward the subject, although we provide a brief overview of how some writers have described the subject's development.

We begin with a consideration of the project terms of reference:

The first generation is described as 'information portals'[22], a period dominated by explicit representation of information necessary to support back and front office integration. The second generation focuses more on knowledge processes and innovation spaces designed to transition organisations into knowledge-based communities. Assessment, measurement and benchmarking become characteristics of the second generation. The third generation described by the terms of reference is more difficult to grasp and assess. Firstly, there is a move toward organisation-wide capacities to co-create abilities across an enterprise or network. Secondly, there is an emphasis on people as information holders and therefore people networks as a source knowledge generation and exchange. Thirdly, there is the derived focus out of information and knowledge towards innovation and collaboration across boundaries. Finally, the commission is concerned to build critical mass of third generation Knowledge Management across European organisations[23].

Dave Snowden[24] expounds a similar picture. In the first age, as Snowden terms it, Knowledge Management was dominated by information for decision support. This age is pre-1995 and therefore predates the term Knowledge Management and, while in substance very similar to the Commission's first generation, Snowden provides useful background to the emergence of Knowledge Management in the reactions to the 'rape and pillage' of business process re-engineering. In the second age, beginning in 1995, Knowledge Management is made popular by Nonaka and Takeuchi's SECI model with, "its focus on the movement of knowledge between tacit and explicit states through the four processes of socialisation, externalisation, combination and internalisation". But this model quickly degenerated into a programme of engineered practices for generating and cycling knowledge throughout the organisation. Snowden challenges this engineering dominated approach with his third age[25] Knowledge Management. Snowden's third age is a more detailed working out of the Commission's third generation. It recognises that Knowledge Management cannot be dominated by engineering or systems thinking and must be radically re-thought if European-wide organisational competitiveness through a critical mass of knowledge-enabled organisations is to become reality.

---

22   Terms of Reference, page 5.
23   The Commission have an obvious direct concern with how the IST programme can contribute to the third generation critical mass.
24   Complex Acts of Knowing: Paradox and Descriptive Self-awareness, Special Edition, Journal of Knowledge Management, Vol 6, No. 2, May 2002.
25   Not his term

Similar views to age one and two (first and second generation) are found throughout the literature, but not all commentators agree[26] and some see the future quite differently to us[27]. We respond directly to the challenges raised by the European Commission's third generation Knowledge Management, but a full account of this aspect of Knowledge Management future is left to our recommendations section. But in any case, we know that Knowledge Management must move toward a radically different position to that suggested by the maturing KM hype cycle produced by Gartner and shown the diagram below. Best practices, programmed methodologies and document management cannot even begin to make an impact on European organisational competitiveness.

Key: Time to plateau
- Less than two years
- Two to five years
- Five to 10 years
- More than 10 years

Real-time collaboration

Expertise location and management — Taxonomy

Records management
Competitive intelligence

Smart enterprise suites
Personal knowledge management
Semantic Web
Virtual community

Information retrieval/search

Packaged methodologies

Web content management

Virtual teams

Team collaboration support

Information extraction
Idea management
Information quality

Best-practices programs

Document management

E-learning

Automated text categorisation

Corporate blogging
Personal Knowledge networks

Visibility

Maturity

Technology trigger | Peak of inflated expectations | Trough of disillusionment | Slope of enlightenment | Plateau of productivity

Source: Gartner Research

26 For a different view see Firestone and McElory "Generations of Knowledge Management"
27 As an example, see the Gartner diagram below

Perspectives within Knowledge Management

In this section, we examine various perspectives underpinning Knowledge Management reflected in consulting practice, research, technology, certification programmes and standards.

One obvious place to start with Knowledge Management is to apply the techniques, principles and approaches already well established in management science, including business process re-engineering, scientific management and information theory. The knowledge problem is not knowing what we know. We feel that if we could only capture our knowledge in better processes, smarter databases and workflow management systems, information portals and best practice databases we would posses all the knowledge we need when we need it - no more, no less. We appreciate that life is not that simple, because human beings do not always happily fit such a perspective. We therefore have to design our human interfaces carefully, adopt good training programmes, incentivise and punish appropriately and continually fine-tune the system to take account of changing circumstances and internal and external interference. In order to model reality in a realistic way, the engineering approaches introduce stochastic elements into their models. Probability is required in modelling the complex world, although the underlying conception of the world in which the probabilistic approaches are applied is still conceived as knowable and would be in a deterministic way if we had perfect access to all the underlying primitive elements in the model. The engineering approach is, therefore, a bottom-up design over a globally conceived end goal.

The engineering perspective in Knowledge Management is in full accord with the shift from the industrial to the information age and while it pays specific recognition to the special nature of knowledge/information as an abstract and non-physical asset, it shares with its industrial predecessors an emphasis on design, control, pre-determined and knowable futures and engineered approaches to work practice design. While very well established in the traditional areas of work practice, this approach is gaining momentum in the knowledge sciences as well.

As examples, we can cite the current interest in information/knowledge portals and knowledge repositories. When knowledge is captured in systems and then embedded into work processes, the knowledge of the individual diminishes while the structural capital (as it is called) embodied in the system become paramount. Organisations can, therefore, streamline knowledge processes in the same manner as shop-floor processes have been streamlined since Taylor and Ford. It is also evident in Nonaka's Spiral of Knowledge[28], with its implied processes of implicit/explicit knowledge conversion and goal of ever increasing knowledge perfection. Knowledge in such a rationalistic dialectic will weaken and muddle to a state of entropy.[29]

Our concerns with this approach is that it pays lip service to the truly creative in human beings, their working in social and cultural environments and their potential to be truly innovative and introduce true novelty into any organisation. Spontaneous innovation is impossible in the engineering approach because the end goal, the method of its achievement and the assignment of resources for any achievement is built into the system at the beginning (financial budgeting being one of the most insidious examples)[30]. We believe that novel innovation is an intrinsic aspect of human social life and a necessary condition for European organisations to become globally competitive over the next decade.

The engineering approach centres on design (future determined in advance and history controlled and managed to effect its achievement) and algorithms (modelled process designs, cause and effect, discrete possibilities, control and flow). Another perspective we discuss shares with the engineering perspective an adherence to algorithms (in a more literal way) but not its focus on design. We label this the mathematical perspective. This common dimension of algorithm enables the engineering adherents to borrow many results from the mathematical approach. These can be found in the use of the mathematical theory of information (and communication), search engine technologies, taxonomies and knowledge representation and interchange languages.

---

28   "A Dynamic Theory of Organisational Knowledge Creation", Ikujiro Nanaka, in "The Strategic Management of Intellectual capital and Organisational Knowledge", Chun Wei Choo, Nick Bontis (Eds), Oxford University Press, 2002.
29   Dave Snowden, in a conversation, has likened this problem to that of machine translation. Using a machine translation program, translate an original sentence in one language into another language, then from the second back into first and continue for a while noticing the derogation of quality until the original sentence becomes completely meaningless. The message (I believe) is not to dispense with machine translation or any focus on transferring tacit skills, but to recognise that an endless path of perfection based on a systematic and repeated programme of transfer is a mirage. Most often, the transfer is a one-off (single translation - experience with a mentor) or based around an apprenticeship model, where theoretical knowledge is supported by on-job experience with skilled workers.
30   Another example given by Dave Snowden in conversation.

But the most striking individual application of the mathematical perspective to knowledge management is the belief that knowledge can be represented, encoded and therefore stored, transferred, re-contextualised, visualised and in its elementary components, manipulated via computer implementations of first order logic. One often finds in the mathematical approach an emphasis on computability and computational efficiency. Pure logic is insufficient to determine the best representation of any given knowledge since amongst formally equivalent expressions some will be more computationally efficient than others[31].

But while the mathematical perspective is tied to algorithms, various applications of mathematical principles in Knowledge Management can escape the idea of representation. This is particularly so in the use of mathematics in a neural networks approach to Artificial Intelligence. Knowledge Management has taken up the neural network approach in what was initially called Parallel Distributed Processing but may now be subsumed in complexity theory. Some early writers in information theory and Knowledge Management saw the power of complexity theory in dealing with the interactions involved between actors in large organisations[32]. More recent research is being published in the Routledge series, Complexity and Emergence in Organisations,[33] and by Dave Snowden and his colleagues at the IBM Cynefin Centre for Organisational Complexity[34]. But detail of this approach is left to our recommendations section of this report. The key point here is that complexity theory is able to draw results from the mathematical approach without commitment to a representational perspective on knowledge.

Outside the complexity approach, we see the mathematical approaches to Knowledge Management in various knowledge repository products, the search engines used to access their contents, XML representations of their content[35] and ontology-based content classification systems (where current research is active in ontology representation, taxonomy representation, ontology learning (providing automated ways to classify content in large knowledge bases and the Web) all of which forms the foundations for the Semantic Web[36].

31   See, for example, Robert. C. Moore, "The Role of Logic in Artificial Intelligence", in Moore's "Logic and Representation", CSLI Lecture Notes, CSLI Publications, 1995, page 9,10.
32   See, for example, "Information Space: A framework for learning in organisations" Max Boisot, Routledge 1995 and "Knowledge Assets: Securing Competitive Advantage in the Information Economy", Oxford University Press 1998
33   With titles such as "Complexity and management: FAD or radical challenge to systems thinking" "Complex Responsive Processes in Organisations: Learning and knowledge creation" and "The Emergence of Leadership: Linking self-organisation and ethics".
34   See "The New Dynamics of Strategy: sense-making in a complex-complicated world", Cynthia F Kurtz and David J Snowden, IBM Systems Journal, Fall 2003.
35   For example, a document rendered in XBRL (Extensible Business Reporting Language)

Our main concern with the mathematical approach is its emphasis on representational knowledge. Real revolution in organisational innovation leading to global competitiveness has little chance under the overly rationalistic approach centred on classification and representation typical of the mathematical approach.

It is not surprising to find strong recoil from the engineering and mathematical perspectives by those more sensitive to the contribution of social, cultural and human aspects of knowledge. We call this perspective the strategic and human resources perspective, or the social perspective. This more social approach proposes that the uniquely human, non-mechanistic nature of people in organisations should be the focus of KM efforts, rather than an afterthought. This perspective values creativity and inspiration rather than data recall.

The social approach does not accept the engineering or mathematical approaches. Though the social approach does not recognise natural sciences and neo-classical economics as the appropriate foundation for Knowledge Management, there is a corresponding scientific base from sociology, social psychology, political sciences and history. The following trends are discernable:

- *There is a growing interest in management sciences to integrate the perspectives of social sciences. This is a movement that is mainly carried by the top business schools. It also has rapidly extended the toolbox of research methods such as linguistic methods, long-term ethnological studies of organisational behaviour and deep qualitative analysis. This in a domain which was formerly determined by quantitative statistics and often simplifying case studies in a best practice sense.*

- *The different epistemological approaches are: natural sciences are marked by positivist (nature can be understood by clear rules) or post-positivist paradigms (nature is determined by clear rules but will never fully be understood due to its complexity and emergence). Social sciences are mostly either post-positivist (mainstream management sciences, best practices thinking), constructivist (our perception of reality is constructed through social processes and interaction, social reality has to be understood by its mechanisms) or critical (postmodernism).*

"KM concerns how you identify a crucial but under-used strategic asset present within all organisations (ie: knowledge) and exploit it to maximise competitive advantage. This book takes a building blocks approach to KM. The authors present a straightforward framework of knowledge-related management processes and analyse each component separately, thus providing a practical and structured tool for assessing the entire range of knowledge-related activities in an organisation. The methodology and focus they develop should help readers identify and make sense of the complexities surrounding KM, and begin to chart a path forward"

From synopsis of 'Managing Knowledge: Building Blocks for Success', by Probst and Romhardt, John Wiley and Sons, 2000.

36   See "Toward The Semantic Web: Ontology-Driven Knowledge Management", John Davies, Dieter Fensel, Frank Van Harmelen (Eds) Wiley, 2003. "Visualizing the Semantic Web: XML-based Internet and Information Visualization", Vladimir Geroimenko, Chaomei Chen (Eds), Springer, 2003, "The Semantics of Relationships: An Interdisciplinary Perspective", Rebecca Green, Carol A. Bean, Sung Hyon Myaeng (Eds) Kluwer Academic Publishers, 2003, "Ontology Learning for the Semantic Web", Alexander maedche", Kluwer Academic Publishers, 2002, "Relationships in the Organisation of Knowledge", Carol. A. Bean, Rebecca Green (Eds), Kluwer Academic Publishers, 2001. "Ontology-Based Query Processing for Global Information Systems", Eduardo Mena, Arintza Illarramendi, Kluwer Academic Publishers, 2001. "Knowledge Representation" John F. Sowa, Brooks/Cole, 2000.

- *The role of the human in social sciences is not seen uniformly by all theories (the structure/ agency discussion is fundamental to social sciences). One side argues for an extreme dependence on structure (organisations are mainly determined by the environment, by rules, institutions and social norms). Others argue for human agency (entrepreneurship). Creativity and inspiration are only valued by the latter. Both positions are converging in more recent approaches (innovation management, intra-organisational-ecology, dynamic capabilities school).*

- *The design approach of the social perspective is equally positivist as the engineering school. It assumes that social systems can be designed (see the discussion on corporate cultures or the naive visions of innovative organisations, intellectual capital). This makes them not difficult to apply in practice - rather they are based on simplified practices (from groupworking to knowledge champions) - however, the results of these implementations were mostly disappointing and ambiguous. This is linked - as we argue later - to a guru perspective on management and to an omni-potent view of the top manager (leader) in changing the social behaviour of the organisation. Focus of KM top management action in this approach is therefore: design of a KM culture, creation of (core) competences, transferring of best-practices from KM leaders. New age and new economy are essentially derived positions of this approach that mix neo-classic liberalism with a technocratic view of the world - both in the technical and social dimension. They are more ideology than theory.*

- *Postmodernism is the critical counterpart to this view - but also an ideology. It is essentially a way of de-constructing the arguments of the new age school and showing their ideological content. However, postmodernism is deeply relativistic (every view of reality is regarded as ideological) and carries a strong anti-technological component. It is also rather pessimistic about human behaviour and any notion of socio-economic progress.*

- *The emerging approach of the social perspective is less ideological and relativistic as it recognises the importance of patterns in the development of social systems but also their inpredictability. Many draw either on biological mechanisms (ecology, evolution) or mathematical mechanisms (chaos theory). Other stress social mechanisms (search for legitimacy, mimetic pressures). However, there is also recognition of the importance of human agency in shaping directions and being innovative. Furthermore, an important role of organisations becomes to experiment, learn and adapt. This leads to the emergence of strategy. But contrary to the top-down design approach, this autonomous strategy is less anchored in strong leadership but rather grows from bottom-up actions and middle management engagement. This view challenges the previous role understanding of top management. Competences take time to evolve, knowledge can not be designed. First of all, organisational knowledge and generating mechanisms are specific to an organisation and have to be understood in order to become influenced. Influencing is to some extend possible by induced strategies and reward mechanisms, but has to draw on the previous behaviour of the organisation. This is also linked to the individual coding of knowledge in organisations (especially tacit knowledge). The possibility to transfer KM best practices is therefore highly reduced. KM becomes more individual but can also mean a more profound and sustained way to competitive advantages.*
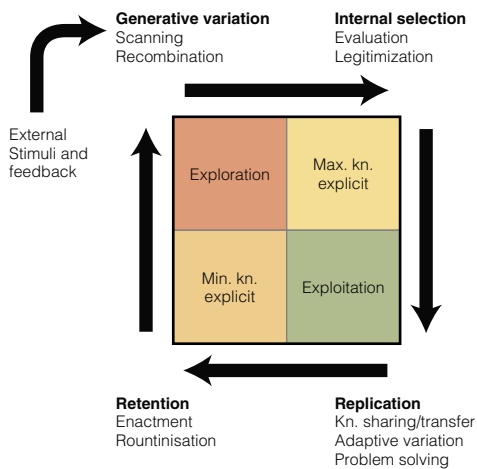
Example of a social approach: Knowledge evolution cycle
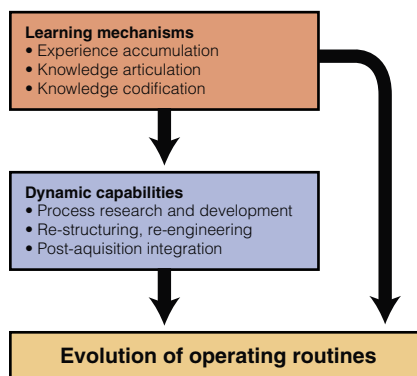
Example of a social approach:
From knowledge to operational routines and attachment

From: Maurizio Zollo, Sidney G. Winter - "Deliberate learning and the evolution of dynamic capabilities:, Organization Science, May-June 2002, Vol. 13, No. 2

KM Technology - in this sense it is used but has to be re-configured and individually composed. Implementation of KM is equally seen as a learning and trial process.

There is a strong human element in the social perspective approach, which values creativity and inspiration. Humans are part of the system, which is a social system to the core, which accounts for the strong emphasis on individual leadership and matrix-based organisational structures.

At the extreme end of this approach is an advocacy of a new age beyond that of intellectual capital. They call it social capital and this will be the future currency in organisational growth and wealth.

Current examples of this type of emphasis can be found in much current work on storytelling and mentoring, Nonaka's concept of Ba, discourse theory, learning, communities of practice, ethics and trust.

One concern we have with the current emphasis on the social approach is that in its cruder formulations, it throws the baby out with the bath water[37]. The importance of information and our abilities to store and access new forms of expression on computer systems is not in doubt. The role of information technology as an important driver and artefact in modern life should not be denied[38]. Advances in mathematical aspects of Knowledge Management will have an important role in future advances.

There is further evidence that technology has itself a transformatory influence on social behaviour, such as patterns of communication, idea generation and collaboration. In this sense, KM technologies should not simply be regarded as a tool to make organisational learning more efficient but can also change the way in which this learning happens. Whereas the engineering perspective tends to be technology deterministic and to disregard the importance of social mechanisms, the social perspective tends in return to downplay the influence of technology in shaping social mechanisms.

---

37 An English expression referring to the problem of radical switches between polar concepts where the good or insightful in the opposite side
  is thrown away with the rejection of that side and the acceptance of its opposite.
38 See the introduction to "Towards the Semantic Web": Ontology-Driven Knowledge Management", John Davies, Dieter Fensel, Frank Van Harmelen
  (Eds), Wiley, 2003.

But our biggest concern with the social approach is that it still has a strong emphasis on design. The end state is conceived as knowable and the system is designed and planned to its achievement, only this time, without the dominance of engineering approaches. This makes this approach difficult to apply in practice, because it has an emphasis on producing an envisioned end state but without the disciplined resources available to the engineers. The social perspective also alerts us to the rational, non-rational, and irrational in human behaviour. That is, following the theoretical insights of numerous psychoanalysts after Freud, and Jung and Goleman's summary of research on emotional intelligence, we have become aware that human behaviour is frequently unpredictable because ultimately it is affected by our unconscious mind. We can often make up a rationalised explanation for behaviour that really stems from wellsprings of motivation outside our conscious control. This means that both the ends and means of a social organisation may be subverted by responses to needs, such as order and control, power and subordination, formality and rules, that tend to distort healthy human interaction.

A further analysis, phenomenal complexity theory, (Letiche, 2000, Boje, 2000) in a sense bridges the complexity and social schools. Letiche challenges the realism, rationalism and reductionism of logical positivism with the inclusion of the postmodern relativism. Social systems are seen to be in constant change; knowing parts does not enable us to predict the direction of a complex system; phenomenal complexity is rich in inductive sense-based knowledge processes; and there is a plurality of valid cognitive and experiential modes of knowing rather than a unity. Boje shows how Disney Corporation "is flirting not only with phenomenal complexity, but chaos by walking the razor's edge between courting traditional family entertainment values and reaping the income niches in global capitalism special interest groups find problematic." (Boje, 2000 p.559)

The bipolar position between the engineers and the social perspectives has introduced a number of much discussed dichotomies in Knowledge Management. Intrinsic to these two perspectives is an approach based on analytical philosophy that requires a choice for one side of the dichotomies. These should be familiar to most, and are presented in the following table.

Natural-science perspective terminology	Social-science perspective terminology
Technology focus	Cultural/human focus
Natural sciences approach	Social sciences approach
Knowledge as a thing	Knowledge as a process
Knowledge can be classified, structured and shared	Knowledge is build through evolutionary processes and organisational learning
Information/knowledge described mathematically	Information/knowledge considered constructively
Technology impact inevitable (essentialism)	Technology in human control (if used at all)
Knowledge embedded into formal processes and organisational functions	Knowledge embedded in informal processes and chance encounters
Knowledge Management as a separate discipline or as part of IT	Knowledge Management as an essential part of organisational capabilities (but difficult to isolate in terms of actors, routines and objects)
Knowledge Management as specified initiatives and programmes, standards and technologies	Knowledge Management as an organic knowledge enabler based on creative encounters, constructive activity and social behaviour
Knowledge Management as a programme managed and implemented by executives	Knowledge Management as an all embracing activity central to strategy and the tasks/outlook of senior executives themselves

The story so far indicates a significant diversity in perspectives within Knowledge Management. This diversity represents diversity already deeply entrenched in our society which, depending on country and culture, promotes dichotomy and division or a more harmonised dialectic.

These considerations open up another approach to Knowledge Management that recognises that KM as a discipline is very different from previous perspectives. This is a dialectical approach that synthesises views from the perspective poles based on solid conceptual principles. In one example, the synthesis comes from biological and evolutionary complexity theory supported by a strong philosophical commitment to human free will and human facticity[39]. It also emphasises communities and their complex interactions with individuals as an important factor in knowledge creation. More will be said about the dialectical approach later, because this approach represents a strong possibility for European competitiveness.

We are left with one further perspective we need to consider: This is the approach adopted by most of the major consulting companies providing commercially based Knowledge Management consulting services to clients.

We call this the consensus perspective since it is syncretistic. Elements from any of the other perspectives are prescribed based on 'what has worked will work' - a best practices approach to Knowledge Management itself.

While this approach has great short-term benefits and can deliver value to clients, its main weakness is its lack of conceptual coherence. The problem of taking stock of good practice and applying used results across the board has been severely criticised by Christensen and Raynor[40] while describing how empirical based theories often develop within the business literature. "… researchers risk laying a foundation for unsound theories by simply observing a few successful companies, identifying some practices that they have in common, and concluding that these practices will work at all companies" and we might add, "at all times". But it is within the consensus perspective that we see most of the known Knowledge Management approaches, practices, war stories, best practices, stories of barriers and enablers, technology implementations and the like. Most popular books on Knowledge Management follow this approach, as do many of the journals and conference circuit programmes.

---

39   The human will is free, but the human being is situated in the world and is governed by historical context and whose possibilities are constrained by finite boundaries.
40   "Why Hard-Nosed Executives Should Care About Management Theory", Clayton M. Chirstensen and Michael E. Raynor, Harvard Business Review, September 2003.

Our concern with the consensus approach is quite fundamental. It lacks any framework for driving Knowledge Management beyond what it is. But we need to do this if we are going to allow Knowledge Management to contribute toward successful European global competitiveness and collaboration.

And finally, in this section, we look to the special situation of Europe and SMEs. Europe itself is a region of great cultural diversity. European organisations are used to working across borders and within multicultural consortia. Europe also has strong relationships and ties with south-east Asia, China and Indonesia. Asia is also a land of great diversity and cultural pride. Along with the eastern European block, the Asia Pacific area represents a unique opportunity for Europe based on Europe's ability to provide an approach to business that is different from the United States.

Europe is a region with a significant number of SMEs. SMEs in Europe already enjoy considerable expertise and experience in working across borders and within clusters and multiple-organisational supply chains.

The coming enlargement of the European Union represents the influx of additional diversity, additional opportunities and an even larger base of SMEs.

But the approaches adopted by both sides of the perspective poles and the consensus schools are dominated toward large enterprises. This is partly because of the investment costs associated with KM technology and consulting fees. It is also because the approaches themselves are monolithic and highly structured, which is unsuitable for the SME environment.[41]

The conclusion must be drawn that the suitability of current thinking in Knowledge Management is questionable for Europe. None of the approaches adopted at the perspective poles, or from the consensus perspective, will provide any substantial opportunity to improve organisational competitiveness across Europe.

Approaches adopted by Knowledge Management

This section summarises issues and responses (approaches) commonly adopted by Knowledge Management. This amalgamation of issues and responses is a classic presentation of the consensus approach, but the approaches are so common we consider it important in any presentation of the current situation. In addition, the issues commonly addressed in Knowledge Management projects reflect the user-readiness for such projects. Knowledge Management must be grounded in the issues faced by users to be effective and to minimise user-centric barriers (another important dimension to the question of user-readiness).

---

41   And, we will argue, for the large European corporate environment.

Issues

This section summarises the many issues which have evolved through industry adoption of Knowledge Management tools and practices in Europe and are reported in research and secondary literature. In line with the different schools and perspectives, the issues are broad ranging from highly operational and technological to strategic.

Finding the right information at the point of need

Information, in either structured numeric or structured/unstructured text and multimedia form, is a key life-blood of most decision makers. Most users face the dual problem of overload and under-load and the issue of enabling workers to locate the right information effectively and efficiently at the moment of need is an important issue being addressed by the Knowledge Management community today.

Finding the right expert

Not all knowledge requirements can be met from information stored in documents. At times, direct contact with, or contributions from, knowledge experts is required. Gaining access to who knows what within large organisations is a significant problem. The literature sites case studies from BP, McKinsey and Company, Buckman Labs, Chevron and others.[42]

Connecting people and communities

People are often the most effective means by which humans access knowledge, either expert knowledge or in written form (information). Human context is also important to interpret such material. There is a tendency in early Knowledge Management to see the discipline as information based storage of knowledge and expertise location, mostly in the form of yellow pages. More advanced versions see communities of practice and interest as appropriate and complex systems approaches actively work on engineering the informal networks, avoiding direct management of knowledge. This is one of the fastest growing and most controversial areas of KM.

Not a sharing culture

Traditionally organisations rewarded individuals based on individual contribution to end tasks/ goals. In such an environment, knowledge is hoarded. Those who have knowledge are reluctant to share it and those who don't are afraid to expose their ignorance. For Knowledge Management to succeed, some argue it must promote a knowledge learning and sharing culture that places incentives on both learning and sharing, others argue that incentives have the opposite impact to that intended and working on social obligation is more successful. How this is done will vary on the KM perspective held and the explicit situations within the organisation. However, this is an over-simplistic statement of the problem. Knowledge is often retained not for selfish motives but due to fear of abuse or simple lack of time. There is a growing body of opinion which argues for ensuring a degree of cultural difference (something that plays to the multicultural diversity of Europe).

---

42   Examples of the problems and solutions of expert location are found throughout KM literature.

Information and knowledge resources not aligned with business processes and responsibilities

This has ramifications for both input and output. On the input side, workers knowledge requirements tend to emerge from the individual and group responsibilities during some form of business or management process/responsibility or activity. But too frequently access to information/knowledge required to meet those needs is not structured appropriately for the process/responsibilities concerned.

On the output side, investment in knowledge should be applied to value-added activities such as improving customer service (in all its dimensions). When effort is exerted on activities that do not contribute to the value-added activities of the firm, the KM project itself is at risk from cynical and frustrated reactions.

Importance of innovating

Contrary to the previous point, knowledge activities leading to significant innovation require thinking out-of-the-box and away from the daily processes that blind perspectives for a more holistic approach.

This is an important structural and cultural responsibility for those designing knowledge-based organisations, especially where innovation is frequently not encouraged outside specialised R&D and marketing departments. Many creative people feel threatened in environments that do not welcome experimentation, wild ideas or out-of-the-box brainstorming style discussions. In such a situation, the resulting silo mentality can prevent ideas from crossing organisational boundaries. However, eliminating the silos does not produce innovation and often reduces the coherence of the groups and the necessary level of conflict or irritation which is essential to innovation.

Modern Knowledge Management is also starting to challenge the supposed linkage between creativity and innovation. Distinguishing between incremental and eureka innovation allows both process and disruptive approaches to KM applications to innovation. Following the work of Thomas Kuhn on the structure of scientific revolutions, or indeed the rules of inductive logic, we can see that innovation is likely to be a step change from existing knowledge. Innovation often springs from a completely different perspective on an issue, perhaps stimulated by ideas from other disciplines. New ways of looking as the world often come from unexpected sources and people, and involve chance elements that are unlikely to have been designed into a formal knowledge system.

Importance of decision making

Knowledge supports decision making at all levels of the firm. In some cases, decision making is based on best or good practice - the entrained patterns of past experience, in other cases it needs to first gain a new perspective, to stand above the old patterns of understanding. A considerable effort in KM is now going into decision making with significance investment from the US Department of Defence coming into Europe where much of the innovative thinking in this space is taking place, but without European recognition.

Information resources not made available to those who need them

Organisations traditionally place a tight grip on the information they maintain - the perspective of 'block until justified'. There are two aspects here, the external and internal. Potential external allies may be neglected based on untested negative stereotypes, whilst internal support can be overlooked through an over emphasis on formal position or hierarchical level as opposed to enthusiasm and relevant ability.

Experience gained not transferred

Organisations should be learning from their experiences for the purposes of becoming better and cheaper. Many organisations are frustrated by their inability to gain knowledge from experience and apply this to other teams, other locations or the next project/initiative. Interestingly narrative technologies are allowing sharing of 'worst practice' which often provides a better learning environment than 'best practice'

Organisation does not support a culture of knowledge learning/innovation and sharing

One response to the knowledge problem is to push 'knowledge' to those who need it. The McKinsey survey concludes that 'knowledge' push is ineffective as a Knowledge Management strategy and advises an approach based on knowledge pull. Others (Snowden) argue that push and pull strategies are both appropriate depending on the context, rejecting the idea that there must be one best way. In summary form, they explain that we should avoid focus on databases and reports and get people talking and communicating. Dixon also highlights culture as a problem inhibiting knowledge sharing but warns that an organisation should not address culture as such (ie assume that getting the culture right to start with will enable knowledge sharing to follow) but to address knowledge sharing and allow the culture to follow. Dixon (quoting Szulanski[43]) is clear to identify the limitations of absorptive capacity as a major stumbling block in information sharing (and one that can be directly addressed). Szulanski also adds that "causal ambiguity and the arduousness of the relationship between source and recipient dominate the motivation related barriers to knowledge transfer[44]".

43   Szulanski, G. (2003) Sticky Knowledge: barriers to knowing in the firm, London, Sage
44   Results in Szulanski's book summarised by Rod Shelton of UCE, June 4th, 2003

Organisational Knowledge Management needs and approaches

This section summarises various approaches to Knowledge Management based on proven business needs which we have identified through our experience supported by desk research. As pointed out in the introduction, this is not an exhaustive list. Indeed, even if it were, the speed of innovation would cause it to be outdated within a very short time. Furthermore, since respectable taxonomy of approaches exists, hence each of the authors cited would not subscribe to all of the approaches or indeed the manner in which they are classified here.

Our main concern is to note the diversity of approaches and to link approaches with the issues (and eventually, the schools and perspectives).

Post-review meetings

When teams need to make continual improvements to a process or activity, a typical KM response is to introduce post-review sessions. These sessions are held physically as they involve the same team repeat performing an important task (opening new stores, for example).

It is normal for management to be absent from post-review meetings since they should be held without fear of management response. The main focus is on continued improvement based on an analysis of what went right, what went wrong, what should be repeated, what should be avoided and what should be done better. This may produce single learning - ie error correction as opposed to the more knowledge based double-loop learning involving deeper examination and change of dominating assumptions (see Argyris and Senge for example).

Teams and communities

A team is not the same as a community. While a community normally shares common interests, a team also share common goals and tasks. But teams may co-exist across geographical (and even organisational) boundaries.

Community formation is encouraged in order to provide cross-fertilisation of team member expertise and experience. Normally the members of a community are members of one or more teams responsible for a project or initiative. The learning gained from the member communities will have direct benefit to the work of the teams. A feature of human community is that our individual identity is frequently explained in terms of memberships of communities. Human knowledge is often construed by silent or expressed reference to the norms of such communities even when the individual is not in direct contact with other members. This may not be observable by outsiders such as managers or researchers. The implication is that knowledge is incapable of being bound.

Virtual teams

A virtual team is one that 'meets' virtually using various types of technology. They share ideas and solve problems relating to the project(s) they are jointly responsible for.

Virtual communities

Communities exist because of a common interest or responsibility. Each member of a community brings knowledge and experience to that community and their engagement in a community promotes overall knowledge and experience sharing and exchange. If the community crosses organisational or geographical locations (or both), some form of virtual community support is required. Virtual community support was an early Knowledge Management approach, since the technology required was available via the Internet and software applications such as Lotus Notes.

Virtual communities are a particular type of collaboration activity. In many firms, encouraging more participative collaborative efforts across teams, communities, organisations, geographic locations and projects has been a KM emphasis. Various technology applications have appeared to support collaborative work in general, with virtual communities also being supported as a particular[45] case.

Expert directories

Many organisations first Knowledge Management programme was to publish expert finder directories. This can be highly effective when well identified expertise descriptions are applicable to the firm and an appropriate support mechanism can be placed to ensure its relevancy and accuracy.

Many variations of approach have been taken to expert directories. The issue of focus for most approaches has been overcoming the barriers to enabling availability of experts and encouraging the use of the directory (not invented here problems etc.).

Knowledge publishing

Knowledge is pushed to users based on management decision or on more subtle push approaches that sound more like pull. Examples are personalisation of information requirements and location.

---

45   In general, a collaborative session may be a one off. It may centre on a particular project. Collaboration memory may or may not be important in each case. But a community requires a community memory to function well. For this reason, community based collaboration applications require additional features that will ensure historical and personal identity of and within the community.

If people in the organisation require information then this approach ensures that every staff member has access to the corporate repository of knowledge. Users gain access to knowledge using sophisticated cataloguing and search facilities and the main Knowledge Management emphasis is on:

- *Ensuring that all the content is available*
- *Ensuring that the catalogues are appropriate to the various user groups within the organisation (although this is often poorly done in practice)*
- *Encouraging users to contribute to content*
- *Negotiating external information sources*
- *Defining and installing suitable content management practices*
- *Providing knowledge workers who are trained as librarians of the information databases and tasked with helping users with knowledge requirements*
- *Ensuring that the IT environment is suitable for the various user tasks (such as single sign-on and adequate security)*
- *And so on (if you take the checklists provided by the consulting firms, the list is endless).*

It is worth emphasising that approaches to knowledge repositories will vary considerably between KM schools and much has been published in theory and practice guidelines about critical success factors (normally surrounding human, social and cultural aspects of information management) for such databases[46].

Question and answer services

This approach is aimed at workers separated by distance who need to request information from others in the organisation. When someone requires help in any form, a question is placed to the firm (typically via e-mail, but features of collaborative applications also provide such services) and responded to by anyone in the recipient list who is able to contribute. It would not be typical to send requests to the whole firm. Participants normally select service groups appropriate to their expertise and needs and individual requests are directed to a particular group.

Creating learning and open organisations

While KM writers will always see the importance of promoting an environment (and associated practices and support) for learning and open communications, this is frequently addressed within the context of using information and knowledge delivered to individuals via knowledge repository applications.

But it is significant that the holistic approach to Knowledge Management recognises these issues as an overall goal of KM independently of particular technologies and approaches to training and information delivery. How such learning and sharing organisations are created is a deep issue and the subject of a considerable literature which won't be detailed here.

---

46   See, for example, Bukowitz and Williams "The Knowledge Management Fieldbook", Prentice Hall (Financial Times) 1999

One important perspective contained in the learning school is that knowledge must be created in order to be shared. Knowledge has a use by date (not to be confused with the document use by date that triggers document archiving in a knowledge repository) and can get stale. The whole issue of the learning environment and how people interact and contribute to the continual growth of learning and how organisations can apply techniques to provide discontinuous learning experiences (for example, in response to a radically new requirement or problem) is the subject of much current learning research and will form an important subject in holistic approaches to Knowledge Management as well as lend support on a number of micro-KM initiatives.

Intellectual capital measurement

While the intellectual capital movement has given birth to a school of KM, considerations to the importance and measurement of intellectual capital has become an important approach in many KM programmes. For example, many organisations are using a balanced score-card[47] approach to highlight customer, learning, process (structural) and financial capital as a means to initiate innovation and creativity management. The relevance for Knowledge Management is that the balanced scorecard method holds knowledge and learning at the foundation of the other contributing capital assets.

Peer assist

This is similar to expert location but frequently provides face-to-face encounters aimed at complex problem solving around highly implicit forms of knowledge and experience.

Storytelling and the emergence of narrative approaches

Storytelling has become a popular approach in both academic and industry based Knowledge Management literature and we have seen some case studies surface through that work.

Stephen Denning has used his storytelling experiences in the World Bank to form the background to his book 'The Springboard'[48]. While the book is largely anecdotal and many aspects of the background theory (he provides very little) weak, the case-studies at least indicate that stories in the workplace should be taken seriously and that stories are a fine way to promote change. But Denning is very careful to qualify that his springboard storytelling as not a panacea for change management and he does provide a careful analysis of those situations in which it is likely to work, and those in which it isn't.

Denning is more interesting in his RSA Lecture[49] where he sites stories from the financial sections of the financial times as an illustration that our lives are thoroughly imbued with stories - even in such staunch rational areas as the financial and business community. Of course, just because a news item in a newspaper is called a story doesn't make it one in terms of the folklore genre of storytelling. And this is important. Storytelling as promoted by Denning is a long way from Knowledge Management per se (and Denning in these references doesn't claim otherwise) and from stories we are used to hearing as children.

---

47   Robert S. Kaplan and David P. Norton, "The Balanced Scorecard", Harvard Business School Press, 1996
48   Stephen Denning, "The Springboard - How Storytelling Ignites Action in Knowledge-Era Organisations", Butterworth Heinemann 2001.
49   Stephen Denning "How Storytelling Ignites Action in Knowledge-Era Organisations", RSA Lectures 23 January 2002.

Yiannis Gabriel[50] provides a much more in-depth analysis of storytelling. He is very careful in defining storytelling and demarcating it from other genres (such as reporting, myth, moral tale, fable, legend and fairy tale). While it is not possible to cover this subject in depth here, the following points from Gabriel relate to storytelling as an organisational concern:

- *Stories entertain.*
- *Stories are subject to lots of embellishment and alteration.*
- *Stories have their source in facts, which is important, but the purpose is to generate and transmit meaning, not report facts. Hence modernist approaches to storytelling are not useful for understanding them.*
- *Stories also function to undermine or destroy meaning - but even here meaning, and not fact, is the focus.*
- *Stories and narrative are not equivalent. Narratives include stories, but a lot more beside. This idea helps us to retain the important contribution of stories by constraining us from thinking that everything is a story.*
- *Stories need storytellers. Listeners in turn can become storytellers by putting their own slant and embellishments to the story.*
- *Stories can succeed, fail and be good, poor, effective and ineffective.*
- *A storyteller can make a poor performance of the storytelling.*
- *A story has a plot and characters. The plot frequently has twists and the characters give and learn lessons through the story (although storytelling story plots, characters and lessons never approach the sophistication of legends).*
- *Stories help us to "open valuable windows into the emotional, political, and symbolic lives of organisations, offering researchers a powerful instrument for carrying out research... We gain access to deeper organisational realities, closely linked to their members' experiences. In this way, stories enable us to study organisational politics, culture and change in uniquely illuminating ways, revealing how wider organisational issues are viewed, commented upon, and worked upon by their members."[51]*

It seems as if, from Gabriel's point of view, many of Denning's stories aren't stories[52] in the sense described by folklore specialists, but various types of special narrative (in particular, stylised reporting) which, while not necessarily giving insight into the symbolic lives of the organisation, do provide a tool for change management.

Storytelling can go wrong and must be used with care, expertise and sensitivity. Both Denning[53] and Snowden[54] provide warnings of mishaps in storytelling within organisations. Inexperience, creation of myth from anecdotes and embarrassing audiences are given as examples. But on the other hand, careful use of stories can be invaluable for obtaining understanding and buy-in from those who hear them.

---

50   Yiannis Gabriel "Storytelling in Organisations: Facts, Fictions and Fantasies", Oxford University Press, 2000
51   Gabriel, Page 2.
52   See his favourite story, which can be found in his third interview with Knowledgeboard, found at www.knowledgeboard.com/cgi
       binitem.cgi?id=93443 last accessed 13-June-203, which is the story of the Pakistan highways problem. This story is really a piece of factual
       reporting.
53   Interview with Denning, "Storytelling improves knowledge" Knowledge Management Magazine, June 2001, available at www.kmmag.co.uk/
       MAR02/FORUMma2.HTM last accessed 12 June 2003.
54   Interview with Dave Snowden, "The bard of IBM tells business tales" Personal Computer World, 12 June 2003, available at www.pcw.co.uk/
       Analysis/1112158 last accessed 12 June 2003

Snowden makes specific mention of the folklore nature of stories, and is careful to locate story construction in light of stories found naturally within organisations. He also mentions, as does Gabriel, how stories can provide insight into the nature of organisational culture and management style. And while Snowden's use of 'story' goes beyond that of folklore[55] the approach is similar to storytelling in that the 'listeners' are brought to a new understanding of their world (sometimes the world they have created) and in such a way that change is encouraged through the understanding process. Snowden and others make a clear and absolute distinction between storytelling and narrative patterning[56]. Arguing that storytelling focuses on the individual storyteller and the individual story and is thus a subset of communication theory and practice, it is also highly dependent on the charisma and presence of a facilitator or coach and is this not scalable or sustainable. Narrative, in contrast, focuses on the indirect capture of large volumes of anecdotal material and the creation of abstract forms of representation that enable multiple interactions between communities and narrative. This, it is contended, reflects the natural and serendipitous search mechanisms of humans who, faced with a difficult problem or issue, do not draw best practice from a KM system, but engage in conversations with people in their social network (both physically and virtually) synthesising new meaning and insight from multiple conversations. Narrative-based technology is being developed in the US and Europe and is already starting to who strong evidence of use in a variety of areas. For example, narrative enquiry as an alternative to market and competitor intelligence, worst practice systems to complement best practice (humans learn more from failure than success), cross-cultural understanding programmes, knowledge repositories for capturing the experience of retired employees and many other areas. Ironically, Europe, through people such as Gabriel and Snowden, have led this movement which potentially has a massive market value, but most funding for research and technology development is coming from the US and there is a danger that the capability maybe lost.

Barbara Czarniawska sees organisations as a complex and dynamic Web of narratives. These narratives can reveal aspects of knowledge creation and production through the use of the tools of literary analysis such as paradox and metaphor. Narratives give us access to the many voices (polyphony) available in organisational life, though it is clear that some voices, usually closer to the managerial position get more attention than others.

Knowledge enabling organisations
Von Krogh, Ichijo and Nonaka followed Nonaka and Takeuchi 'The Knowledge Creating Company' with 'Enabling Knowledge Creation'. The emphasis on the sequel is to spell out an approach to Knowledge Management that can be applied to enhance knowledge creation in an organisation.

The approach is interesting because of the explicit omission of any direct reference to technology to support the approach. This is not because the approach is antithetical to technology, but it appears that any use of technology in this approach will need to become part of the knowledge enabling process itself.

---

55 His example in "The bard of IBM tells business tales", ibid, is sending executives a copy of Dava Sobe's book Longitude and asking them to give four of five examples of where they have treated staff in the way the establishment treated the clock makers.
56 Snowden, D "Narrative Patterns: the perils and possibilities of using story in organisations" in Eric Lessor and Laurence Prusak eds. Creating Value With Knowledge Oxford University Press

While it is difficult to summarise, let alone evaluate, the contents of the book in a single paragraph, several key principles drawn from the book will serve as illustrations to the approach. These are:

- *Support knowledge creation do not control it.*
- *Support knowledge enabling conditions not Knowledge Management.*
- *Emphasise relationship and conversation building.*
- *Recognise a caring environment accepts emotional knowledge and playfulness.*
- *Identify knowledge enablers and steps (activities) associated with facilitating knowledge enabling within an organisation.*
- Recognise the *importance of micro-communities of knowledge, which differ significantly from organisational teams*.
- Have a *set of specific principles or assumptions about what knowledge is and how it can be enabled. These principles show a considerable bias toward constructivism and not scientific cognitive approach in epistemology.*
- *Have everyone in the organisation knowledge-focused, not just management or technical elite. This idea has important ramifications for organisational structure and management style and human resource planning.*
- *Management need to understand what knowledge is and appreciate its various theoretical and philosophical underpinnings and act accordingly in their management behaviour.*
- Recognise *the idea of Ba, or space, in which knowledge enabling has its home in the people working in that space.*

While this approach has many interesting features as listed, the challenge to Nonaka is growing in informed Knowledge Management circles.[57]

Concerns with current approaches

We began this section on the current situation with a reflection on the success of current Knowledge Management practice and we recognise that Knowledge Management has not delivered huge amounts of success stories. Of course, these approaches have helped organisations as documented in many of the case study KM journals. However, our emphasis here is on radical changes that can drive up competitiveness of European organisations. We are highly sceptical that any of the approaches listed here, especially within the consensus perspective, will have any major impact on our objective.

---

57   Dave Snowden - KM study seminar, Oct 2003

Barriers to knowledge creation and sharing

A study of the barriers to knowledge creation and sharing provides another important dimension to user-readiness. We shall indicate however, that many of the barriers to Knowledge Management are not user related, but stem from an overemphasis on representation, modelling and control. But in this section, we shall describe the diverse approaches and synopsise of the knowledge barrier problem. Our key barrier, following the research of Szulanski, is the limitations of absorptive capacity within organisations to deal with new and growing knowledge.

It is difficult to find any degree of consensus on barriers to knowledge sharing. We offer two main standpoints on barriers. Firstly, we can discuss barriers perceived by those working within the Knowledge Management approaches above. Secondly, we can indicate that a major barrier to Knowledge Management in terms of our overall objectives of European competitiveness and collaborative potential are current practices in Knowledge Management. Primarily, the application of design thinking to management overall and Knowledge Management in particular. This critique covers both the engineering and social perspectives. But we leave discussion of this latter barrier to our recommendations section, where the idea of this barrier will become very clear. We devote the rest of this section to discussing barriers observed in current approaches.

Many different types of barrier exist and each type will require different treatment. Barriers are associated with the individuals in the organisation and their current situation. The organisation itself manifests barriers to knowledge as does the organisations guiding management and knowledge philosophies.

Finally, barriers are associated with the act of introducing any change programme, and a Knowledge Management initiative/project is no exception.

Szulanski in 'Sticky Knowledge' claims that current research places the largest barrier to knowledge sharing in recipient motivation.[58] But this is indicative of the danger associated with surveys that ask management what they think are causes of any effect. Szulanski's in depth research into the problem identified, contrary to the 'received wisdom', a lack of absorptive capacity as the predominant barrier to knowledge transfer. Recipient motivation is at the bottom of the list, with Causal Ambiguity and Arduous Relationship falling in-between.

It is of interest to ponder the implications of the received wisdom. Szulanski's research suggests considerable waste in effort and resources in programmes attempting to create incentives (disincentives) for sharing (hoarding) knowledge. Szulanski's concludes that while current competitive environments will create sharing imperatives (even for selfish purposes) and organisations can, with relative ease, get people naturally sharing,[59] the ever increasing complexity of business where the value of existing knowledge diminishes quickly, absorptive capacity is placed under severe stress. He talks of the need to move away from incentives to other 'subtleties of Knowledge Management' as a key to resolving transfer barriers.

---

58   Szulanski,G.(2003) Sticky Knowledge: barriers to knowing in the firm, London, Sage page 75
59   Some of his comments remind me of one of Dave Snowden's paradoxes of Knowledge Management, namely "if you tell people they can keep their knowledge private they will share it, and if you tell them to share it they will keep it private" - and the last point is probably not to be taken literally all the time). See also Czarniawska (1997).

Von Krogh, Ichijo and Nonaka[60] provide a rich discussion of barriers. They start by listing individual barriers associated with the change that often accompanies Knowledge Management initiatives. The barriers listed here are of two types - limited absorptive capacity and reduced self-image.

- *Inability to accept new ideas (and this is seen as a contextual and social thing, not lack of intelligence or willingness to learn)*
- *Problems associated with 'not invented here' attitudes*
- *Differing intellectual capabilities*
- *Problems assimilating to, or adjusting to, new social encounters*
- *Individual stories that justify someone's expertise and approach to expertise may hinder the absorption of new knowledge that is contrary to the stories told by that person*
- *Downgraded social/expert recognition by changing around teams.*

The second type of barrier is organisational. Four major organisational barriers are described:

Language

Creative processes that require innovative language are frequently ignored if they run contrary to the organisation's way of speaking (Shelton, 2002). This problem is exacerbated when the creative process involves team members from different functions and disciplines who then report into different stakeholders.

Organisational stories

The innovative process will be hindered if the organisation is replete with stories that make a mockery of past failures or consolidate value systems that run contrary to the new ideas.

Current procedures

If current procedures are well ingrained and are seen as exhibiting established, efficient and effective operations, new approaches will be seen as counter-productive. Similarly, current processes, budgetary control and practices may hinder cross-functional initiatives.

Company paradigms

Like many of the barriers discussed in this section, company paradigms can have a positive role in knowledge enabling. However, because paradigms also determine the legitimacy of personal knowledge within an organisation,[61] any ideas seen as running contrary to these are less likely to be received with welcome.

---

60   Enabling Knowledge Creation, Chapter 2
61   Enabling knowledge creation p. 25

Other barriers cited in the literature are:

Lack of compatibility between computer hardware and software
In those cases where technology is used to support Knowledge Management, compatibility is essential. By its very nature, Knowledge Management technologies are pervasive and therefore any incompatibility will be an enormous barrier. Many global organisations, especially during mergers, have suffered from the limitations of technology incompatibility.

Lack of ability to adopt successful approaches to Knowledge Management
While emerging approaches to Knowledge Management will tackle a multitude of complex knowledge situations, current practitioners are not well supported with solid approaches and understanding to cope well with complex situations (where, for example, the situation affects large parts of the organisation and involves predominantly tacit skills).

Previous Knowledge Management failure
Many firms have failed with the 'knowledge database'. People just didn't contribute or bother to use it.

Not enough resources or time allowed for knowledge sharing processes
An example: In industries such as professional services organisations, post-project reviews are obviously helpful, but when charge out targets are high, consultants are discouraged from time wasting activities between projects such as gaining insights from one project to pass onto others.

No high level sponsorship for Knowledge Management
It will be reasonably obvious that a subject like Knowledge Management cannot be successfully implemented as a sole domain project of the IT, HR or any other organisational department.

Concerns with the current barriers to knowledge sharing.
Our main concern relating to the types of barriers discussed in this section is that they are rather local. We should be more concerned with larger and more global barriers. We are concerned that many of these barriers are related to approach more than genuine barriers. For example, it is our belief that many barriers arise through the application of the engineering perspective. If some KM failure can be attributed toward the design of what isn't designable, or from practices that have been uncritically copied from another case-study, then the barriers belong to the approaches as a whole, not to any local condition within the project. But too much emphasis on local barriers then focus practitioners on the wrong area, such as trying to improve acceptance of new practices or in attempting to tighten up on management commitment.

Technology application functions

It is becoming well understood that a technology centric approach to Knowledge Management represents a misunderstanding of what knowledge is and its dynamics within the complexities of organisations. In this context it should be considered that social mechanisms are themselves affected by new technological possibilities. Technological development in Knowledge Management should therefore not be considered as a linear development. Rather, it resonates with the way technologies get integrated into social processes.

But technology applications do play an important role in most, if not all, Knowledge Management initiatives and services. While technology seems inappropriate to some of the approaches discussed in the previous section, emerging research is finding extremely innovative ways to incorporate technology applications to those areas previously thought incapable of being amenable to it.

While this study does not provide a detailed analysis of Knowledge Management technologies (two other studies have covered this subject in depth and should be consulted)[62] it does overview the main current and emerging Knowledge Management technologies.

Current Knowledge Management application functions

We begin with a diagram that will help place some of the product types currently marketed as KM technologies into the knowledge capture and use cycle. While neither the technologies listed, nor the cycle itself, encompasses the whole of current state KM, it does provide a useful framework for a good proportion of what is currently marketed as Knowledge Management technology.

Collaboration

Software that enables groups to work together synchronously or asynchronously, and to share structured and unstructured knowledge. Collaboration tools enable collaboration within a project team, a community and/or within an enduring workflow.

Content management and personalisation

Content Management: A coordinated solution that includes global access to, and management of, a common pool of digital assets.

Personalisation: Tool that enables the portal to present targeted delivery of content throught the use of metadata and business rules.

Analytics and reporting

The distribution of raw data (data mining) into groupings, so that reporting tools can perform efficient, focussed queries.

Business intelligence

Tools that facilitate the aggregation and reporting of structured information.

Portal engine: software that manages aggregation, presentation of content and services from disparate applications. It serves as the central point for content and application assembling and final portal page rendering.

Taxonomy

A systematic approach to classifying concepts and bus processes in a hierarchy of ordered groups according to their natural/logical relationships.

Expert finder

A directory of subject natter contacts, groups for K-finding.

Search/push

Search: tools that use either key words (from a directory or taxonomy) or full-text to locate documents.

Push: tools that push external content to relevant audiences.

Knowledge bases and knowledge based systems

K-base: Tools that enable capture, structure, access, update and mgmt of explicit content (structured and unstructured).

KBS: Applies rules, decision-tree logic, or other reference to solve a problem.

Capture — Organise — Store — Access — Use and innovate

62   Both studies are referenced in the study Web site

It will be seen that most of the current Knowledge Management technologies - those that are available commercially - fit into a knowledge acquisition and use cycle.

In fact, in this section, we cover the types of products commercially available from KM software vendors. Given that our understanding of knowledge is deepening, we believe that current applications will need to change considerably if they are to meet the challenges of modern Knowledge Management thinking and avoid death by irrelevancy, as has been the fate of many other technology tools that were defined with good utilitarian purposes, but failed to meet the ever increasing demands from the user environment.

Collaborative workspaces - Asynchronous dialogue

This technology supports communication push and pull that is not continuous and instantaneous. Many applications support asynchronous dialogue - e-mail systems, file sharing, threaded discussion groups and boards are examples, as is the facsimile machine.

Mobile devices and mobile telephone 3G technologies provide a growing market for asynchronous (and synchronous) dialogue. For example, text messaging can provide mobile communication, enabling new ways of working and improved efficiencies, customer service and business growth.

Collaborative workspaces - Synchronous dialogue.

This application technology covers a variety of instantaneous response communication tools. These include instant messaging[63] and Internet voice chats. The IBM report includes instant messaging such as mobile text messages, but while these are instant, they are not synchronous. But next generation mobile will provide for non-voice synchronous communication between people and people and machines (m-business). Of course, the telephone itself is a classic example of a synchronous KM tool.

3G mobile and emerging mobile computing devices provide yet another example of the potential for synchronous dialogue. Many commercial applications are emerging where mobile staff and clients can transact and dialogue any place, any time.

Collaborative workspaces - Virtual conferencing

This is a type of synchronous dialogue technology. It has become reasonably main-stream within global organisations finding it much more effective to work virtually. These tools provide many of the functions available to a normal conferencing room - and in some cases beyond. Examples are white boards, drawing, chat, presentations, audio-visual and file sharing.

Collaborative workspaces - Other support

Additional services are required from collaborative tools in order to tie together the various components into a working whole. The applications must provide file storage, file sharing, history, search and retrieval, user profiling and security and so on.

---

63   For example, Lotus SameTime, Microsoft MSN and features of the Groove product.

Community Support

Communities are groups of people within an organisation or across multiple organisations who share similar interests and issues. Support for virtual communities is an early Knowledge Management application and today, of-the-shelf community support applications include many of the collaboration tools described above.

Expert Location

An expert locator is an application that provides a directory of expertise. If someone requires help in an area of expertise, they can make contact with experts contained in the directory. If an organisation supports virtual communities, experts may be attached to a community, in which case a user can place requests into the community concerned.

Although this type of application may appear simple, there are many pitfalls to avoid in setting up expert advice services.

Translation

Language is the primary medium of knowledge acquisition, sharing and use. We communicate with language, but for many organisations, the language barriers between geographical areas can cause concern.

Very few (if any) organisations can afford to translate all available resources (such as documents, Web pages, e-mails) and in some circumstances, human translation, when demanded, is too slow.[64]

While machine translation started with great promise and received huge government investments, its demise in the 1960s resulting from lack of progress has not diminished the usefulness of current generation machine translation products delivering comprehension level translations.

Machine translation highlights the importance of absorptive capacity in knowledge transfer. A reader's chance of successfully understanding a machine translated document or recognising a problem in the translation is increased significantly if the reader has sufficient background knowledge of the subject matter, knowledge of circumstances surrounding the document's creation (working on the same team, for example) and the author or recipient team.

Content summarisation

An application related to machine translation is content summarisation. The purpose of this technology is to reduce the size of text based on the interests of the reader. Summaries can then be presented to the requester in the form of document abstracts, which can be very useful if a search engine returns a large number of documents from a search request.

Summarisation is normally tuned to a taxonomy. The taxonomy represents the conceptual perspective of the user and it is used by the summarisation software to personalise the summary.

---

64   A situation provided to us was of a financial instruments firm requiring translations of prospectus documents received, but many were unavailable by the time a human had translated the documents.

Classification and categorisation

Knowledge and document repositories typically store thousands of documents. Without some form of library management, the library would be inaccessible to its users. Digital libraries, like their physical counterparts, require careful management and the categorisation of content is one of the primary techniques of information retrieval in library management.

A number of foundational technologies come together in the subject of digital resource categorisation, some of which will be covered in the technologies section below. From an application standpoint, categorisation technologies work on the basis of content in one of two main ways. Firstly, some products with built-in semantic and statistical language processing algorithms aim to categorise documents based on content analysis. Taxonomies are a by-product of the categorisation process and, as a result, are often referred to as automated taxonomy generation products. Secondly, some products categorise based on a pre-given taxonomy or taxonomies. The taxonomies, which are defined by the library users, represent the conceptual landscape represented in the documents typically required by the users.
It is more common to define an organisational wide taxonomy as it is simpler, but gaining consensus on a single taxonomy is extremely difficult and unwise. The second approach is more accurate and will provide more accurate categorisation results, but does require up-front human effort to supply the initial taxonomy.

A number of other categorisation applications are available based on various types of bibliographic relationships. Much of this area is state-of-the-art and beyond, and will be covered in the technology section to follow.

Visualisation

'A picture paints a thousand words' is an often repeated phrase when insight is lost in the oversupply of words and numbers. While this piece of old wisdom would have few detractors, there are many dangers associated with visualisation techniques. That it can go wrong is proven by the investigation results into the cause of the Challenger disaster. Diagrams used to map the effects of temperature on certain seals did not adequately show the danger faced by the crew of the fated Challenger. Changes to the way the same information was visualised had the dangers highlighted clearly.[65]

The goal of visualisation is to reveal patters, trends and other new insights into a phenomenon.[66] Its aim is, therefore, to aid cognition. In the domain of Knowledge Management applications, visualisation can go beyond mere representation. Fluit, et al[67] provide an example of a query for holiday accommodation. Given a complex set of requirements, the visualisation provides graphical representation of the accommodation meeting requirements. What is most useful in the graphical approach is how easy it is to see alternatives when exact requirements cannot be met.

---

65   See "Readings in Information Visualization: Using Vision to Think", Stuart K. Card, Jock D. Mackinlay, Ben Shneiderman. Morgan Kaufmann, 1999, page 4 for one of many accounts of the information problems surrounding the challenger disaster.
66   Chen, "Information Visualisation Verses the Semantic Web", in Geroimenko and Chen, "Visualising the Semantic Web", Springer, 2003
67   Fluit, Sabou, Van Harmelen, "Ontology-based Information Visualisation" in Geroimenko and Chen.

One of the early KM applications of visualisation was topic map display. A topic map is a representation that describes knowledge, their relationships and context and provides links to existing information resources.

"Topic Maps provide a bridge between knowledge representation and information management. They build a semantic network above information resources, which allows users to navigate at a higher level of abstraction." [68]

Most topic maps will be very large, making it difficult for users to find the relevant information. It is for this reason that researchers are discovering visualisation techniques to help guide users through a topic map.

If the user task is to locate documents covering a certain topic and upload the most relevant, it is questionable whether visualisation techniques could be more effective than Yahoo type hyperlinked structures[69]. Graphical visualisation is particularly strong in representing metainformation relating to knowledge in various subject domains. An example given by Le Grand and Soto are topic map visualisations providing indications of the distribution of documents across topics. Metainformation visualisation can represent other dimensions of document distribution and can provide multidimensional views on a single screen. For example, document size represented by degree of boldness, geographic source by colour, the degree of relevance to topic by the distance from the topic marker and so on. But this takes applications beyond standard document retrieval.

One further illustration of visualisation in Knowledge Management is worthy of particular mention. This is the IBM Babble community enabling product (currently in beta release). The rationale for the Babble system is explained in the emerging applications section below. But the basic idea is to allow collaborative sharing to take cognisance of the overall social context of its development and use. The challenge is to make social interactions on the system visible. IBM has come up with the concept of social translucence to refer to systems, "that provide perceptually-based information about the presence and activity of users, thus creating social resources that the group as well as individuals can use to structure and enhance their online interactions".[70] This is done by what IBM call a social proxy. In the Babble programme, the social proxy on the screen is known as a cookie. A conversation is represented as a shaded circle. Participants are shown as dots, also known as marbles. Marbles inside the circle are involved in the conversation, those outside have logged into the conversation are only viewing. A user's marble will move toward the centre of the circle as their participation grows. Since the cookie represents synchronous activities (those happening now) Babble has an asynchronous proxy called the timeline. The timeline shows the activity of each person in a conversation. It shows when they are logged out, logged on, listening and participating.

68   Le Grand and Soto, "Topic Map Visualisation" in Geroimenko and Chen (Eds) Visualizing the Semantic Web", Springer 2003
69   See www.wordmap.com for a Yahoo style topic map system that incorporates many advanced features from advanced taxonomy and bibliographic research.
70   J.C. Thomas, W.A. Kellogg, T. Erickson "The Knowledge Management Puzzle: Human and Social Factors in Knowledge Management", IBM Systems Journal, Vol. 40, No. 4, 2001

One of the biggest challenges to visualisation application research is related to its biggest strength. The example of the Challenger space shuttle illustrates this. To be useful, a visualisation has to match the problem domain and must therefore be highly customised to a problem. The challenge is to develop visualisation tools that are highly customisable to generate different visualisation methods within a single organisation. This problem is not so much technical as intellectual. The science of visualisation needs to develop generic approaches that can be combined and applied to different situations to produce different visualisation effects.

Data mining and data warehousing

According to some software vendors, Knowledge Management is data warehousing (now termed business intelligence). While this is obviously incorrect, many applications in the data warehousing and mining areas have provided management with significantly better ways to gain insight into the operations of their organisations.

A data warehouse has the following features worth relating from a KM perspective:

- *Multidimensional. Different business dimensions are combined to provide users with cross-dimensional information interrogation.*
- *Consistent and centrally controlled. Typically, an organisation's information systems are dispersed and decentralised, often containing large amounts of redundancy and even inconsistencies. The data warehouse collects and cleans information from multiple sources from within and without an organisation to provide a central repository of consistent data.*
- *Aggregated. Management typically requires aggregated data providing them with numerical trends and comparisons. To do this across multiple dimensions, the data warehouse contains fine grained detail information which is then pre-aggregated according to common high level enquiry needs.*
- *Interactive and user responsive. Traditional management reporting is predetermined and static. An important feature of a data warehouse is that users can interrogate its information contents in realtime. This includes slicing and dicing, drilling up and down and across dimensions in the warehouse.*

A data mining application provides users with information about the contents of the warehouse that would be otherwise difficult for users to find. Using advanced statistical, linguistic and Artificial Intelligence techniques, a data mining application searches the data warehouse for trends, exceptions and relationships within the data and reports on an exception basis.

Document warehousing / digital libraries

The advent of increased computing power and improvements in linguistic based algorithms has enabled text and document based warehousing. A document warehouse is similar in concept to data warehousing but is confined to textual and multimedia documents. Whereas the data is a data warehouse is highly structured and numeric, the document warehouse contains unstructured and semi-structured text and multimedia based data. Its rationale is that large proportions of an organisations recorded information and knowledge is contained in documents and not from transaction processing systems.

A digital library is like a document warehouse. It is a digital version of a physical library. The linking technology is the catalogue, which provides access to the documents contained throughout an organisations wide area network (or beyond).

We are seeing a convergence of applications in this area. A good document warehouse and digital library are really components of a good content management system, which are both required for the delivery of information via an enterprise portal. But the portal user interfaces and information retrieval mechanisms, and the underlying use of taxonomies and metadata are important components of the Semantic Web.

But that is not to say that every organisation requires all of these applications wrapped into a single package. Many organisations require an emphasis on the digital library, where retrieval of relevant documents is more important than fancy presentations and personalised interfaces across organisational information systems.

Enterprise information portal

An enterprise portal is simply a piece of layer technology that integrates multiple applications through a single (and consistent) interface.

The rationale is simple - organisations typically use multiple applications which are not consistent or uniform in the way they work. Users have to become familiar with a multitude of user interfaces and navigation systems as well as know which applications they require and where they are located and most users will only require a small percentage of features available for any application. A portal provides a highly customised view tailored for each individual giving them sufficient application exposure without any excess.

An enterprise portal, being Web-based, can also provide access to facilities contained in intranets, extranets and the Internet. For example, a user with access to a supplier extranet can imbed the extranet inside a suitable part of the portal interface. Most portals enable users to define personal pages, such as stock and finance information pages, weather, road and traffic reports.

But what is the relationship between the enterprise information portal and Knowledge Management? Firestone states it in this way, "I've taken the view that EIPs have their place in the larger mosaic of Knowledge Management and that their purpose in this broader context, is to help organisations and individuals adapt to the changing environment of the workplace and the organisations. In particular I think that ultimately EIPs should be evaluated from the viewpoint of the support they give to organisational intelligence, the ability of an organisation to adapt to its environment".[71]

Emerging areas of Knowledge Management

In this section we outline some of the emergent areas of KM research from a European perspective. For a full description of next generation KM technologies, while the deliverables from the IST VISION[72] project provide highly detailed descriptions of next generation KM technologies primarily, but not exclusively, from a mathematical perspective. For example, a section in the VISION report deliverable D2.1 State of the Art Report on Core Enabling Technologies, is devoted to ontologies, the Semantic Web and knowledge discovery - which is interesting in its list of sub-technologies and heuristics. These include: a. Regression techniques, b. Classification techniques, c. Bayesian classifiers, d. Statistical clustering techniques, e. Decision trees, f. Neural networks, g. Self-organising maps, h. Kenetic algorithms, i. Association rules, k. Case-based reasoning.

Convergent technologies

One important current trend is that of application convergence. Traditionally, computers and non-computing devices were standalone. Today, we are beginning to see the convergence of cameras, telephones, diaries, e-mail, Web-browsers, application servers, handheld, navigation and other devices within a single device, or many devices linked via common operating systems or open interoperability standards. We are beginning to see office linked with office, office to on the road user, office to home, home to home and home/office to car.

While much of the current publicity surrounding convergent technologies lay with domestic products, commercial applications will be eagerly sought. A major obstacle to convergent technology is the current lack of killer applications[73] and the huge debt incurred by mobile telephone companies in securing bandwidth. The commitment to digital convergence is illustrated by Samsung. In an advertisement in the Financial Times, 23 May 2003, Samsung Electronics Vice Chairman Yong Yong Yun stakes his commitment to, "An aggressive and proactive response to the opportunities offered by, and demand for, digital convergence." Interestingly, Yun believes that disorder and confusion can be tools to stimulate imagination and innovation. "Problems yield to solutions required to deal with chaos." The implication for Knowledge Management is that our technologies should work with us in the new world of complexity, not attempt to rationalistically dissolve the complexity.

71   Joseph M. Firestone, Ph. D. "Enterprise Information Portals and Knowledge Management", Butterworth Heinemann, 2002, Page xvii and xviii.
72   http://km.aifb.uni-karlsruhe.de/fzi/vision/
73   Both in terms of devices/software and in terms of business requirement

Social computing

While the current technologies described above do address the approaches and issues, it is becoming well recognised that many Knowledge Management project failures can be attributed to a neglect of the social/cultural dimension in organisational and system behaviour. This is particularly noticeable in Europe. Quite often, 'globally driven' Knowledge Management initiatives in multinational organisations face strong barriers in making initiatives work in Europe. Quite fundamental factors, such as language barriers and associated cultural problems act as triggers for failure. While the more scientific schools do address social and cultural issues as a problem dimension and aim to identify more user friendly approaches and features, the post-scientific approaches challenge this as too superficial. Applications must themselves be seen as socio/cultural artefacts in their own right, supporting and generating cultural and social behaviours that enhance creativity and innovation. It is in this area that we are starting to see the emergence of narrative-based technologies based on high abstraction search criteria as a key aspect of lessons learnt, including new story-based XML languages and linking with other disciplines such as scenario planning and market intelligence.

Semantic Web, KM and related reseach

There can be little doubt about the value of the Semantic Web being an important tool for adding structure and sensibility into huge content stores (corporate document stores and the www). It can be viewed as advanced library science for worldwide document resources.

In this sense, it is an important KM tool, but while researchers are considering human and social aspects of the Semantic Web and its users, the Semantic Web itself should not be seen as the new Knowledge Management panacea. The principle reason is that for most organisations, stored documents are not their strategic source of knowledge and innovation - even when their libraries form part of their knowledge dynamics.

The implication is that even in document rich organisations, their Knowledge Management emphasis should be focused away from the documents. But in these organisations, Knowledge Management is frequently seen as document resource management and the Semantic Web is seen as the new awaited breakthrough that will put it right.

A large number of technologies are combined to form the backbone of the Semantic Web, and most of these are emergent technologies. In most areas of the Semantic Web considerable research efforts are underway and most are critical for its ongoing viability. The technologies include:

- *Description logics*
- *Ontologies*
- *Natural language processing*
- *Taxonomies*
- *Knowledge organisation and relationships*
- *Metadata*
- *Broadening the Semantic Web from document-centric to application-centric knowledge.*

In addition to these, a number of bottom level technologies are at the heart of the Semantic Web. These include XML and associated languages such as RDF and DAML/OIL.

Selected references

Amidon, D. (2002) The Innovation Superhighway: Sustaining collaborative advantage, New York, Butterworth-Heinemann

Boje, D (2000) Phenomenal complexity theory and change at Disney: response to Letiche, Journal of Organisational Change Management, Vol.13 No.6 pp.558-566

Chauvel D. and Despres, C. (2002) A review of survey research in Knowledge Management: 1997-2001 Journal of Knowledge Management, Vol.6 Issue 3 pp.207-223

Czarniawska, B. (1997) Narrating the organisation: dramas of institutional identity, London, University of Chicago Press

Letiche, H. (2000) Phenomenal complexity theory as informed by Bergson, Journal of Organisational Change Management, Vol.13 No.6 pp.545-57

Shelton, R.(2002) The development of Knowledge Management in SMEs: a discourse analysis of facilitation, Unpublished PhD Thesis, Birmingham, England, University of Central England.
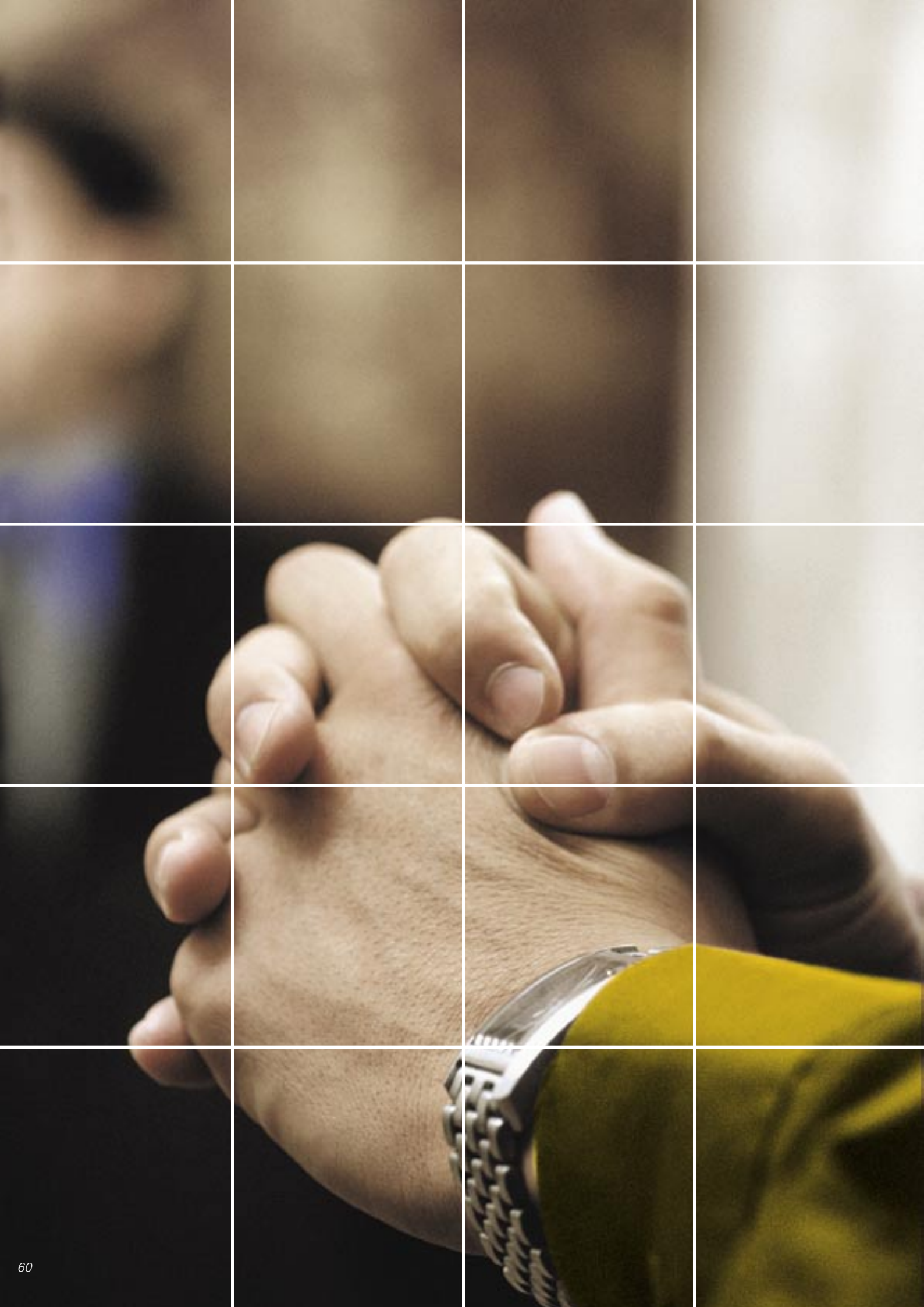
European competitiveness in Knowledge Management

In the previous section, the focus has been mainly on how organisations can benefit from Knowledge Management from a global and European perspective. In this section we summarise how competitive Europe is in terms of Knowledge Management tools and applications. It has not been the primary purpose of this study to analyse how competitive Europe is in terms of Knowledge Management. Indeed, since Knowledge Management is multidisciplinary and its focus has changed rapidly, it would be of questionable value to commission more detailed research. This section shows how Europe has fared in the early scientific phase, using existing research as it sources, what the current trends are, in terms of product prototyping and where European strengths lie.

In the early phases (1995-1999) of what we term Knowledge Management, tools and applications were based on a scientific approach to management with its emphasis on control, design and processes. In response to an anxiety of knowledge loss, the problem of staff walking out of the door every day and other kinds of more permanent loss of expertise, this approach sought to capture, codify and distribute knowledge[74]. But this has had the effect of eroding the type of knowledge that counts for true competitiveness - knowledge required for innovation and decision making. Although tools and applications in this domain (such as Lotus Notes and other groupware applications) are mainly of US origin, Europe has played, and continues to play, an important role in researching and developing these tools (for example, Lotus has a development lab in Ireland which also carries out localisation work for Europe). It is therefore not straightforward to identify which tools and applications are European. The climate for innovation has traditionally been more favourable in the US, which has led to key breakthroughs in market terms happening there, but research and development as well as the end user market is global.
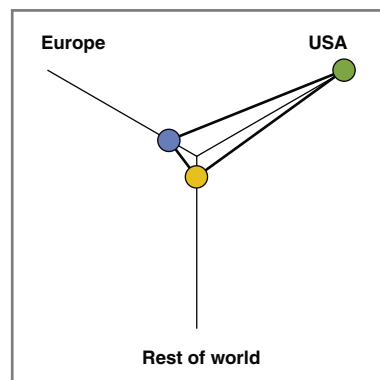
Commercial Knowledge Management Products

This graph represents the number of Knowledge Management product vendor companies marketing globally known software to commercial organisations.

---

74   This is still the predominant view, if one examines Knowledge Management product-vendor literature - say in the Insurance industry

Of the 139 major (globally recognised) KM product vendor companies evaluated by IBM[75] only eight were from Europe and only five from the rest of the world. We can interpret this in many ways. For example, it may indicate that most of the technology is irrelevant (but then most of the technology marketed globally is). It can be interpreted as a problem in Europe getting research results into commercial product form (most of the companies surveyed did not exist before the 1990s). It could also point to a lack of European investment in product development, or it may represent a missed opportunity and an indicator that Europe should look elsewhere to lead product development (virtually all of the products surveyed serve the engineering perspective).

Contrary to the scientific approach, the human-centred approach which has become very important over the past two years (approx. 1999-2002) postulates that knowledge cannot be represented and implemented as a management process in purely algorithmic/process oriented forms, but must as well focus on communities, cultural sensitivities, workplace environment, expert locators, stories and an overall sensitivity to people. However, as we have pointed out before in this study, this does not mean that the human-centred approach is unscientific, but merely that is based on different scientific origins.

This new wave of Knowledge Management addressed this imbalance in traditional Knowledge Management but it has done so in a way that it continues to share the scientific management's underlying philosophy of design. Communities are created and stories told in order to implement predetermined goals defined and controlled external to the system itself. The danger in both approaches is clear - instead of supporting knowledge-based innovation, the risk is that innovation is hampered through trying to design it into the system. A human-centred approach in the emerging sense, as is postulated by the social complexity quadrant in the model might focus more on understanding than on designing knowledge processes. In this context, it is particularly important that Europe is strong in experimenting with new approaches. It is important that these learnings are leveraged. This is not only a question of deriving technical products but also of deriving new forms of KM services to help companies in this - largely individual - process.

From the viewpoint of SMEs, this raises the question of affordability and access to such services. However, given Europe's heterogeneous cultural and language background this could also be an interesting option for European service providers - and an entrance hurdle to those coming from outside Europe.

---

75   And published in their reports "Knowledge Management and Technology in Context", Chyisty Silver, 2000, and "Community Enabling Technologies", Richard Karanaj, Published by IBM Institute for Knowledge Management (available on the KM2010 Web site)
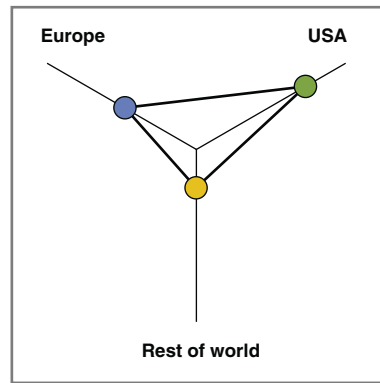
Test Bed KM Products

Our observation and experience from involvement in European Commission IST projects and conducting secondary research via academic research journals as well as attending specialist conferences, is that Europe is much stronger in test bed software than fully commercialised vendor-based software. There are many European Commission funded projects, such as Onto-knowledge, in which universities are producing test bed products to demonstrate new ideas sourced from mathematical and logical sciences.

The European challenge is to make these products suitable for the emergent complexity perspective (discussed in our recommendations) and to produce commercially sound (and scalable) products from it.

Europe needs to improve its ability to 'productise' software and services. The ability to take good ideas and prototypes to fully fledged market offerings depends on the openness to relatively high risk ventures and the availability of venture capital. Currently the climate in Europe towards funding new initiatives and start-ups is not favourable. Linking university and private research initiatives more strongly to industrial partners, which is happening in the Sixth Framework programme though Integrated Projects, is one method to achieve a higher degree of commercial exploitation in Europe.

Knowledge cannot be coded without sophisticated technologies to do it. These technologies require foundational advances in logic and mathematics. There is a considerable research effort around logical and mathematical work in Europe at the moment, within leading universities and industry. The main results of this work are in the area of the Semantic Web, supported by logic, text-based computer readable representation languages (for example, RDF and DAML/OIL all represented in XML).

Fundamental KM Technology research

Again we do not have specific analytical research results to support our findings here, but we hypothesise our results based on our experience with various universities within Europe. Europe has a very strong R&D capability in the development of mathematical-based Knowledge Management technologies. In particular, European universities have led the world in the development of description logics (especially non-standard reasoning) ontology and semantic learning, statistical and logical-based linguistics research, knowledge representation theory and the like.

Our concern is where this knowledge is put to use. We will see that these developments fit our mathematical perspective and therefore can be used to support engineering and algorithmic approaches to Knowledge Management. Again the US has a very strong advantage (as shown by the perspectives graphs above), while the use of mathematics in the complexity sciences currently has a strong European advantage.

If Europe is to become a competitive force in the world, it needs to embrace diversity and use it wisely to shape its own industrial landscape, but flexibly so, in order to ensure it can react subtlety to the complex and ever changing world environment.

Europe is more prominent here in terms of research activities as well as applications.

If systems are designed, no provision or space is given to emergent opportunist patterns or results innovation. Ironically, it is precisely this type of situation that entrepreneurs are used to exploiting.

Dimensions in Knowledge Management products and technologies -
A framework for evaluation

The diagram below outlines the dimensions in which Europe's position in current situation Knowledge Management can be measured.
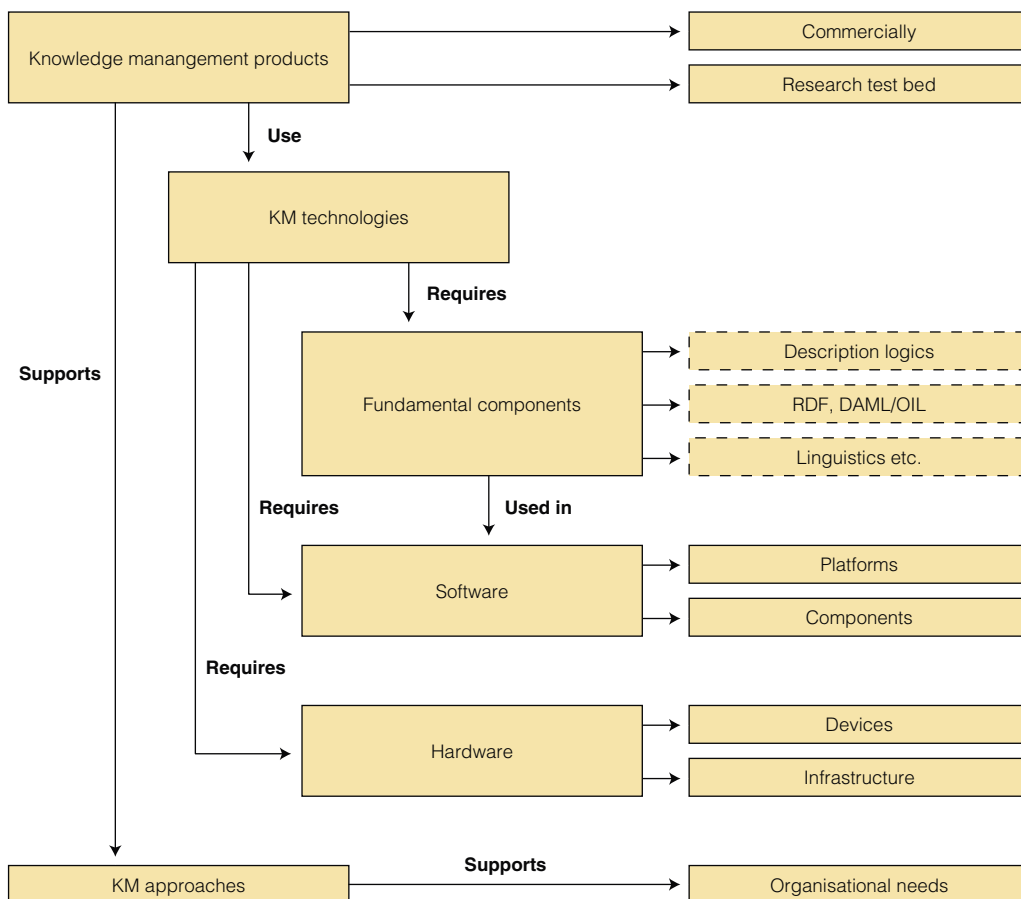
Our dimensions show the continuing importance of hardware in Knowledge Management. However a comparative analysis between for example the US and Europe would need mainly focus on software and approaches that are directly oriented toward Knowledge Management itself. Supporting hardware typically has many other applications and purposes outside Knowledge Management.

In order to assess the strengths of European Knowledge Management tools and technologies, it is necessary to look at different Knowledge Management dimensions and relate these to tangible measures. For example, the following dimensions and measures could be used to provide a framework for measurement.

Dimension	Measure
KM Products - Commercial	Number of major products sourced from area/Number of vendor companies producing products from area
KM Products - Test bed	Number of major test products sourced from area
Fundamental KM technology research	Number of researchers per 1,000,000 population/Amount of research money invested
Software technologies - Components[76]	Number of researchers per 1,000,000 population/Amount of research money invested
KM approaches	Number or proportion of approaches developed in the area

76   We do not consider software platforms to be significant for this study although, as an example, the European commission is already very active in promoting uniform standards in the mobile telecommunications infrastructure - especially for 3G and beyond 3G.

This section highlights some of the key trends that have emerged from our analysis:

- *The first phase of Knowledge Management, which we describe as the Engineering Approach, led to Knowledge Management tool and technology development. US vendors enjoyed, and still enjoy today, a dominant position in this market segment.*
- *The second phase of Knowledge Management has seen much more attention on human-centred tools and approaches. The dominant position of US vendors is not as clear. Europe has a stronger position in this market segment although there is uncertainly as to whether Europe offers the right conditions taking promising protypes through to successful development.*
- *In the area of mathematical complexity, Europe has a strong position with regard to research and early tool and prototype development, which has yet to be converted to the successful commercial environment.*
- *If Europe is to measure competitiveness in Knowledge Management tools and technologies, different dimensions need to be measured. This is a daunting task, since Knowledge Management tools and technologies cannot be seen in a vacuum. Hardware and technology applications serve different purposes.*
- *The picture of US dominance is not that clear. Many very successful Knowledge Management applications have benefited from European research and Europe is seen by US vendors as an ideal location to test and develop new products.*
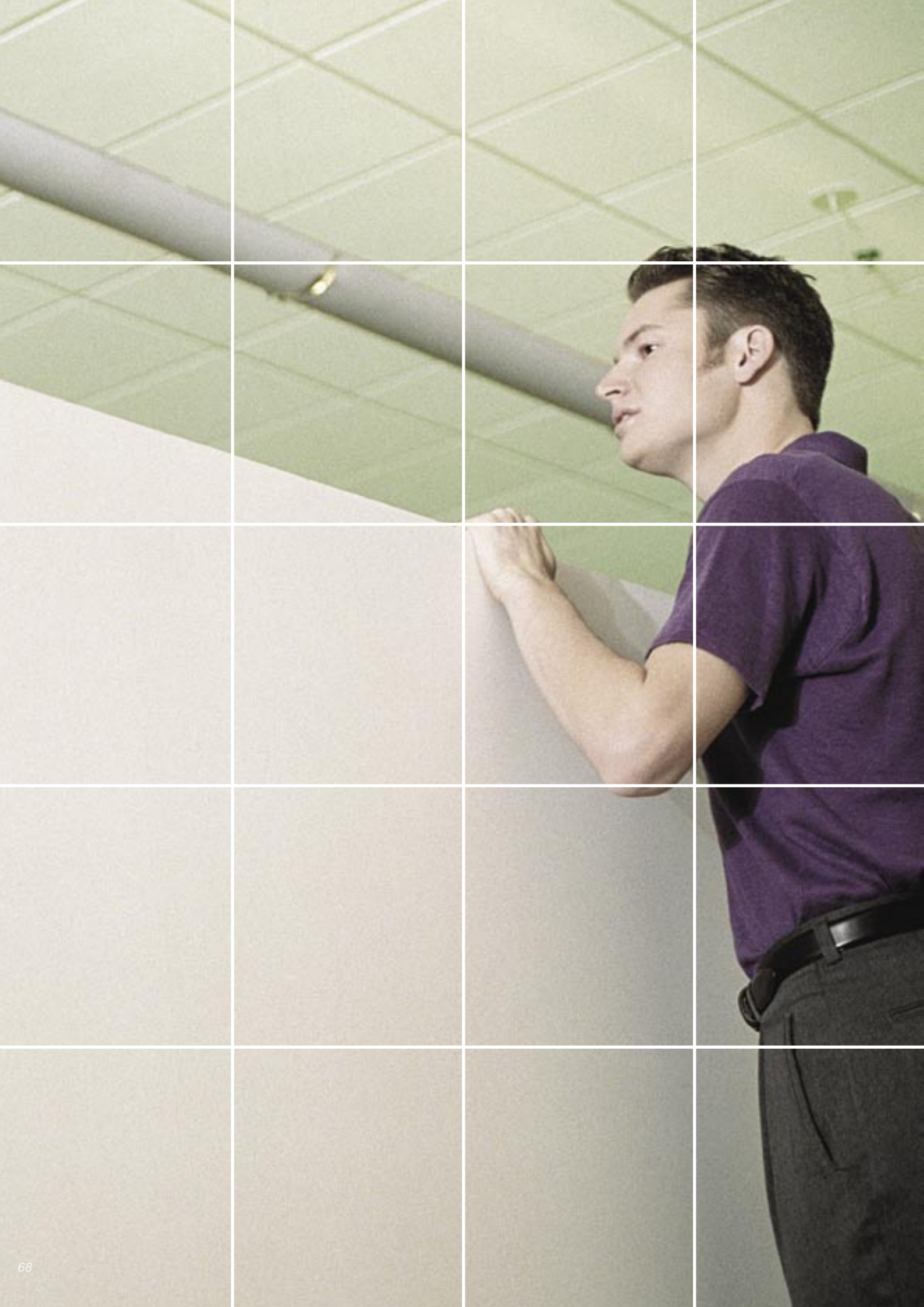
An overview of the Knowledge Management technology market

This section provides an analysis of the global Knowledge Management technology market. It is extensively based on a previously unpublished report by the IBM Institute of Knowledge-based Organisations (IKO) which was finalised and distributed to IKO member organisations in 2000.

In the face of increasing competitive pressures, organisations are beginning to identify how they can better manage their intellectual and information assets. Let's look at an overview of this knowledge-based era:

What leading analysts said at the beginning of 2000

- *Ovum projected the value of the KM software market would soar from US $515 million in 1999 to US $3.5 billion by 2004, while KM services would jump from US $2.6 billion to US $8.8 billion.*
- *IDC forecasted the worldwide KM market to grow from $2.0 billion in 1999 to $12.1 billion in 2003. They estimated that spending on knowledge solutions will grow sixfold between 1999 and 2003.*
- *Lazard Freres & Co. estimated that the core technologies directly associated with KM would grow from about US $1 billion in 1998 to over US $12 billion in 2003.*
- *Gartner predicted that by 2003, more than half of the Fortune 1000 companies would implement KM, and KM will be a mainstream business management practice among market leaders in all industries.*

Independent of industry, market, and profession, the heart of competition is the drive to be the best. We have moved from the era of the traditional industry-based business into the era of the knowledge/information-based business. In order to be the best, organisations have found it necessary to value assets, innovate, streamline working operations and procedures based on the intellectual processes of providing services and managing what they 'know'. As IDC succinctly states, this new era is:

"Characterised by markets that trade not on products and services per se, but on the degree to which suppliers understand how their customers benefit from those products and services. Thus, the new basis of competition is the knowledge gap between how well you understand your customers' businesses and how well your competition understands them. This depends on the efficiency of gaining and sharing expertise so that the cumulative expertise of the whole organisation no matter how large or widely dispersed is always available to every individual working for it, and by association, available to its customers as well."

Organisations that proactively tackle this knowledge gap by more efficiently enabling the knowledge creation process and make knowledge objects, in whatever format, discoverable, and through a human-centred approach transfer this knowledge in alignment with their cultural and business processes, will outclass their competition. These organisations are more likely to thrive in the new knowledge-based era.

Early adopters in the Knowledge Management domain were typically the information retrieval, groupware and document management vendors. Their products evolved out of a need to better manage and utilise the vast amounts of information available within an organisation. They mostly focused on the management of explicit forms of knowledge. In many cases, this has led to an over-abundance of data and information (comparable to the information overload on the public Internet), and hence the realisation that the traditional practice of picking up the phone to call a co-worker is still faster. We refer to this era as the engineering approach to Knowledge Management later in this study. What organisations are realising today is that even with a basic technical infrastructure in place there is still much the organisation does not know it knows. There is still much to be contextualised, used, re-used, shared, innovated and accessed and technology can help more as an enabler than as a pure technology solution. This more modernist view is described later in the study as a progression from the human-centred approach to Knowledge Management to the social complexity approach.

Erick Brethenoux, a leading analyst with Lazard Freres & Co., suggests that Knowledge Management can maintain its momentum while lacking a clear total technology solution because:

- *Pieces of the KM process actually rely on IT strategies to be efficient.*
- *Many techniques that were barely addressing few users' needs are now starting to scale at the enterprise level.*
- *Most of the KM initiatives now are not coming from IT groups pushing their technologies (which was initially the case) but from business units optimising their operations.*
- *The Internet wave has changed the way users communicate online.*

Currently, the market for Knowledge Management technologies is still fairly young. This market is clearly being driven by organisations' needs to connect disparate resources, including people. At the beginning of 2000, the Knowledge Management technologies market saw an increase in the number of start-ups with niche products targeting the Knowledge Management domain. These emerging niche product vendors offered products that provide users with add-ons and point solutions (component solutions) that enabled such functions as intelligent agents, push, collaboration, community, retrieval and classification. The dot.com bust in 2001 saw many of these niche product vendors, which were heavily reliant on venture capital and whose most important clients included other Internet start-ups, disappear from the market, either through insolvency or through being acquired by a larger player. One of the main reasons for this failure to survive is that niche and best of breed vendors failed to evolve their products beyond specialised functionality. Merger and acquisition activity persists and the KM technology market has converged over the last two years.

Additionally, the Knowledge Management technology market includes vendors with established product offerings, such as document management vendors. These vendors are adding features and launching new and upgraded products aimed specifically at the Knowledge Management technologies market. These, along with the more recently established portal product vendors, believe that they have consolidated and identified the customised and total KM solution. Their offerings enable a combination of functionality that, if proven scaleable and easy to integrate, provides an ideal solution for any organisation. In fact, it is this broadband capacity that seems to have brought some validity to the concepts of Knowledge Management by offering a tangible approach to harnessing corporate memory. But these vendors must package as part of their offering most, or all, of the common Knowledge Management functional attributes in order to be classified as a total KM solution/ product provider. Currently, there are no panacea products that assemble all the attributes required to support all the needs of every evolving knowledge-based organisation.

The portal offering has evoked some sense out of the fuzziness that has eclipsed KM to date by clearly and visually presenting a tangible reality around the practice of Knowledge Management. These portal offerings pledge to make accessible, via a single point of entry, all the disparate sources of knowledge and information within an organisation. It is this promise that appeals to the organisation that knows that the key to staying ahead in today's market is enabling access across the company to the information necessary for their employees to make tactical and strategic decisions. This pledge has triggered the portal craze, while also bringing validity to some of the concepts associated with Knowledge Management. But keep in mind, that although portals are being touted as the solution of choice, they must facilitate scaleable content depth and access breadth to be fully effective.

Furthermore, while many product vendors have incorporated KM into their marketing taglines, buyers should be sure of a product's ability to solve pressing business issues before they make a buy decision. Additionally, just as there are vendors who are using KM to their selling advantage, there are many products on the market that can significantly impact a KM programme that are not being overtly advertised as Knowledge Management enablers. Again, this is money in the bank for the services sector, which can, for the time being, rely on their ability to evaluate, select and align with business processes the product that best meets an organisation's needs while the organisation works to more completely understand the potential of KM.

By definition, technology includes the development of new materials, machinery and processes that improve production and solve technical problems. It is this definition that underlies the role of technology in the evolution of effective Knowledge Management. Therefore, the products or functionalities that enable Knowledge Management to improve and solve the flow of knowledge throughout an organisation are the ones that will see a future in this market.

Emerging Knowledge Management technology market trends

Current market activity reflects immaturity unbounded by some potential. This section is a compilation of the principal trends emerging in the Knowledge Management technology market.

The market for Knowledge Management, as we discussed earlier, is still developing and as Knowledge Management continues to mature so too will the tools and products available to support the concept. We have discussed the evolving market as it relates to Knowledge Management and have begun to outline some of the trends to follow over the next couple of years. Compiled below is a list of five major trends affecting the Knowledge Management domain: portal phenomenon, market convergence, XML and emerging standards, component offerings and service providers. These market trends represent analyst opinion, market observation and personal interviews.

Trend 1: Portal phenomenon

The surge of portal offerings hitting the market, to include enterprise, corporate, knowledge and e-business, has fueled new interest in the practice of Knowledge Management since the beginning of 2000. Portals, in general, pledge to aggregate all the information and knowledge from disparate sources within an organisation through a single point of access.

Over the past two years, vendors have touted their products as portals, declaring they offer multiple functions that support Knowledge Management (like collaboration, search and personalisation) through a single interface. While these products may in fact offer this functionality, it is premature to assume their success without more formal evaluation of their scalability and integration capabilities within a global organisation. We warned in 2000 that you should not look for one single vendor to provide all the functionality required of a portal architecture and framework, and that vendors would need to interface with present systems and competing products that are part of the portal infrastructure. This has indeed been the case. Vendors that attempted to provide total solutions have not achieved a dominant position in the marketplace. One of the leading and successful portal vendors in the early 2001, Epicentric, has recently been acquired by Vignette, another leading player. The leading document management vendor, Documentum, was acquired by EMC in 2003[77]. Other examples of solutions that provide portal and content management functionality are IBM's WebSphere, and Plumtree[78]. Multiple market offerings, for instance in multilingual content management solutions, that are not readily integrated with standard content management solutions, mean that further consolidation is likely and desirable from a customer viewpoint. However, with increasing pressure from the market to drive down prices, larger scale investment and the provision of totally integrated content management with multilingual functionality is some way off.

---

[77]   See www.documentum.com/news/announcements/emc.htm
[78]   www.plumtree.com/default_flash.asp

Organisations must consider the breadth of the Enterprise Information Portal (EIP). When considering portal technology, it is important that the portal strategy reflects a focused and more specific portal category, like Enterprise Knowledge Portals (EKPs), so as not to return to supporting traditional information management. If the goal is to better produce, collect, disseminate and manage knowledge, then it is the EKP space that best creates a knowledge competitive advantage. As the EIP space continues to mature, the trend to follow the identifiable and unambiguous subset of portals like EKPs will strengthen. This will be the future of the portal market. Additionally, because of the newness and expansiveness of this portal phenomenon, expect the market to develop further around customisation, scalability, industry verticals and enterprise requirements. The trend towards larger scale solution providers to integrate their current offererings with content management and portal solutions is proven by the fact that Peoplesoft, Oracle and SAP now rank among the leading solution providers[79].

Trend 2: Market convergence

As the previous trend suggests, the KM technology market is increasingly dominated by vendors that can supply an integrated suite of Knowledge Management services and products. There has already been extensive consolidation in the market over the past two years as vendors seek to acquire additional technologies to extend their own product offerings.

Large players have, and will continue to, positioned themselves as full scale KM solution providers, to include products and service offerings. Many smaller firms, as we have said before, have been absorbed by the larger consulting firms and Systems Integrators (SIs) as they look to launch their own KM practices or expand their own service offerings. Any small KM vendors will need to think carefully about how they position themselves, especially regarding partnerships with SIs, Independent Software Vendors (ISVs) and Value Added Resellers (VARs). It is these service providers that maintain the influential relationships with leading prospective Knowledge Management accounts. Small vendors will need to establish themselves as best of breed providers of distinct KM functionality that integrates well with other products and is supported by a strong set of partner relationships.

There will still be market space for innovative start-ups to emerge, although few will prosper in the long term as independent entities. In order for these innovative companies to survive, they will need to find a particular niche (such as vertical markets within specific industries) or gain enough momentum through an exceptionally innovative (patented or difficult to replicate) technology. These niche and best-of-breed vendors will need to evolve their products beyond specialised functionality. These niche players are attractive targets for acquisition. Examples of niche players offering innovative solutions in content and Knowledge Management are Knowledge Reef, Stratify, FAST, and iFramework[80].

79   See http://www.portalsmag.com/guide/#3 for an up-to-date list of solution providers.
80   See http://www.kmeurope.com/exhibitorslist.asp for more details of these solution providers and other similar emerging companies, These were all exhibitors at KM 2003 in Amsterdam.

Trend 3: XML and emerging standards

Initial standards are emerging that foster interoperability, particularly across search and retrieval products, as well as workflow tracking products. The emergence of standards will promote a common platform that simplifies integration and furthers connectivity between diverse sources of information.

Extensible Markup Language (XML), for one, is emerging as a fundamental enabling technology for content management and application integration. XML is a set of rules for defining data structures. Unlike HTML, which specifies the form of how things are presented, XML specifies the function of what things are. XML makes it possible for key elements in a document to be categorised according to meaning. It enables a search engine to scan a document for XML tags that identify individual pieces of text and image, instead of selecting and presenting a document based on a metatag found in the document header.

XML offers the possibility of a standards-based approach to integrating many aspects of Knowledge Management technologies. XML brings together structured and unstructured information handling. As KM works to aggregate all this information and data, XML works to categorise it. It enables advanced searching capabilities through a document's attributes, thereby increasing the speed and accuracy of searching. Ultimately, it will enable vendors to offer new levels of dynamic content generation, integration, interoperability and functionality through a browser interface.

XML is becoming one of the key underlying open standards which has provided a basis for specialist vertical solutions, as for example XBRL (eXtensible Business Reporting Language) and NewsML[81] (developed for the media industry).

- *The standard is recognised and supported by W3C.[82] In addition to providing standards for vertical solutions, XML is increasingly being used as the core open standard for personal productivity solutions such as Open Office[83], whose mission statement is, 'To create, as a community, the leading international office suite that will run on all major platforms and provide access to all functionality and data through open component based APIs and an XML-based file format'.*
- *The trend towards open souce/Open Standards (OSS) is having a strong effect in the European marketplace, with increasing numbers of proprietary system clients (mainly Microsoft™ Office) moving to OSS solutions.*

81   http://www.newsml.org/pages/index.php
82   http://www.w3.org/XML/#wgs
83   See http://www.openoffice.org/ for more information on Open Office applications and general information about the Open Office project.

Service providers will continue to play an integral role for organisations who continue to cope with the novelty of the conceptual models and basic principles of KM, who lack internal experience in creating KM strategies and projects, who struggle to understand the inflexibility of their existing systems and finally, who grapple with the 'option shock' of an immature product market.

Trend 4: Component offerings

While the market is evolving towards consolidation and integrated solutions, vendors will need to develop their product offerings so that they are component and modular-based. This approach will ensure maximum flexibility, integration and customisation with an organisation's legacy systems. Also, Knowledge Management products and other strategic solutions (like e-commerce, e-business, CRM and ERP) products have already started to blur as these products have similar underlying foundations and KM products become increasingly targeted at the business environment.

As vendors continue to develop innovative enabling technologies in support of Knowledge Management, they will be best integrated with other enterprise systems if based on a modular architecture. This is primarily important in evolving relationships with SI's, VAR's and ISV's who will play important roles in the integration, customisation and dissemination of products in this market.

Trend 5: Service providers

Knowledge Management service offerings include consulting (assessing, evaluating and planning), implementation, operations management, training and support. Service providers will continue to play an integral role for organisations who continue to cope with the novelty of the conceptual models and basic principles of KM, who lack internal experience in creating KM strategies and projects, who struggle to understand the inflexibility of their existing systems and finally, who grapple with the 'option shock' of an immature product market.

There are increasing opportunities for Knowledge Management specialists who can direct organisations through cultural and executive changes, vertical specialists who understand the value chain, IT service organisations who have the potential to deliver horizontal and vertical solutions, VARs who can develop innovative horizontal applications in areas such as product development, and outsourcing firms who can support the technical infrastructure needed to support KM strategy implementations. Examples of organisations that provide such expertise rank from large consulting houses, such as IBM Business Consulting Services, to smaller niche vendors, such as TFPL[84].

Also, increasingly organisations are turning to IT services and consulting firms to handle the day-to-day management of their KM technology infrastructure and applications. It is important to note, however, that the people and organisational processes of Knowledge Management must continue to be managed internally.

Additionally, although consulting services firms today present KM as a stand-alone offering, they are typically part of other engagements. But while KM has been viewed by many organisations today as enhancing other service areas, such as customer relationship management, ERP, supply chain management and e-commerce, it is already becoming an essential component of almost all types of services, rather than a separate entity or business discipline in its own right. This trend in our opinion is a sign of maturity in the industry. On the other hand, it represents a threat to smaller niche players who are finding it difficult to compete with larger players.

As the market converges, it is becoming increasingly difficult to quantify the market in terms of key players and size.

---

84 See http://www-1.ibm.com/services/ and http://www.tfpl.com

Why do we need to manage knowledge? - Views from the marketplace

Here we look at the key business issues commonly identified as problem areas within organisations today. These business issues have traditionally been the most frequent drivers of the practice of Knowledge Management and the need to implement a Knowledge Management strategy, programme and solution. In this section, through examining how knowledge activities impact these issues, we can get a clearer understanding of why the management of knowledge is such a significant part of an organisation's business processes and goals.

Aligning key business issues driving the market for Knowledge Management with what we do with knowledge (knowledge activities) illustrates the impact knowledge has on desired business outcomes. Table 1 illustrates how knowledge activities can impact common business issues. It clearly shows that Knowledge Management significantly addresses a broad range of business issues, some of which are not pervasively thought of as KM issues.

By exploring how knowledge activities impact key business issues affecting many organisations today, we can better see the interrelationships that exist between what we do with knowledge (we share knowledge), why its management is needed (reduce time spent looking for experts), and how technology can enable the knowledge flow (online community or expert directory).

Based on our descriptions from Fig. 1 (Knowledge activities), we have established a matrix that identifies the impact each knowledge activity can have in helping an organisation address common business issues or problems. Managing the flow of knowledge throughout an organisation by maximising an organisation's attention to knowledge activities can significantly affect the bottom line.

	Typical knowledge activities				
	Discover/ create	Capture/ collect	Organise	Share	Access
Reduce or control costs	•	•	••	•••	•••
Increase speed to market	•••	••	•••	•••	•••
Reduce time spent looking for information	••	•••	•••	•••	•••
Reduce time spent looking for experts/skills	••	•••	•••	•••	•••
Increase customer satisfaction	••	•	•	•••	•••
Enable and increase creativity and innovation	•••	•••	•	•••	•••
Retain knowledge, employee turnover, retirees, etc.	•	•••	•	•••	••
Capture lessons learned, best practices	••	•••	•	••	•••
Start new businesses	••	••	••	•••	•••
Operate in new markets - globalisation	••	••	•	•••	•••
New product development	••	••	••	•••	•••

Common business issues labels the row group.

Table 1: The impact knowledge activities can have on addressing an organisation's common business issues. ••• Significantly impacts, •• Moderately impacts, • Little to no impact

Table 1 displays the impact managing the discovery/creation, capturing/collecting, organising, sharing and accessing of knowledge in an organisation can have on any number of strategic business issues that might be identified as paramount problem areas.

To explain further what we mean by this, consider the issue of retaining knowledge, employee turnover and retirees. One can recognise almost immediately the value in being able to gather, compile and store the experiences, insights and hunches of employees, teams and groups in a repository so that when needed (if they are not available or no longer with the organisation), they can 'virtually' be called upon for reference. Thus, the knowledge activity of capture/collect significantly impacts the successful retention of knowledge in an organisation due to typical workforce attrition, workforce reductions or retirements. The implication is that if an organisation can better manage the activity of capturing and collecting knowledge - codification of knowledge - then it can increase its competitive edge and avert the risk of running into a situation where no one internally can respond.

Take the following examples:

- *Ford - New car developers wanted to replicate the success of the original Taurus design team. However, no one remembered, or had recorded, what was so special about that effort.*
- *International Harvester - Russian officials approached the company about building a new truck factory. They contacted Harvester because it had built a plant in Russia twenty years earlier. However, there wasn't a single person still in the organisation who knew anything about the previous project.*

These two examples validate why the activity of collecting and capturing knowledge can be so important. If either of these two companies had gathered and documented the information, they might have closed out the year with substantially higher revenues/profit margins and would have been better positioned to respond to any number of situations that could have been leveraged from capturing this knowledge.

This leads us into the how. How do we get at this knowledge? The above examples confirm that Knowledge Management should be deployed as a combination of culture, process and technology. Implemented independently, none of these would not have been enough. Simply creating a database or repository for the storage of best practices, will not ensure submission and participation on the part of the knower. However, for the purposes of this report, we continue our focus on the technology portion of KM.

To this point we have worked to establish a framework based on knowledge activities and their relationship and influence in affecting key business issues. We know that as individuals we "do" different yet common things with knowledge - at different times of the day, in different parts of the world and most importantly, in different contexts. Understanding the interrelationships and interdependencies that support knowledge flow is essential to accepting the practicality and magnitude of introducing the practice of Knowledge Management as a key strategy for achieving competitive advantage.
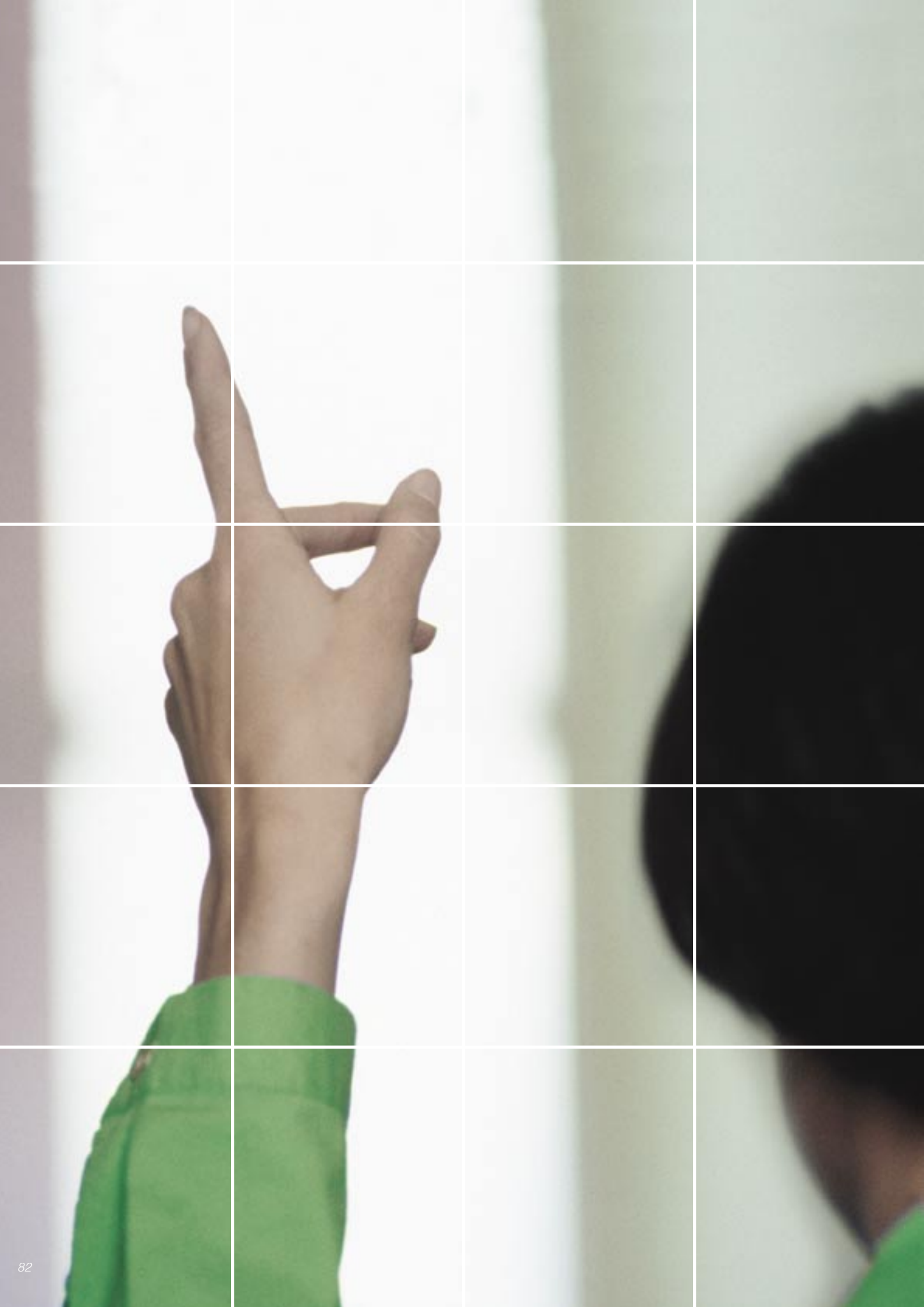
How do we 'get at' this knowledge?

This section will explore how we uncover the knowledge needed to enable effective business decisions. If we can evaluate and understand the flow of knowledge throughout an organisation in relation to our key business issues, then when it comes to technology, all we really need to know is how significantly a product's functional attributes align with an organisation's knowledge activities. Therefore, a product defined by its functional attributes as supporting agents/push, collaboration, personalisation, user interface and visualisation, can have significant impact on the knowledge activity of sharing and access, while perhaps only a moderate to slight impact on the activities of discover/create, collect/capture and organise. This approach to product evaluation allows us to align a product's functional attributes with the impact that product has on the flow of knowledge throughout an organisation.

As we've established, successful Knowledge Management is accomplished through a combination of business process, organisational culture and technology. Relying on and implementing one of these as an independent solvent to addressing business issues is like interpreting a puzzle with a few significant pieces missing. You might think you've interpreted the full meaning, but most likely you haven't uncovered all that is there - the true value and meaning. You haven't aligned with your strategy or really captured and enabled the successful flow of knowledge. You haven't finished the puzzle.

Leading Knowledge Management pioneers recognise the significant impact technology is effecting on this evolving knowledge-based era. As Davenport and Prusak say:

"Since knowledge and the value of harnessing it have always been with us, it must be the availability of these new technologies that has stoked the knowledge fire."

So how do we deal with the surge of technologists who claim to offer Knowledge Management products? How do we know if their products are true knowledge enablers?

Products are defined by their function. There are certain functional attributes that best enable Knowledge Management. Below we have identified a list of the most common attributes. In Appendix B, we have profiled and inventoried over 100 vendors and their products. Each product has been assessed using this list and each contains combinations of these functional attributes. It is these combinations of functional attributes that significantly impact knowledge discovery/creation, capturing/collection, organising, sharing and access.

Common Knowledge Management functional attributes

- *Agents/push: The transparent delivery of relevant content to users to support gathering, delivering, categorising and profiling of information as it arrives and according to the user's preference. Agents are usually initiated by the information server rather than by the information user or client. e-mail is a form of push technology.*

- *Categorisation: The classifying, indexing and grouping of content according to predetermined taxonomy hierarchies in near realtime, such as tagging news feeds for distribution throughout an organisation.*

- *Clustering: The process of grouping collections of documents dynamically based on common themes or patterns. Clustering can extract dominant themes within a set of documents and then group the documents according to those themes. Clustering algorithms can also be used to generate an initial knowledge map or corporate taxonomy automatically.*

- *Collaboration: The effective means of transferring or sharing know how from e-mails, documents, drawings, data tables, multimedia between individuals, groups or the enterprise independent of physical locations, and in both synchronous and asynchronous modes. This includes groupware and e-mail.*

- *Communities: Enabling a self-organised, deliberate collaboration of individuals who share common practices, interests or goals and want to advance their knowledge. This can include communities of practice or interest, discussion groups and bulletin boards.*

- *Conferencing/whiteboarding: Enabling the synchronous sharing of documents, text or video with a group/team. Conferencing can support both scheduled and spontaneous sharing of information, ideas, knowledge and expertise.*

- *Data mining: Uses algorithms (usually proprietary) to analyse the aggregation of data and meta data across structured and unstructured repositories (often large volumes of data) to uncover relationships, patterns or visualisations which may not have been evident from just listings or summaries of the data.*

- *Data warehouse: A separate, centralised or integrated repository for all, or significant parts, of the data that an enterprise's various business systems collect, which is optimised for data retrieval and storage.*

- *Distance learning: Enables and extends the transfer of contextual, tacit and explicit knowledge and skills, despite physical location.*

- *Document management: A family of applications that facilitate the management of compound documents, including storage/archiving, cataloguing/indexing, search and retrieval, analysis, workflow, routing, aggregation, diffusion and distribution.*

- *Expertise/skills location: Enabling people/users to find the leading sources of expertise available to the organisation - both internal and external - on a given subject. These systems can include expert/skills inventory databases, yellow pages or directories, project participation or monitoring a person's activity.*

- *Linguistic/semantic analysis: the break down of existing full text indexed repositories on the basis of word meanings and associations at the document, repository, and global levels. This includes corporate thesauri, word stemming, inflection, compound word, phrase analysis, etc.*

- *Messaging: enabling users to engage each other for synchronous dialogue, file transfer or other form of exchange in realtime.*

- *Metadata management: the management of 'data about data'. The process of capturing data like title, author, location, date of creation and so forth adds context to the information being described.*

- *Natural language query: enables users to ask questions to a system the way they would ask them to a person.*

- *Personalisation: the subscription to information by a user based on his/her preferences and interests.*

- *Search: Query-based approach to discovering content across multiple sources. Search has evolved over the years to include the sophisticated advancements in linguistic analysis, natural language queries, user profiles and contexts.*

- *Taxonomy/mapping: The process of guiding, inventorying and categorising or associating complex documents (both internal and external), information or knowledge sources through hierarchies of words, meanings and associations. This is essential to maintaining an accurate enterprise repository (or data warehouse) and can be maintained or generated both manually and automatically.*

- *User profiling: The chronicle, collection and administration of information about a user, such as job title, department, skills, expertise, authorship, access rights or role in process. This information is used to feed agent technology and document management systems.*

- *User interface/portal: The access capability, entry point and presentation of the corporate memory. Typically, access is offered through portals, intranets and extranets.*

- *Visualisation: The graphical representation of massive volumes of information that link the interrelationships of content.*

- *Workflow management: Enables the tracking/management of task-based work processes through an online, virtual community.*

With the Knowledge Management technology market growing as it is, and product functionality assimilating into core features, we will begin to see these attributes merge and fall from the list, as well as new functional attribute additions to the list.

Additionally, as with all systems whose goal is maximising organisational efficiency, there are some fundamental elements required of Knowledge Management product offerings to ensure that a successful and usable solution can, and will, be implemented. These technologies must be easy to use, easy to integrate, scaleable to the enterprise, easy to access, customisable, measurable, usable and secure. The applicable integration of these elements will contribute to either the success or failure of the Knowledge Management system. It is imperative to the success of a Knowledge Management system that:

- *Everyone in the organisation knows where to go to find the organisation's knowledge.*
- *All individuals are able to use the knowledge in the context that is right for them.*
- *All knowledge is available and accessible, independent of physical location.*
- *All knowledge is relevant, current and directed.*

These functional attributes enable, from a technical perspective, the flow of knowledge throughout an organisation. They cross-identify products by function and impact on knowledge activities so that a Knowledge Management decision maker is better equipped to choose the products that best meets the need of the organisation.

Leading Knowledge Management pioneers recognise the significant impact technology is effecting on this evolving knowledge-based era.
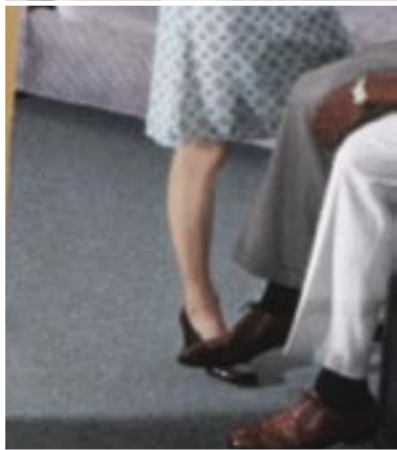
Product vendors that enable Knowledge Management

In the following pages of the study, we provide an overview of leading Knowledge Management vendors and their products. The list of vendors (provided at Appendix 6) was put together in early 2000 as part of a report published by the IBM sponsored IKO (Institute for Knowledge Management). As part of this overview, we provide a list of Knowledge Management product vendors in Appendix 6 and their main strengths. We have also provided an update what has happened to these companies since 2000. The products profiled for this report were compiled from sources including the Web, analyst reports, news items, interviews and word of mouth. The products included are not just those touted as strategic Knowledge Management products by the vendors themselves - they were chosen objectively to represent the products that best support the generation, codification and transfer of knowledge.

The Product Profiles have been organised within a framework that is based on the product's combination of functional attributes and the impact of that product on an organisation's knowledge activities. Instead of presenting these technologies within a categorised framework like document management, collaboration and so forth, we offer a schema that links the product to the flow of knowledge and hence to an organisation's overall desired business outcomes. Therefore, it is within this framework of activity and function that a Knowledge Management decision-maker will be able to quickly assess and identify possible technologies to address and meet an organisation's driving business needs.

Update and trends of vendors and service providers in 2003

The previous sections were based on an extensive survey carried out by the Institute of Business Value, which was supported and carried out by IBM in consultation with industry in 2000. As part of this study, we conducted a post-analysis of the vendors and solution providers that featured in the original report and are listed earlier. We examined the following questions: Does the organisation still exist today? If not, what has happened to it (takeover, merger or liquidation)? Is it Europe-based?

Of the 118 vendors and service providers surveyed, 42 or 35 percent no longer exist, having either been acquired or having merged with another company. This supports our argument in this study that there has been entropy in the marketplace of providers of Knowledge Management solutions in the dot.com bust era (2001-2003).

**Companies surveyed in 2000
(total 118)**

■ 42 or 35% no longer exist
■ 75 or 65% still exist
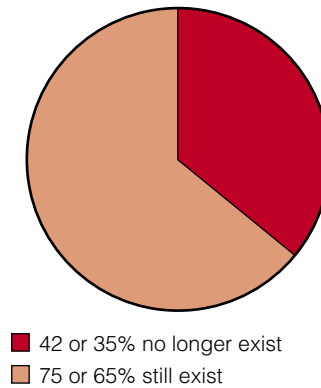
In the original study, a large majority of vendors were US-based. Looking at the organisations from today's perspective, the situation has not changed. Of the current population, 34 or 28.8 percent are predominantly US-based with no European operation. Only 9 or 7.6 percent are of European origin.

**Where KM companies are based
(from analysis in this study)**

■ Only 28% are of European origin
■ 72% US based
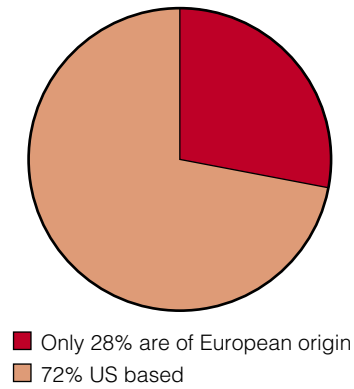
65 percent are global in their operations, with at least US and European sales offices and/or research and development facilities.
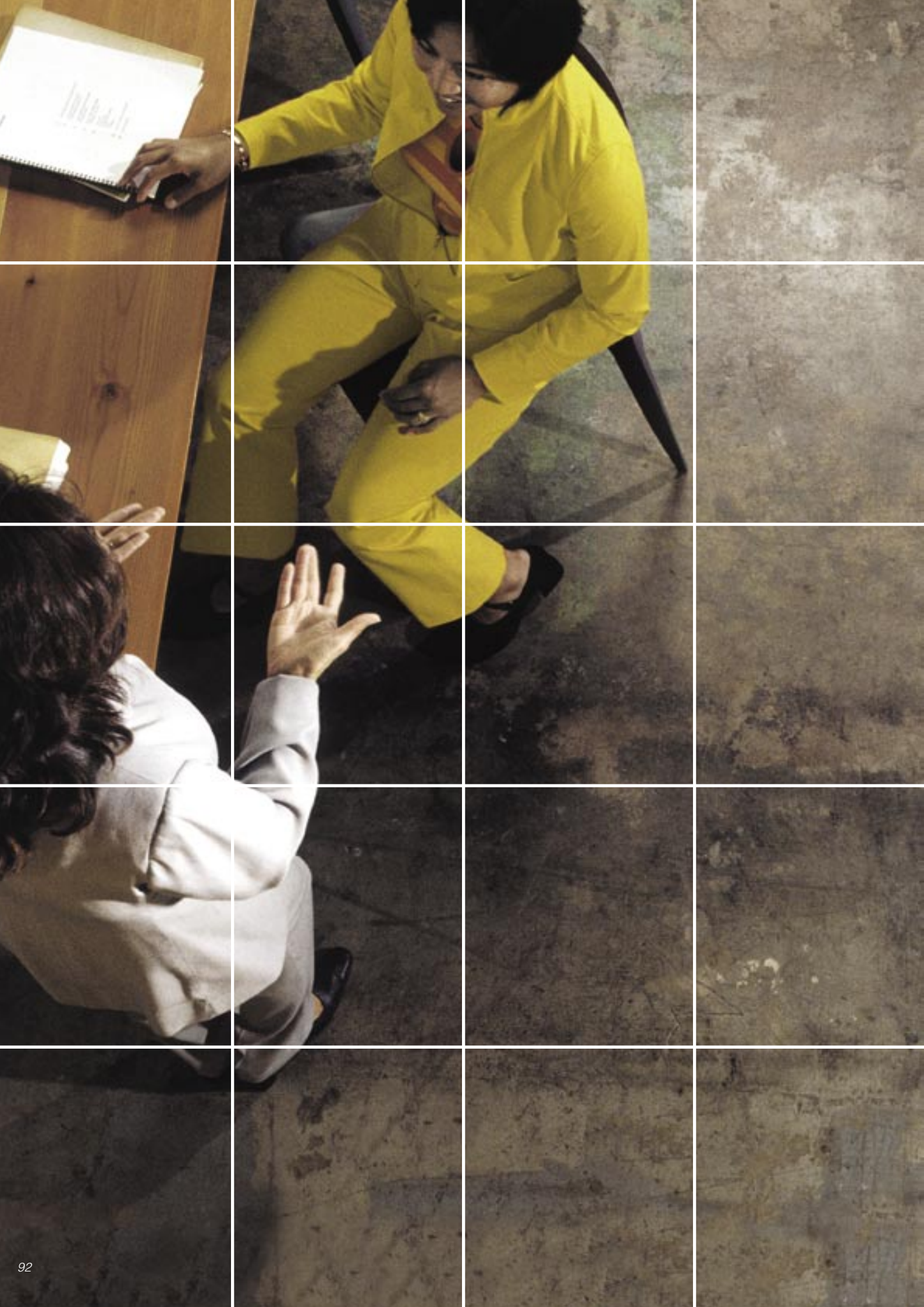
2010 scenarios for Knowledge Management

In this section we describe both the method we used to construct the scenarios for Knowledge Management in 2010 and the model we developed as a conceptual framework for the scenarios.

Method

We opted for a scenario building approach in the study based on expert opinion and research because of its many advantages. These include:

- *Forward looking visionary thinking based on qualitative approach*
- *Potential involvement and interest in participating from top tier thinkers and KM experts can influence thinking in catalytic manner*
- *An innovative and creative approach*
- *Using the latest KM techniques to achieve the objectives.*

The method we used for generating our scenarios was:

- *Selection of KM thought leaders for close consultation (the KM expert panel) from academic and business organisations (from both demand and supply sides). These experts were chosen on the basis of their status not only as practitioners but also as influential figures in Knowledge Management research.*

- *Engagement with the panel of experts through multiple communications to raise questions and explore possible issues (final stage was the carrying out of 10 semi-structured interviews which were recorded and transcribed for analysis, then analysed using 'mind maps' and text mining techniques)[85].*

- *Collation and analysis of interview results and combination with other inputs - further consultation within project team, identifying recommendations and exploring further possibilities. The experts' database which was extracted from the transcripts gave us an extensive set of future concepts to consider based on their learning from experience, and their perceptions of future trends and possibilities. Our task, as we saw it, was to acknowledge that diversity of experience whilst offering a cogent, yet succinct formulation to the European Commission and other readers of our report. We were also able to draw on our interview data in formulating questionnaire items that would analytically validate and develop our contentions. Development of numerous grounded axial codes, such as objective-subjective/certainty-uncertainty then design-emergent and rule-heuristic, to be used to form coordinates for the scenario grid.*

- *Building 2010 scenarios based on expert opinion, the current state of KM and other empirical resources (academic papers). We organised various workshops in London and several conference calls in order to depict all our scenarios. We drew on a number of published and unpublished scenario creating methodologies so that the team had a common language and shared process concepts.*

---

85   This technique corresponds very closely to the Complexity Research methodology which is described in Finland Futures Research Centre publication 6, November 2003 in an article by Eve Mittleton-Kelly entitled "Approaches and Methods: the LS Complexity Group Integrated Methodology". Mittleton-Kelly uses a similar approach in terms of the interview structure, the timing and the resulting analysis though narrative. According to Mittleton-Kelly, this form of exercise identifies "common themes, dilemmas and key questions".

The leading Knowledge Management thinkers interviewed were:

- *Steve Denning, former CKO of World Bank*
- *Elisabeth Lank, former CKO of ICL, independent researcher and consultant, expert reviewer for FP5 projects and creator of Knowledge Cafés*
- *David Ewebank, Chief Knowledge Officer of Aventis*
- *David Gurteen, researcher and practitioner who runs the Gurteen Knowledge Newsletter, the largest Knowledge Network in the world (this network was used in the study to gather wider opinions)*
- *Peter Schuett, researcher and author of leading German Knowledge Management publication*
- *Joseph Horvath, Chief Knowledge Officer of Millennium Pharma, researcher and author of leading publication on tact knowledge*
- *Steve Barth, researcher and editor of largest Knowledge Management journal*
- *Victoria Ward, founder of Spark Knowledge, former Chief Knowledge Officer of Natwest bank and researcher into the relevance of Knowledge Management for not for profit organsisations*
- *Nancy Dixon, University of Chicago, independent researcher and author of Common Knowledge*
- *Dave Snowden, University of Cardiff, Director of the Cynefin Centre, IBM.*

In applying scenarios, it is important to note that scenarios do not predict the future. They are created to support and facilitate thinking about the future. We believe that our scenarios have demonstrated a capacity to promote discussion and exploration of likely futures for Knowledge Management. We recognise that alternative scenarios could be constructed using different assumptions. No single paradigm (set of values and assumptions about the world) can take a dominating position over others in the theoretical sense - though in practice such singularity of mindset is quite common. We propose to continue to evolve our thinking about KM by seeking to understand other viewpoints and to assimilate their implications for our scenarios as we learn more.

Results

Scenario building

From the 'Current state of Knowledge Management' section, the following points are important for the creation of 2010 scenarios:

- *Knowledge Management has an active history of approximately 7-8 years. The discipline emerged around 1995 with the publications by Nonaka and Stewart.*
- *There are now different schools which are highly divergent in their focus and different related activities. This means that the term Knowledge Management is very difficult to define since there are many interpretations, ranging from the traditional technology/engineering focus dominant in the mid-90s through to more sociologically oriented approaches.*
- *The current consensus position which we have defined (see diagram below) is represented by the scenario 3 in the middle. This represents an area of work where Knowledge Management itself is a label which creates enthusiasm, however the best practices approach and methodologies used, described in much of the literature and employed by many consultancies, are not likely to provide competitive advantage to Europe in the future, due to their lack of research background and conceptual robustness.*
- *The reason for this is that they are developed for, and aimed at, large enterprises and as a result, are frequently dependent on enterprise level IT infrastructures, operating within organisational firewalls. They frequently prevent inter-organisational networking and do not take cultural diversity and multilinguality into account. They are largely irrelevant to SMEs.*
- *The lack of conceptual roots to the current consensus position is a major issue, as it seems to fluctuate between different fashions and it is difficult to see it avoiding the traditional fad curve of decline.*
- *As (or if) Knowledge Management matures as a discipline it may move from the centre to one of the extremes - there is some evidence that engineering and mathematical approaches are starting to dominate. It may fragment into different things as well, some of which will not be called KM representing aspects of all five scenarios.*
- *There will be overlaps and compatibilities as well as incompatibilities.*
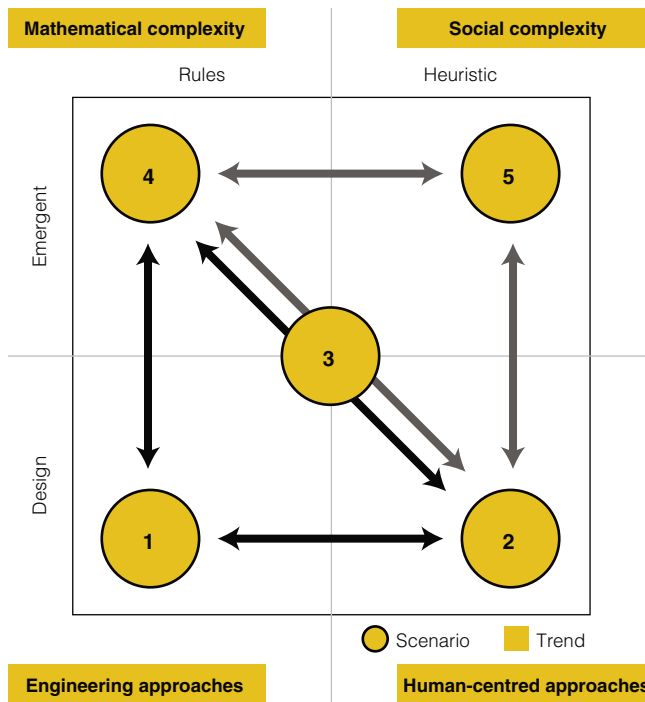
Figure 1 - KM Scenarios for 2010 as a result of the expert panel and research

Fig. 1 provides a graphical representation summarising the results of our analysis. We have identified five different scenarios for Knowledge Management in 2010, which are represented as circles, numbered and positioned on the matrix according to their affinity with different Knowledge Management extremes. Scenario 3 has no particular affinity and is thus placed in the middle.

The different scenarios are:

1. *Engineering approaches*
2. *Human-centred approaches*
3. *Consensus approach*
4. *Mathematical complexity*
5. *Social complexity.*

The matrix in Fig. 1 shows a fundamental distinction in the nature of order in organisations between the design approach and the emergent approach. These are matched against a distinction between rule and heuristic-based approaches to business design.

By design, we mean the ability of a leadership group or consultant to stand outside the system and design the system as a whole based on designed outcomes, gap analysis etc. In contrast, in the emergence approach, the system cannot be understood or managed as a whole, but only through the interactions of the agents (people, processes, technology, government etc.).

Rules which could equally be described as 'process' remove ambiguity. Heuristics, which could be restated as 'values' provide direction, with a degree of ambiguity. The result of the latter approach is that there are a range possibilities, there is no best practice.

Each of these scenarios is described in more detail later in this section, in terms of what would happen in 2010 if this approach dominated, what the effect would be on European industry and what the effect would be in terms of European competitiveness. The scenarios are positioned on the matrix to show the affinity of each scenario with different extremes which have emerged from our analysis.

The blue arrows and resultant bottom left triangle represent the traditional approach to Knowledge Management. The orange arrows and top right triangle represent future directions of Knowledge Management.

We propose to continue to evolve our thinking about KM by seeking to understand other viewpoints and to assimilate their implications for our scenarios as we learn more.

These five scenarios are summarised in the table below and interpreted in terms of how each extreme will affect Europe, in terms of: impacts on decision making in business organisations, effects on innovation, how this impacts organisational forms, what the implication is in terms of European R&D, and, finally, what the future opportunities and threats are for Europe.

	Engineering approaches	Human-centred approaches	Consensus	Mathematical complexity	Social complexity
Decision making	Process and expert-based, focus on best practice, strong technology element with a focus on technology-based interpretation of data Categorisation and best practice	Based on vision and values, recognised strong human element. Directed by leaders who stand outside the system and make judgements based on stakeholder interests such as good practice	Muddles along generally based on consensus Pragmatic, rooted in practice, transferring things that worked between engagements Not conceptually rooted, based on fashion	Extreme form of engineering, use of agent-based models and increasing technological sophistication. Heavy emphasis on simulation, danger of confusing simulation with prediction	Sense making of boundaries between systems. Allows space for best, good and worst practice, but in human interactions focuses more on pattern management with humans augmenting machine-based decisions
Innovation	Resource and time-based, rooted in traditional view of management, focused on goals, almost an imperative for any organisation to address	Focuses on creativity and inspiration Use of disruption to break boundaries Recognises the potential of double loop learning for creating new ways of working	Suggestion boxes and multiple programmes, accidental use of starvation, pressure Picks up on aspects of all other approaches but not in a sustainable way	Similar to engineering, increasing focus on artificial life to create novelty (life contrasted with intelligence which is more an engineering concept)	Boundary-based, differentiates eureka (requires linkages to be loosened to allow new patterns to emerge) from incremental innovation (as engineering). Use of starvation and pressure as part of design
Organisational form	Functional Strongly designed normally hierarchical	Matrix Strong focus on leadership and acceptance of leadership values	Constant switching, central control to distribution, hierarchy to matrix. As each fails another is tried	Self-organising Discovery	Managed coalescence Direction through boundaries and attractors
R&D focus by EU	50 percent of budget, focused on known issues	Limited, but current funding mechanisms OK	Fluctuating, tends to consolidate existing practice or imitation	Need for investment on basis of controlled portfolio, current mechanism OK	Needs new models as highly emergent and current funding model and practice will not satisfy
Opportunities for Europe	None - US will dominate and Europe will always be second best	Some, but US is strong and has created a whole industry of guru led movements around this	No advantage to anyone as going nowhere	Diversity of expertise could be advantage to Europe as this will be strong US almost certain to dominate	High, cultural incompatibility with US, compatibility with ethnic diversity of Europe and Asia, main current centre in Europe (Cardiff) although US funded
Dangers	Second-rate follow on	Guru base does not suit European temperament	Most likely state given the decision process and funding in Europe	Danger of loss of talent to US as funding easier and personal reward higher	Fails to recognise value of engineering and mathematical in a holistic approach

Each section will now be described briefly, in terms of the European position in 2010.

Scenarios

By 2010 the engineering approach evidenced by Siemens in Europe and other large Europe-based multinationals such as British Telecom and British Petroleum has established itself firmly as a hygiene factor in good business management practice. Having established by 2003 an extensive and deep set of communities of practice within the company and across the world, organisations such as these were well positioned to apply the same basic processes, suitably scaled down to meet the needs of its many thousands of SME customers as the latter came to appreciate the direct benefits on sales, costs, quality, and innovation from a strongly technological form of Knowledge Management.

The engineering approach had been developed in the late 80s and early 90s by American organisations. Europe is still playing catch-up and is unable to gain any competitive advantage from this approach. There has been a reluctance to allow this approach further space in the organisational agenda because of the perceived risks to innovation, flexibility, and individual freedoms. SMEs have attempted to use only those highly specific forms of the knowledge field that support their basic need to be responsive to large companies and markets.

Having established the basic disciplines of in-company Knowledge Management as a series of top-down processes related to strategic business alignment in behaviour, culture, technology and knowledge content, the attention of leading practitioners and policy makers turned increasingly to collaboration. The first place where major developments had taken place was in the Web of relationships surrounding the focal enterprise. That is, it became

common for all stakeholders-suppliers, partners, customers, local authorities and beneficiaries to be able to share the same knowledge system and to interact easily and effectively with one another. Uniformity became the norm, producing temporary but not sustainable competitive advantage.

As the dominant model of knowledge in business and government, the engineering approach was attended by recognition of the dangers of ossification through standardisation of process at the expense of responsiveness and innovation. Licensing of practitioners had become common, along with lengthy qualification programmes and sub-disciplines of specialisation. Technology continued to stimulate dynamic change by continuously extending the range of possibility and introducing numerous unintended consequences into the system.

> **Scenario 2 - Human-centred approaches**
> **KM dominated by social perspectives (post-managerialism)**
> The social school does not accept universality of the engineering approach since the system cannot be conceived as a machine. The underlying nature of human behaviour within complex organisations precludes this view from the start.
>
> Because, to the social school, there are no completed pictures of the world, any approach that assumes such is rejected. There is a strong human element in the social perspective approach, which values creativity and inspiration. Humans are part of the system to the core, which accounts for the strong emphasis on individual leadership and matrix-based organisational structures.

This approach therefore adopts a considerably more radical approach to the human aspect than the scientific approach. People and social interactions form the basis, means and ends of the Knowledge Management programmes.

By 2010, the course of primarily technical advances in Knowledge Management had achieved most of the original goals set for it by its practitioners. Most large and medium sized companies, and many smaller ones, were now able to create, install and maintain an up-to-date knowledge system to meet their important business needs. These tended to include detailed information on customer behaviour patterns and characteristics, highly automated data transfer and rapid re-scheduled and flexible production/service delivery methods. Accuracy and speed of response at low cost were now taken for granted in all sectors of the economy in most parts of the world.

Similarly, the people organisation and management aspects of Knowledge Management had improved rapidly over the decade. Firstly, standards had been introduced in all areas of development and training. For each job and role it was now possible to establish measures of effective work performance and to institute a range of blended learning approaches to rectify any training gaps. Technology had assured managers of data on which to base their HR decisions for many years, but now it gave them flexible means of meeting HR needs in a commercial timescale.

Secondly, organisations had commonly become more extroverted. Rather than working almost entirely on internal control mechanisms around steady state equilibrial, progressive organisations had now realised the benefits of effective global relationship building. Very large organisations had long been conglomerates and were now moving in the direction of extremely large global projects to create and disseminate science-based innovations across the spectrum from pharmaceuticals and defence, to urban-rural development. Higher levels of systemic understanding now enabled such companies to exert positive and dynamic changes in greater appreciation and avoidance of unintended side effects. Smaller organisations had become adept at fostering international collaboration projects which had transformed their earning capacities and ensured the survival of those that had been able to adapt sufficiently quickly to avoid the fallout from more intense competition.

However, this development was paralleled in the US and in the growing markets of Asia Pacific and the brain drain to the US has increased with Europe acting as a low cost ideas factory.

At the micro level of within firm Knowledge Management, more effort now went into the qualitative aspects of relationships and knowledge creation in support of one major (meta) competence innovation. The rate of innovation had so increased by 2010 that knowledge systems were now used to protect inventions (predictive patenting), to prevent over redundant duplication elsewhere in the same concern, and to ensure market niches did not close before earnings exceeded necessary rates of return. In the not for profit sector, now considerably larger than manufacturing in most areas of Europe, Knowledge Management had become a force for the restoration of meaning and identity in embattled communities ravaged by poverty, disease, war, drugs and other ills. Networks of networks and communities of communities were now so well linked that every field worker in Europe, and many beyond, was able to call down knowledge support in almost all areas of their work funding bids, cross boundary collaboration, education and training for workers and clients, service innovation experimental data and expert resources. The dominant metaphor had become international social integration based on inter-agency collaboration informed by up-to-date intelligence.

Scenario 3 - Consensus approach in between the poles

The engineering and human-centred approaches to Knowledge Management and the different perspectives are two extreme poles. In most cases, but not all, Knowledge Management thinkers and practitioners do not work entirely at the ends of the poles. We develop later in this document a more sophisticated model that incorporates four poles and we place major schools of thought within them. In this way, the current situation will be seen as a very diverse range of perspectives and approaches.

We highlight the following two considerations related to the picture drawn so far.

These poles have created a set of dichotomies in Knowledge Management thinking. These are sometimes addressed in the literature but are often hidden or tacit.

Consulting firms, especially those from the big five and some academics (with a strong case study background), adopt a consensus approach taking elements from the KM pot based on project empirical results and best practice. Unlike the extreme poles, the consensus approach lacks a distinctive conceptual foundation and therefore will fail to provide a sustainable approach to KM.

Scenario 4 is deliberately not fully expanded as a scenario in its own right, since it is more of a black hole without any clear identity. The consensus approach is characterised by a middle-of-the-road risk-averse strategy that has traditionally been adopted by business organisations and is well documented in the vast array of publications on Knowledge Management that have appeared in the last 5 years, as well as in some postgraduate university courses. The consensus approach lacks innovation, and though it may be apt for larger organisations who have yet to embark on KM, it is no longer a differentiating factor and is largely unsuited to European organisations and small and medium sized enterprises (SMEs).

Scenario 4 - Mathematical complexity

Similarly to the engineering or scientific approaches, mathematical complexity is dominated by a belief in the ultimate success of a predominantly technical approach in predicting and modelling complex situations. The application of ontologies and semantics combined with Artificial Intelligence and use of agents leads to the development of intelligent knowledge applications that support decision making and intelligence gathering operations, as well as business processes. However, the use of Artificial Intelligence and agent technology faces specific problems in terms of confidentiality and privacy in Europe. Trade union resistance and European data protection legislation mean that such tools and applications are frequently contrary to legislation and if there is awareness of what intelligent agents do, to social acceptability.

By 2010, Knowledge Management had moved out of the static and intuitive paradigm that had evolved since Sveiby's seminal work in the 80's. Interdisciplinary contributions from mathematics, language, computing and social science, had by now combined in variety of fruitful ways, especially at deeper levels of analysis than everyday behaviour understood in the common sense . Not all of these achievements were visible or known to most practitioners but nonetheless constituted an intellectual asset for the European Community. Several major centres for Artificial Intelligence had grown up in Europe and now presented a significant economic force to the rest of the world, many of whom collaborated with these Europe-based specialists in scientific, technological and business solutions. One of the dynamic forces in this development was investment by the European Community in continent-wide projects to create new sources of competitive advantage in software production and application. Drawing on open source software and later ecological methods, the European teams were quickly able to establish multilanguage expertise in the invention of discovery-based, intelligent agent software.

Increasing automation as a result of agent-based development creates increasing levels of unemployment and becomes a social issue. And Europe fails to create a cultural differentiator for itself.

Unfortunately for Europe, much of its potential competitive advantage in this field was counter-balanced by increased US defence systems spending and the production alliances it spawned. This meant that US and European leaders chose an intensely collaborative path in this the greatest single field of scientific investment in the world. Whilst there were many parallel and consequent civil spin-offs from this work, these were not sophisticated enough, or large enough, to constitute a unique knowledge asset for Europe. Europe was also reluctant to place too much emphasis on competitive strength given the apparent interdependencies in the world and was more inclined to collaborate in joint ventures with other sub-continental groups such as China and India.

As Europe increasingly unified and extended its political scope with the accession of more new states by the end of the decade, the home market for the results of the mathematical scenario were increased, lowering costs and raising profitability. Gradually this fed back into higher levels of investment, and it is possible that in the next ten years to 2020 Europe will be able slowly to differentiate its offering from the US. Notable civil applications include learning for all and support for an ageing population. Substitutes for high cost labour and for personal services in remote locations appear likely candidates. These may then engender commercial opportunities in transfer of such technologies to other world regions.

A risk throughout the decade was of losing key skills to the US. Europe to some extent resolved this by increasing supply and maintaining attractive cultures for research and development. Yet it was never fully addressed.

Scenario 5 - Social complexity

Similarly to the human-centred school, social complexity does not accept the universality of reason and the predictability, which is fundamental in the engineering approach since the system cannot be conceived as a perfectly functioning and stable mechanism.

Since the beginnings of management science, there has been unquestioned belief in certainty, rationality, control and linearity, or to put it a different way, in an ordered universe.

Social complexity perceives the world as less certain, less rational and less controllable[86]. Since there is greater complexity in settings where strategic decisions are made and implemented, different factors need to be taken into account. One of these factors is the impact of human nature and behaviour. For Knowledge Management to be useful in the new business landscape, where there are no certainties, no absolutes and no universal best practices, it needs to embrace both the human-centred approach and the techniques and tools that are now becoming robust in the area of mathematical complexity. Bearing in mind the importance of the human, Artificial Intelligence needs to be set in the right social context, with appropriate levels of social permissioning. Strategy is not necessarily indeterminate in the short term. But the deterministic attitude of strategy has changed. Strategy in the emerging school becomes, according to K. Eisenhardt - Stanford Business School, 2002, more simple, more organisational and more attentive to timing issues. In other words: it becomes less a plan but a tactic. This is the first view on short tem-strategy. The second view - but this is complementary - is, that long term strategy becomes largely a backward sense making of the autonomous strategy produced by the organisation. This makes strategy itself an important element of learning. In this scenario, the importance of learning needs to be stressed. A main idea of the evolutionary/emergence school (perhaps a little contrary to the complexity school derived from natural, chaotic behaviour) is that companies can achieve both: inertia at the core and adaptability. In this sense, companies are not hectically reacting to environmental changes but become faster in adapting and absorbing changes without being necessary to change the whole organisation. The danger of permanent change for an organisation is instability - the power of the social complexity approach lies in the attempt to achieve both: adaptability and inner stability.

By 2010, most KM practitioners in Europe had mastered the basics of the engineering and social approaches, and many had incorporated the scientific and technical advances of the mathematical approach. Some leading thinkers had since been able to achieve yet higher results by avoiding the very goals and values that had made successes for these schools of thought and pursuing quite different aims instead. Essentially, the complexity and emergence group of practitioners recognised that purpose develops over time, and when it is regarded in less specific ways it is more likely to draw on and exploit the full potential of the enterprise. However this renders strategy, to the rationalist the prime area for clarity, order, and predictability, indeterminate in the short term. It is only in retrospect that strategy can be validated.

86   Mika Aaltonen in "Organisational Complexity", Finland Futures Research Centre 6, 2003.

At the time, all our strategies contain unknowns and in turn produce unknowns for others. Rather than lapse into a fugue at this prospect, the complexity school advocates the use of certain concepts that move with, rather than against, the state of the world. One example is the search for patterns in turbulent phenomena. Knowledge is regarded as an active process of relating, rather than a static one of storing what is known, abstracted from its use. Knowledge was now seen to be volunteered rather than conscripted, to be characteristically spoken rather than written, and to be deeply contextual rather than abstract. Following Heisenburg we might better regard knowledge both as a thing and as a flow according to how we observe it.

Over the 2000 to 2010 decade practitioners in Europe developed noticeable skills in working with emergent phenomena. Change agents were trained in self-developing techniques and were soon able to advise companies on how to build on earlier work in fields such as leadership and change management. Experts were able to seed the emergence of productive patterns using disruptive techniques against unproductive emergences but supportive techniques with productive methods. Europe was able to maintain its position as a source of expertise in KM because it was perceived by others, including the US as offering something distinctive in KM in contrast to the engineering approach in particular. Further more these complexity-based approaches seemed especially applicable to the world of 2010, characterised as it was by bi-lateral national formations as much as continental bloc politics. These more turbulent dyadic interactions offered little predictability to planners in major corporations. On the other hand, those in SMEs who were able to discern patterns and coalescences and to respond to them sufficiently quickly with appropriate and cost effective innovation, could often find a productive niche.

In the social complexity area, not only natural sciences have had an influence, but also history analysis and linguistics. This has provided a rich understanding of the role and importance of culture and the local environment which has led to a special competitive advantage of European organisations over their American counterparts. This advantage lies in the degree of local embeddedness as well as impact on individual behaviour. In the 20th Century, European companies were invaded by US-based management practices which were frequently not beneficial to the European environment and were often badly adapted. This scenario offered European thinkers a distinctive place in the catalogue of knowledge approaches and became a rich source of competitive advantage and collaborative potential.

Mapping approaches and technologies to the KM2010 model

In this section, we map the technologies and approaches described in previous sections to the KM 2010 conceptual model. In doing this we need to take into account that the following factors will heavily influence which approaches and technologies are actually applied:

- *Actual business strategies and resulting needs*
- *The manner in which Knowledge Management approaches and technologies are implemented*
- *Technologies already available within the organisation that can be exploited.*

It is not singly on the choice of approach and technologies themselves.

This section represents a major element of our analysis of the current state and can be illustrated in a straightforward way. Those taking a predominantly Human perspective (Quadrant 4) are frequently interested in communities, experts, best practice, review, the social and cultural factors involved, storytelling and narrative.

The Engineering perspective (Quadrant 1) is also interested in best practice, review, communities, experts, storytelling and to some degree, social and cultural factors. But they tackle these in a different way, with more emphasis on databases, portals and profiling software and tend to regard the involvement of human factors as 'noise'.

The mathematical perspective (Quadrant 2) is also interested in some of these approaches, because its supporters aspire to representation, complex search and retrieval and agent-based discovery of these elements (for example, using semantic and logical means to retrieve experts, discover stories, personalise portal access etc.).

The complexity perspective (Quadrant 5) likewise will focus on many of these approaches, but in a completely different sense again. They have a stronger focus on the learning and adoption of classification tools, broader approaches to narrative, less deterministic and public approach to expert location and technology support for more serendipitous community encounters and formation. Leadership styles, and therefore over-all management styles to these approaches will vary enormously according to KM perspective.

We find a similar crossover when examining the consensus perspective (Circle 3). Consultants adopting a consensus perspective are also interested in best practice, communities, reviews, portals, expert locators and even storytelling (in fact whatever sells in the marketplace). But the motivations, background assumptions and implementation strategies will be entirely different from the other perspectives. The consensus perspective meets their clients with a solution in hand, pre-packaged and pre-determined. The items in the package box are dependant upon the results of their own case studies and best practice.

We find a similar mix of cross-fertilisation when mapping approaches and technologies to each other. While community building will typically use community building technology, an approach solely dedicated to community of practice building may well select in addition to a community of practice technology, portal technology, text databases, content classification, e-learning and linguistic technologies all aimed at supporting community development. On the other hand, certain community of practice technologies, such as e-mail, discussion boards and the like, may be selected by an organisation with no interest in formally supporting communities. They may see e-mail as a supplier and customer communication tool, without formal community considerations.

For these reasons, we hesitate to provide an unqualified mapping of approaches and technologies to each other and to our perspectives grid. We begin with an analysis of technologies and approaches typically supported by those engaged in the various perspectives.

Mathematics		Complexity

Technologies
Data warehouse
Test databases
Text mining
Linguistic
Visualisation
Classification
Categorisation
Search engines

Approaches
Team support
Communities
Expert directories
Knowledge publish
Question and answer
IC measurement
Story telling

Consensus

Engineering		Human
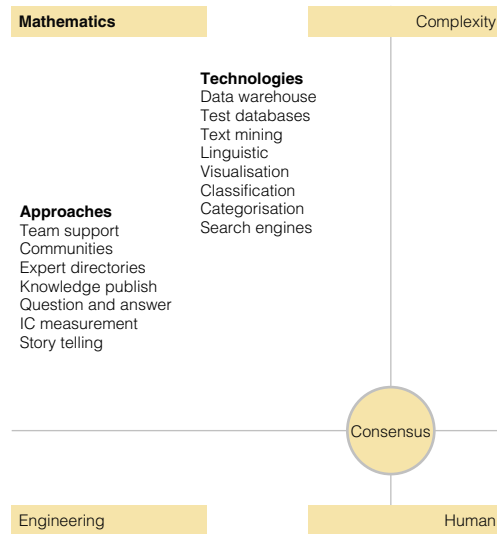
In the above figure, technologies and approaches typically supported by the mathematical perspective are listed (for an explanation of the KM 2010 model, which is used here as the background for clustering FP5 projects according to trends, please go back to page 98). The technologies are developed by perspective to support the approaches listed. Team support, for example, requires sophisticated text mining, visualisation, classification, categorisation, search engines and text database to be effective (from the mathematical perspective). A similar analysis can be given for the other approaches. Knowledge publish (or digital libraries, knowledge databases).

Mathematics		Complexity

Consensus

Technologies
Data warehouse
Test databases
Text mining
Linguistic
Visualisation
Classification
Categorisation
Collaborative workspaces
Portals
Directory services
E-Learning
Best practice
Search engines

Approaches
Team support
Communities
Expert directories
Knowledge publish
Question and answer
IC measurement
Story telling
Post review
Best practice
Learning organisation
Peer assist
Business intelligence

Engineering		Human

In the above figure, technologies and approaches typically supported by the engineering perspective are listed. The technologies are developed by perspective to support the approaches listed. Those engaged in the engineering perspective may, for example, support collaborative efforts across teams. To achieve this, they implement well structured procedures utilising collaborative workspace technologies potentially embedded into a knowledge portal.

Mathematics	Complexity

Consensus

Approaches
Team support
Communities
Expert directories
Question and answer
IC measurement
Story telling
Post review
Best practice
Learning organisation
Peer assist

Engineering	**Human**

In the above figure, approaches typically supported by the human or social perspective are listed. While this list is not exhaustive, we illustrate the anti-technology stance by this perspective in that most of the emphasis in Knowledge Management will be technology-free. This is not to say that organisations with a strong emphasise for this KM perspective will forsake all use of KM type technologies, but such organisations are likely to consider these technologies a normal part of IT and not KM.

Mathematics	Complexity

Consensus

Approaches
Post review, Best practice, Team support,
Communities, Expert directories, Knowledge
publish, Question and answer, Learning org,
Peer assist, IC, Story telling

Technologies
Collaborative workspaces, Portals, Data
warehouse, Text database, Classification
Categorisation, Workflow, E-Learning,
Best practice

Engineering	Human
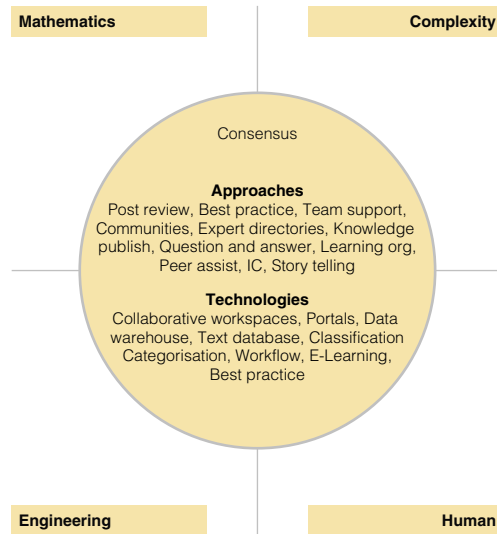
In the above figure, approaches typically supported by the consensus perspective are listed. This just about includes everything, although again, we stress the fact that the line of attack adopted by the consensus approach to these technologies will be different to the other perspectives. As we mentioned before, the consensus approach packages these approaches and technologies uniquely. It would be unusual for any consultant other than the big 4 type practices to package all of these approaches into a large and complex benchmark. Typical of the consensus perspective in practice, is to sell KM consulting around some best practice principles[87] which may include some, or all, of the approaches and technologies listed above.

In order to complete our analysis of Europe's position in the current state, it will be necessary to adopt appropriate measures. We suggest the following indicators for as a starting point, but further detailed research should finally decide the set of appropriate measures.

---

87 Such as Stephen Denning's seven things that need to be put in place for a KM program. They are KM Strategy, Organisation, Budget, Incentives, community, technology, and measurement.

RM2010 Questionnaire Results

KM2010 questionnaire results

Introduction

The purpose of the questionnaire was to explore responses to five scenarios about the future of Knowledge Management in Europe. Questions were formed in group discussion as operational indicators of the scenarios. The questions were placed into a Web format using Confirmit™ and located on the www.km2010.org Web site. It was intended that a large number of respondents would complete the survey. In practice, we have 146 replies at the time of writing (November 1st 2003).

Methodological aspects

Question formats were reversed in some cases to avoid forming an 'agreeing with the question' response set. This means that some positive answers for Knowledge Management involved the respondent disagreeing with the proposition in the question. We have indicated these in the discussion below as reverse questions. Each question could be scored between 1 strongly agree and 5 strongly disagree (a Likert Scale). A common scale, this runs the risk of allowing too much opinion to settle for the middle ground or the neutral option. In analysis we have identified broad patterns of opinion such as tendencies to agree (1 and 2 combined) or to disagree (4 and 5 combined). For some questions the neutral vote is so large that it makes it difficult to draw an unequivocal answer from the survey item. Average scores of up to 3 are taken to signify general agreement and average scores below three are taken to mean general disagreement.

The questions were designed to relate to specific scenarios but we do not know what was in the respondents' minds when they made their decisions. It appears that there was a tendency to report agreement with most items, as if endorsement of one scenario could be matched with agreement to another scenario. The survey also needed to be representative of the structure of the economy by sampling as many nationalities, sectors, sizes and types of organisation as possible. Our results are narrower than this ideal in that whilst we have a good range of organisational sizes, the other parameters are quite restricted, such as a small number of sectors and nationalities. Africa and the Mediterranean are somewhat under-represented whilst English speaking countries are over represented. For these reasons, we wish to regard our data as suggestive of perspectives in the world rather than being fully representative of the world. Further work is needed to obtain reliable and valid measures. The respondents are, as volunteers on a Web survey, likely to be more positive, interested and informed about KM than the general population. Some specific details on this are given below.

Size of respondents' employing organisations

Our sample was quite equally divided between companies with less than 250 employees (53 percent) and those with more than 250 employees (47 percent).

Sectors

We have had responses from people working in the following sectors: agriculture, computer and related activities, construction, education, electricity, gas and water, financial intermediation, fishing, farming and related services, health and chemicals. This suggests we have a good range of sectors in terms of underlying technologies though we appear to be under-representing key sectors such as automotive.

Types of organisation

46 responses were received from the public sector, 64 from the private sector, 9 from not for profit organisations, 20 from universities and 8 from 'other'. This suggests our survey has a good balance of representation except that the not for profit viewpoint may be significantly under-represented.

Nationalities

We have received the following responses: from Scandinavia 3, UK 25, Benelux 9, France 4, Germany, Austria, Switzerland, Italy, Spain, Central Europe, Asia 17, Middle East 2, USA and Canada 19, Latin America 3 and Africa 2. This suggests a bias towards English speaking countries but a good range of cultural diversity.

Introductory results

Respondents were asked to indicate to what extent, or otherwise, Knowledge Management is formalised and measured in their organisation.

The meaning of KM is often unclear to practitioners:
"The definition of KM is not well defined in my organisation where by we could device metrics. There is no direct rewards/incentives tied to KM results. Though KM is recognised as the tool to lead better quality, the 'better' is ill-defined. Maybe adopting Six-Sigma practices embedded into KM may lead inbred adoption, measurement, success of KM."

"I am not sure that Europe can be seen separately from the rest of the world - I believe KM will be a global activity, limited perhaps only by lack of a shared language."

For some it is a matter of formal management processes:

"The organisation is currently preparing a KM strategy and has appointed a Knowledge Manager."

'We are in the process of implementing a KM strategy and appropriate technologies across the entire organisation. This is not yet being managed coherently under a CKO or equivalent executive, so there is not a lot of coherence among the various activities'.

"Knowledge Management is seen by executives as an add-on rather than a transforming programme driven from the top in line with business goals."

"Given that we are an engineering project management organisation, executives have a better understanding of technological solutions to KM problems than they do the social aspects. We currently run at least five different major engineering product data/configuration management and document content management repositories in various divisions of the organisation, but as yet the executive has no coherent plan to formalise or standardise their use for Knowledge Management activities. From the middle level we are trying to encourage the establishment of such policy but are still hindered by the difficulties in working across divisional boundaries."

Some have achieved a pragmatic resolution on this:

"We consider Knowledge Management as knowing what we know, learning what we don't know and using what we know to benefit our own and our customer's business. It's as much an attitude as it is an infrastructure of managing information assets as part of all business processes."

Such a view appears to replace the engineering scenario with something more in line with the human aspects of scenario 2.

Acceptance of the need for KM is not universal:

"There has to be a proper methodology for Knowledge Management to prosper and benefit the organisation. Otherwise, any well intentioned plans would become a white elephant, sooner or later."

"There is very little acceptance of KM at present and it is currently viewed as another fad."

Knowledge Management appears to be formally recognised in organisations (mean 2.1[88]) and the subject of personal appraisals (2.1). A majority (66 percent) of respondents' organisations gave formal recognition to KM with 33 percent not doing so. An 81 percent majority believed KM assisted business performance with 12.5 percent neutral. A majority feel that KM improves business performance. KM is a frequent topic of conversation in most organisations (2.3). On balance work across departments is regarded as difficult in as many organisations as it is not (3.3). Most organisations place an emphasis on social networks (2.1) though most see technology as a key enabler to KM as well (3.6 reverse score question). KM is associated with greater decision autonomy (2.7). Creativity is encouraged and supported by KM (2.4) and both inter-personal relationships and social networking are regarded strongly positive in KM (1.7).

Intellectual capital measurement appears to be an area of division with a majority either not sure about it or not doing it. A strong focus on content management (the engineering approach) receives a narrow majority (45 favourable versus 41 not sure or negative responses). The pragmatic approach of best practice is strongly supported though 23 were not sure (mean 2.2). People appeared to support significant investment in KM though 22 were unsure about this and 21 disagreed.

Future-based opinions
A majority feel that performance measurement is becoming more important in KM (1.6).

A majority preferred a formal approach to KM (2.9) though 28 disagreed and there was a slight tendency for smaller organisations to prefer formality less than larger companies. 60 respondents agreed that best practice and technology offered the best future for KM (2.2). However, 53 thought the social and technological approaches were better (2.2 average). It may be that the questions did not succeed in isolating opinions neatly along the lines of the scenarios.

Scenario 1 - The engineering approach

Questions 16-20.

Key indicators of this scenario
1. *Focus on content management*
2. *Knowledge repositories*
3. *Information portals*
4. *Lessons learned*
5. *Best practice*
6. *Investment in knowledge related technologies*
7. *Preference for systematising, procedures, formal approaches*
8. *Best practice and technology is the future.*

---

88   Each answer had a specific weight: from 1 for « strongly agree » to 5 for « strongly disagree »

Results

A majority of those answering question 20 (73 percent) indicated a measure of agreement with this scenario. This indicates that the engineering scenario itself, and aspects of the scenario combined with other approaches, as in the pragmatic scenario, may well command a significant measure of support in 2010.

A formal approach receives more support from those in large (47 percent) organisations. Medium sized organisations disagreed with the likelihood of greater formality (70 percent). Smaller organisations appeared equally divided on this issue with a leaning towards informality (47 percent).

Table: Formal approaches to Knowledge Management

	0 - 9	10 - 49	50 - 249	250 - 500	> 500
Agree strongly	11.8%	33.3%	4.8%	0.0%	16.7%
Agree	17.6%	16.7%	33.3%	30.0%	30.0%
Neutral	23.5%	16.7%	19.0%	20.0%	26.7%
Disagree	41.2%	33.3%	33.3%	50.0%	26.7%
Disagree strongly	5.9%	0.0%	9.5%	0.0%	0.0%

The best practice with better technology in 2010 question produced much more agreement amongst all organisational size groups.

Table: Best practice and technology combined

Employees	0 - 9	10 - 49	50 - 249	250 - 500	> 500
Strongly agree	5.9%	66.7%	23.8%	30.0%	23.3%
Agree	64.7%	0.0%	66.7%	20.0%	46.7%
No opinion	11.8%	16.7%	9.5%	20.0%	6.7%
Disagree	11.8%	16.7%	0.0%	30.0%	23.3%
Strongly disagree	5.9%	0.0%	0.0%	0.0%	0.0%

I believe that the best practice approach combined with ever more sophisticated technology will continue to be one of the most important approaches to organisational Knowledge Management over the next 8 years.
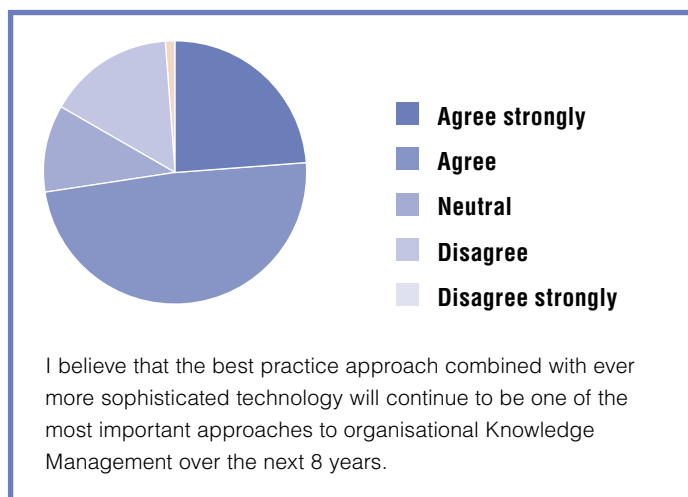
"In the KM evolution, we first developed a knowledge capture process, built a prototype, and then attempted to find something on the market that could be implemented at a reasonable price. At that time, there was nothing available that could meet our requirement. We hardened the application and it is in use today - 4 years later. Now we have implemented content management, portal, and we are looking to move the communities of practice to a standard product - QuickPlace to work with our WPS ports."

"To our users, our intranet is the most visible element of our KM strategy."

Some respondents offer a comprehensive, systematic and quasi-rational account of KM:
"Being part of a HE institution knowledge is our core business."

"My organisation is a communications consulting business. Knowledge is what we differentiate ourselves on and is actually written in our strategic platform. We have specific functions dedicated to Knowledge Management, knowledge development and knowledge analysis (turning information and knowledge into analysis and ideas). To some extent, the measurement of the impact of KM can be seen in the general business figures of the company and in how many new clients we win or how much we develop existing clients. On another hand, we can easily measure the number of hits on our intranet, the number of submissions, the number of training sessions held in the company and so on. What we lack is a mathematic tool that would make the link between the two, ie the input, the knowledge being developed on one hand, and the development of the business on the other hand. We are currently looking at ways to measure the impact of our work on our client's business and may learn lessons from that on how to measure the internal link between knowledge and business results."

Elsewhere, we see that whilst there is a formal expectation of an engineering approach, the realisation of this ideal is often limited in practice.

"It is formalised only in that individuals hold that information in archive form and other company members are informally aware of its existence. There is insufficient time to index it and potentially it would be out of date at next use".

Some organisations have integrated systems and processes to an extent:

"We have formalised KM measurement by weaving some of KM outputs in our business processes and linked this to individual staff performance measures (KVR's)."

For some respondents, contingencies such as size, and development phase, influence take up of the approach:

"KM is considered as an important enabler at corporate level, but there is not enough focus at local level".

"As a small company the formalised indexing and storage of data is time consuming and therefore a cost we are unable to bear. However it is recognised that we ought to do something and we anticipate setting up a network repository for current and future projects".

"The organisation is too small to install formal recognition".

"We are in the very early stages of KM and still in the process of scoring quick wins.' Once we move from this phase, we will begin to focus on measurement".

"Active contribution and leverage are recognised in the annual appraisal and built into competencies and formal learning".

Another says:

"The concept of Knowledge Management is still in its infancy and knowledge sharing is not defined in this way. It will not become contextually measurable until understanding of how it hits the bottom line is articulated. This is some way off".

Summary of scenario 1

This appears to be the dominant paradigm at present. There is a consensus amongst respondents that whilst it will continue to have a central role in KM efforts, it will also have to be at least modified to take more account of human factors. It is interesting how many contributors talk as if even the accessible potential of this paradigm has not been achieved sufficiently in both organisations and wider collectivities such as regions or sectors.

Scenario 2 - Human-centred approach

Questions 9-15 and 28-40.

Key indicators of this approach:
- *Focus on people as unique holders of knowledge*
- *Exchanges between people as primary generators of new knowledge for innovation*
- *Awareness and use of culture, sub-culture, meanings, symbols language and languages, discourses, social activity and exchange.*

Results

This scenario was introduced by asking about Knowledge Management and its relation to your organisational culture. Many respondents related the technical and the social whilst others contrasted the technological with the social.

- Agree strongly
- Agree
- Neutral
- Disagree
- Disagree strongly

By the year 2010, trust, security and privacy have become very important driving forced in Europe. This has severely limited the application if Artificial Intelligence(...). Social computing and the use of personal networks have flourished(...).
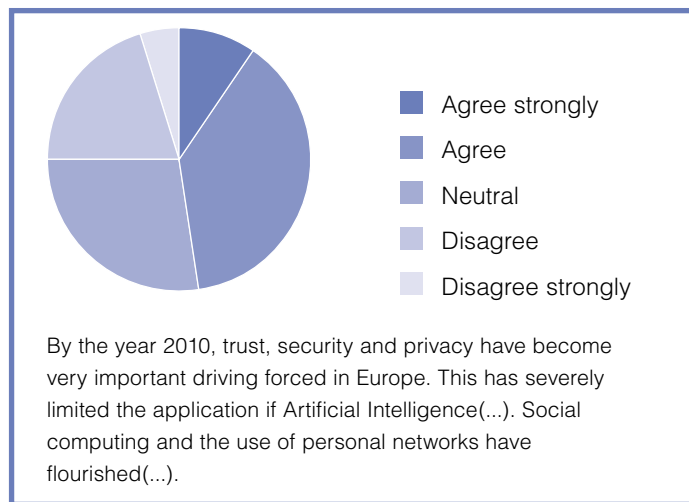
"More than technology, it is the behavioural change in the people that is more critical for the success of any KM initiative."

"There is a curious disconnect between the transfer of knowledge and the means of transmission within this (perhaps not other) school. Informal networks are critical to the operation of this establishment as a means of bypassing extensive paper shuffling."

"The KM term can be very off putting. On the one hand it is dated. On the other hand, it seems to negate the humanity in the uptake side - the application of available knowledge. Too much attention to capture, not enough to use."

Some organisations recognise the value of formalising what is informal at present:
"There is an informal group comprising the librarian, the IT Director and the professional support lawyers that meets to discuss KM matters. We have decided to formalise these discussions and are drafting a KM Strategy to present to the partners and staff. This process should promote KM discussions within our organisation and encourage formal KM procedures and measurements for success."

Others are aware of the conceptual difficulties involved in our key term knowledge:
"This is simply confusing information with knowledge. When appropriate those who know or who know how will codify their knowledge (as far as this is possible), thus creating information for others. This process will continue, and perhaps there will be better techniques for recording and transmitting information. Since knowledge is not a measurable thing, nothing can be said about the amount which will be dealt with in this way, but we expect more of our time and effort to be devoted to converting it into information for others - both internal and external."

"Everyone seems to agree to the value of informal social networks, but often times attendance is minimal because the organisation does not emphasise and reward participation."

"In the end, knowledge is only valued in business when it is put to work. The latent energy in stored knowledge has no impact on the business unless it is unleashed and put to work. That means it has to connect to the people."

"There is, as in all organisations, a fight for power and influence. People managing knowledge have to take this fact into account and may not become frustrated because the formal power is still with the people 'managing' or 'protecting' their own power only and trying to impose their priorities."

"Decrease the investments on technology-drive knowledge development and increase the investments on social-driven knowledge development, knowledge use and knowledge diffusion. Decrease again the investments on technology-driven knowledge development and increase the investments on give social meaning to the existing knowledge. Mobilise the regional and local knowledge to overcome the negative aspects of the selective perception which is part of human decision making."

"Knowledge will become a main topic in legal procedures. Social learning (multi actor processes) becomes more important than linear or dual learning processes carried out by the education institutes. One European agenda for knowledge."

Several respondents emphasised the inter-play of technological and social forces:
"We have a strongly organised global content sharing system with common processes and expectations, but I personally believe that the face to face sharing of expertise and knowledge will play an ever-increasing part."

"(…) However, my organisation has done, and is doing a good job of never thinking about KM solely in terms of technology. Even before the intranet was first introduced, back in 1996, the company had appointed a CKO (in 1993) whose job was to think more broadly about what knowledge is in our company, how useful it is to our business, and how it can be nurtured. The first outcome of this thinking process was the creation of a knowledge human infrastructure. Both this strategic thinking and this human infrastructure - that are still maintained - are, in my opinion, the biggest reasons why our intranet and tech tools are not only tools in our KM strategy and have also persisted over the years."

"We have had a few attempts at the technology part of the solution, but in the absence of a strong business case, not secured the funding for a great technology solution to date. We continue to work towards a breakthrough."

"Some investments are made but not used. Training is lacking, people are not motivated to share information. This is used by senior management as a pretext to stop investments. With the group I am responsible for, we however use all technology to its full extend. It is the most motivated group in the company."

"Currently, most KM is still explicit knowledge related. In future, tacit knowledge and collaborative systems will become more and more important. A limitation to such technologies is still bandwidth."

"Social and informal networks in my organisation (and with other organisations) isn't possible without technical platforms, eg groupware, community tools etc."

"There is a recognition that it needs to be done, but, at the moment, a lack of process and drive to do so."

"An enterprise portal is being rolled out this month and the Knowledge Network with My Communities and Expert Locater is part of the rollout."

"The whole drift of our R&D is towards enabling a socio-technocratic solution that enables definition and measurement of the knowledge component within the activities of any organisation through dynamic engagement with its 'processes', taking that term to mean the formal, practical models by which activity proceeds (whether formalised or intuitive). We have ideas as to how these two extremes form part of a spectrum that can be brought into play in the same environment we seek to create in our solution."

"There is very little formalised KM, and no measurement of it, in my company. Most knowledge sharing is based on knowing who subject matter experts are, and requires an advocate, stakeholder or facilitator to take an active role in extracting, documenting and sharing what individuals and small groups know."

"Major obstacles to innovation and creativity are revenue and work time based individual measurements. Time is a critical resource. KM is incentivated (sic), but time for KM is not allocated."

"Social informal networks are part of the culture of this firm and one is required to have them in order to progress. Knowing who knows the answer has value."

"Informal networks are very valuable because that is the way to work though problems, issues, etc. It's the way to get things done! Also, it's the informal network that helps promote careers."

"In our R&D we consider this factor to be an example of how KM Technology seeks to both define the problem and design the solution around 'what is there now' instead of undertaking the fundamental examination needed to come up with new solutions".

"These are not Tangible assets and as such are Tacit Knowledge. So, therefore these cannot be tied to a ROI or, performance measure at a domain level. As long as the Performance Function at a Domain level (above the individual) does not have these informal/social parameters it cannot happen".

"My consulting firm relies largely on the social and informal networks we are able to develop with our clientele and with others. It is a highly valued system of personal contact and knowledge."

"Knowledge is transferred very informally throughout the organisation. Also, knowledge transfer is performed around ad hoc meetings/discussions where the knowledge isn't captured. KM networks are valued but not formalised".

"Informal networks are maintained because people want to interact with each other. Formal networks should support and encourage this informal information exchange. Explicitly understanding which decisions need broader input and which can be made autonomously defines the structure of the formal network."

"The need for social and informal networking is recognised and encouraged in the meeting/cafe/circulation spaces within the building. However, at a defined cultural level KM is not in the vocabulary."

"We do value social informal networks very highly and will continue to do so; they allow information transfer with minimal codification and in a professional relationship this is often the most efficient approach."

"There is no KM culture, but social and informal networks are critical to our company. However, such informal networks and relationships are not necessarily valued, and their importance is not generally recognised."

"Currently most KM is still explicit knowledge related. In future, tacit knowledge and collaborative systems will become more and more important. A limitation to such technologies is still bandwidth".

"Social networks exist and at least some within the organisation are working to make them stronger and more extensive. However, as yet this is an informal practice. Some in the organisation are attempting to obtain executive buy-in to fund and formalise the process we focused last year on the 'Fish' approach to internal customer care across the entire company and devoted fair resourcing to fostering a fun/social/responsible approach to helping our colleagues."

"I have the feeling that the focus is perhaps too much focused on technologies and not enough on culture and processes."

Summary of scenario 2

There appears to be wider acknowledgement amongst this sample than one might expect of the informal social and political processes that influence real world KM. Technological and social aspects are recognised as interdependent. The schism between technology providers and human-centred specialists seems to be disappearing. This may enable a human-centred approach for the future.

Scenario 3 - Pragmatic and integrative visions of Knowledge Management

Questions 21-23 and 28-40.

Key indicators of this scenario:
- *Tendency not to support any one model*
- *Use of unrelated aspects of several models*
- *A theoretical approach*
- *Use of aspects only because they work*
- *Low on innovation or future orientation.*

Results

This scenario is indicated by positive statements about usefulness and practicality. It may also be evidenced when people draw on multiple disconnected fragments of techniques and ideas. Elsewhere we may infer a pragmatic approach when people avoid either agreement or disagreement to questions and select a neutral option.

To the extent that pragmatism involves combining approaches there is statistical support for the notion that most people expect or want to do this (66 percent agree or strongly agree that their organisations combine approaches/only 14 percent disagree or strongly disagree).

Agree strongly
Agree
Neutral
Disagree
Disagree strongly

In my organisation there is a combination of a technological approach (use of intranet for knowledge sharing and other central tools) with a more social approach (support of communities of practice, use of informal methods).
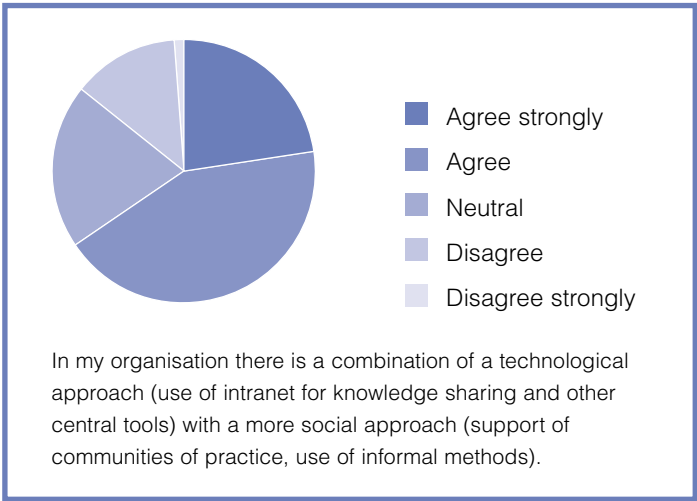
To the extent that pragmatic means not very well embedded then some 39 percent recognise that their organisation has not embedded KM in the fabric of the organisation yet.

Agree strongly
Agree
Neutral
Disagree
Disagree strongly

Knowledge Management is part of the fabric of my organisation. As such it is "embedded" in my organisation as a well-established discipline.
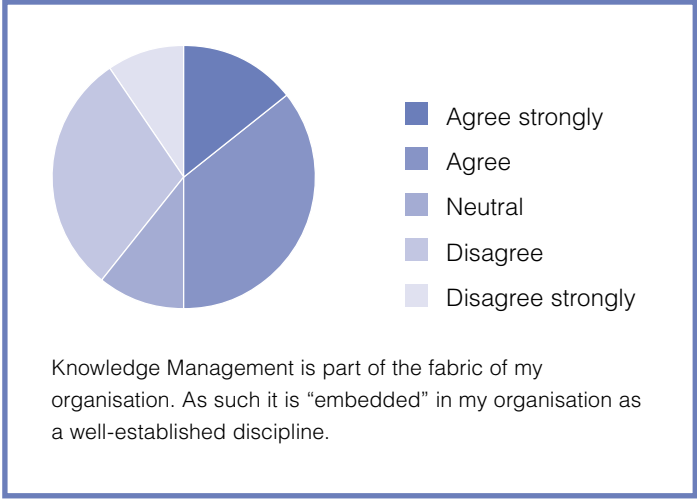
To put that another way, we asked if investment in KM was continuous or subject to review and changes:

50 percent agreed that it was subject to change with a large group of 32 percent staying neutral on that question.

Investments in KM in line with business needs

Agree strongly
Agree
Neutral
Disagree
Disagree strongly

Though there is continued support and investment in Knowledge Management in my organisation, investment is subject to constant review and frequently changes in line with business needs.

"Undoubtedly the ability to meaningfully combine the viewpoints, mind-sets, and disciplines across the socio-technocratic divide, into common goals, beliefs, commitments and actual focused research in the field of 'society' (without defining that. (I mean to get away from the current techy or social separateness of much R&D, and do not differentiate between the myopia of the techies or that of the sociologists)."

"Overcome cultural barriers and barriers in terms of language, overcome the barrier of competitiveness/distance among eastern and western countries, provide reliable and usable technology, combine the technology with the right implementation strategies (change management, total quality management etc.), combine KM with more traditional management tools."

"Embedding KM in central and eastern European members. Growing KM in SMEs which are culturally effective and not mere imitations of US and UK. Overcoming traditional defensiveness and secrecy in eastern European members when implementing a sharing culture."

"1. Life Long Learning Creativity at all levels, less emphasis on knowledge as a given. Guarantee the right of everybody to share info by Internet 2. Avoid that Internet be colonised by e-commerce and enterprises only: protect free speech and individual publishing 3. Keep low the price of communications and hardware devices 4. Promote open source and free exchange of resources KNOWLEDGE MUST BE SHARED. DO NOT PATENT IDEAS! Promote intercultural networks of excellence/communities of practice, offer a platform for Knowledge Management with all important terms, tools and concepts The EC should facilitate an open knowledge space for all. Vested commercial interests by vendors should not act as a bottleneck. All project documents (like public deliverables) should be available in a structured form through a central hub, not be hidden in some project specific Web site."

"A judicious method of sharing the cost of KM development. Design and development of a preferred KM society. Overcoming cultural, sociological, economic, political, commercial, ethnic, religious and other barriers, at least among the European community to start with. Investment in technological skills, product innovation, open systems and security levels that protect citizens."

Summary of scenario 3

We see glimpses of the pragmatic view mostly when people are responding neutrally to other more focused visions. Given the data we have from all sources it is reasonable to conclude that the majority are prepared to mix approaches according to current relevance and impact, but also tend not to have or be able to achieve a distinctive and innovative approach for very long before events take over from it.

Scenario 4 - Mathematical complexity

Questions 24 to 27 and 31 to 33.

This scenario explores the use of Artificial Intelligence - expert computer systems and intelligent software resources that emulates the human intelligence - as an approach to Knowledge Management Made in Europe in 2010.

Key indicators of this scenario:

1. *Use of intelligent agents*
2. *Systems approach to Knowledge Management*
3. *Data mining and data analysis*
4. *Automation of processing*
5. *Trust, privacy and personal relationships*
6. *Social computing and personal networks*
7. *Complexity of organisation and operations.*

Results

The results show a varied response from different regions of the globe and provide a contrasting view of the use of Artificial Intelligence in organisations (Table). For question 24, 16 percent of the respondents either agree or strongly agree to the use of intelligent agents for decision support, content provision and for other purposes. This is particularly influenced based on strong agreements from respondents from Italy, Greece and the Middle East. 28 percent of the respondents indicate no opinions so a large proportion may be taking a pragmatic view (scenario 3) to the use of Artificial Intelligence. 56 percent of the respondents disagree with the use of Artificial Intelligence.

A contrasting view has been provided by respondents to question 25, where 38 percent of the respondents either agree or strongly agree to the systems orientation of knowledge capture, processing and exploitation. 20 percent of the respondents stay neutral perhaps indicating a proportion of them taking a pragmatic approach by willing to 'wait and see'. 41 percent of the respondents disagree to the systems orientation of knowledge capture, processing and exploitation. For this question, an equal percentage of respondents have agreed as well as disagreed to the use of Artificial Intelligence independent of people, while for the earlier question, only a small percentage have agreed towards the use of Artificial Intelligence. This probably indicates the complexity of the area under discussion and some ambiguity about its meaning.

Table: Current use of Artificial Intelligence

	24	25
Agree strongly	6%	5%
Agree	11%	33%
Neutral	28%	20%
Disagree	39%	30%
Disagree strongly	17%	11%

Questions 27, 31 to 33 address the futuristic views on the use of Artificial Intelligence and 31 to 33 particularly address the issues of balancing the use of Artificial Intelligence with that of personal relationships, trust and privacy. For question 27, a big proportion of respondents, 59.5 percent of them, agree that Artificial Intelligence will become an important tool for Knowledge Management in the future. 23.8 percent of respondents disagree and 16.7 percent of the respondents have stayed neutral. This agreement is in line with the usage trends of database management, data mining tools, etc.

Table: Use of Artificial Intelligence in the future

	27	31	32	33
Agree strongly	25%	8.3%	9.5%	14.3%
Agree	34.5%	28.6%	38.1%	34.5%
Neutral	16.7%	17.9%	27.4%	19%
Disagree	22.6%	38.1%	20.2%	28.6%
Disagree strongly	1.2%	7.1%	4.8%	3.6%

For question 31, 45.2 percent of respondents disagree that things will go out of control in Europe with regards to trust, privacy and importance of personal relationships while a close percentage of respondents, 36.9 percent agree to this question. This gives a fairly divided view to this concern. However, the views for questions 32 and 33 are again contrasting as seen in the table above. Some respondents in agreement to question 33, indicating a blended approach to the use of Artificial Intelligence is required with the additional requirements of personal relationships/networks, trust and privacy.

The mathematical scenario is perhaps one of the more inaccessible of the scenarios to the typical respondent as it is often hidden within applications and its operation is highly specialised. Nonetheless we received several responses indicating the value people placed on this area of advancement. Specifically, many saw the mathematical approach as a way of removing red tape and of freeing communications from language barriers.

"Help to European companies in developing a 'European' technology to automatically extract knowledge from networks of people and information".

"We are actively implementing precedents and content management based authoring systems to facilitate the discovery and reuse of textual knowledge. These approaches certainly do not include intelligent agents, and I would not even call them artificially intelligent. However the technology does extend the intelligence of our authors."

'My organisation uses, develops, markets, sells and installs Artificial Intelligence and intelligent agent to extract knowledge, especially using text- mining approach.'

"Technology can do much more than shuffle lessons learnt. This potential will be unlocked in the next 8 years. Technology that 'only' supports informal contacts and formal sharing will be outdated in 3-5 years time."

'Knowledge Management and Content Management tools are essential to enable the ease of use of the information stored in these tools. Without a proper taxonomy and search capability, storing the information is useless.'

"KM in the next years will a) focus on knowledge structures like ontologies to perform technology-based KM and b) on analytical tools (data or text mining) to create knowledge from and about customers."

(a) It is the common belief in my organisation that knowledge can be captured, processed and exploited independently of people. Absolutely true, except that the sentence should read… that a certain part of knowledge… (b) Predicting the future: no sensible human being would believe that this is possible, be it with technology or black magic. I would have clicked a button at the very bottom of the page to express my disagreement."

"Initial experiments have focused on delivering regulated and compliant advice without expert human intervention."

"Results will probably disappoint most people, but personally I know AI pretty well and modest results are still impressive and in those few cases where they are of practical use, they do merit research and investment."

"With my group a reached the frontier of what can be done by people only. I did propose an AI approach to senior management but this was so far from their interests that it even was not commented."

"No AI or agents. Data mining is done on a limited basis."

"Some form of A.I. is everywhere, in most of the projects my company handle."

"We have implemented a tool from Right Now Technologies that employs intelligent agents when re-acting to querie /searches posted to the Knowledge Base."

"Initial experiments have focused on delivering regulated and compliant advice without expert human intervention."

"Results will probably disappoint most people, but personally I know AI pretty well and modest results are still impressive and in those few cases where they are of practical use, they do merit research and investment."

"We are actively implementing precedents and content management based authoring systems to facilitate the discovery and reuse of textual knowledge. These approaches certainly do not include intelligent agents, and I would not even call them artificially intelligent. However the technology does extend the intelligence of our authors."

"Programs in research to integrate the diverse KM tools to really KM systems provide knowledge in a structured way (ontologies), integrate analytical tools (mining tools) and ERP systems and provide shared workspace areas."

"Personal and corporate private data - the increasing use of knowledge provided by third parties via the Internet, free or paid is invariably linked with information requests from the supply site. The nature of the market drive towards individual targeting (and potential use of AI agents potentially means increased access to personal data). The outcome could either be a reaction by not using such knowledge sources or abuse of information. Neither must be allowed to happen. The other key issue is one of piracy of intellectual property - while print/CDs etc provided some difficulty in preventing piracy or at least some proof - plagiarism of electronic text is likely to be as big a problem . Copyright payment also needs to be addressed. Multilingual systems - particularly search and retrieval tools."

Scenario 5 - Social complexity

Questions 28 and on through to 40.

Key indicators of this scenario:

- *Use of concepts such as complexity, non-linearity*
- *Attractors, disruptive processes*
- *Emergence*
- *Flexibility, innovation, alliances, networks*
- *Holism v dichotomous thinking*
- *Chaos*
- *Ecology.*

Results

Need for a more innovative approach to KM.

- Agree strongly
- Agree
- Neutral
- Disagree
- Disagree strongly

There is a need for a more innovative approach to Knowledge Management which takes into account the impossibility to predict the future through the use of past experience (eg through heavy reliance on best practices and similar approaches).
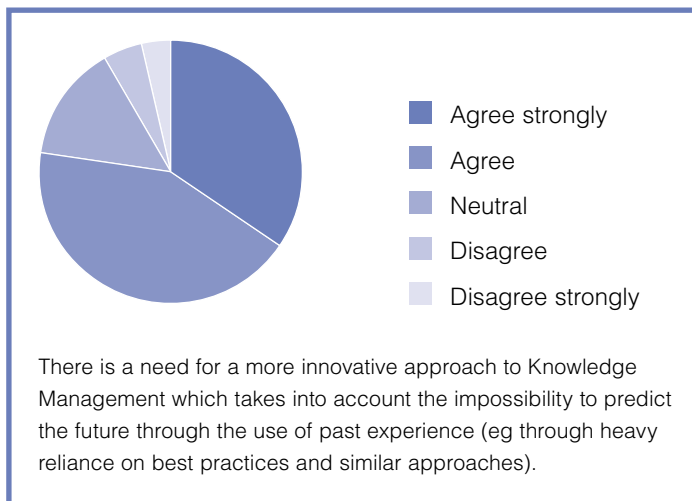
77 percent of respondents to this question indicate agreement (8.4 percent disagreed) with the idea that we should acquire a more innovative approach to KM based on the unpredictability of the future.

This scenario is another view of the world that is less accessible to common sense, and so appears less frequently and less evidently in peoples' testimonies. For that reason we have abstracted quotes which contain key words such as complexity, and self-organising, that might plausibly be interpreted as constituting this perspective.

"Bring KM to people, it will flourish only when people are empowered. People make organisations. 2. Look for self-organising systems, look for non-deterministic tools. This conflicts with the views of large software companies (like IBM) 3. Emphasis on training, life long learning, advantages for people individually linking KM more strongly to innovation management since there is already the movement to measure the outputs in more concrete terms productivity improvement and improvement in the ability to innovate (eg developing new products and services) are examples of issues where KM is expected to be able of providing tangible benefits this is in contrast to the 'generic' approach to KM as 'managing knowledge generation, use and sharing' in orgs"

"Multilinguism and cultural diversity: both are important barriers while sharing knowledge across boundaries."

"Best practice tends to indicate a best way of doing things that is specific to an individual current work environment... where the term leading practice recognises that what were are examining/reviewing at has real value for the originator and may or may not have a benefit in hole or in part if it is adopted in another setting. It is more then a correction of wording... knowledge based processes and practices as well as the adoption of tools requires learning and critical thinking if we are to realise the suggested benefits."

"We are currently wrestling with the implementation of these tools and the KM yellow brick road has many twists and turns (which we are exploring in this journey)."

"The major problem of asset reuse is to facilitate development of "ready for reuse" assets. Most are not. Another big problem is language: most assets are in English, but in Europe national languages are a must, not an option. KM across boundaries is a challenge."

"The one area that has largely eluded the industry is the support of complex functioning human systems, whose characteristics defy analysis into finite computational steps. Artificial Intelligence has tried to replicate the way we think, and has even succeeded with relatively simple expert task support - in effect by isolating the complex phenomena of human intelligence into things that can be ascribed finite computable attributes. Current research is looking at both what happens in complex human systems - we call this 'process analysis', and what it represents as an information handling and decision-making problem. We can refer to this as process automation, though computer supported human processes might convey the idea better. This is the area of computing that our group is working in. We seek a partnership between the best of automation and that of human systems that extends their reach and effectiveness. This is the area of behaviour, decision-making, and above all goal-oriented activity. To achieve this we need to evolve new paradigms of human-computer working. These embrace worlds that traditionally do not meet or share common ground. A new research space has to be created and populated. Fortunately much of its needs have already been prefigured in existing ideas and research work. We can support business process engineering, Knowledge Management, and such like by existing technologies. Present limitations arise

because human behaviour is richer, more complex and creative - even idiosyncratic. Our brains plus organisational structures enable us to manage the world we create, but it is perceived wisdom that all the above is getting more complex, dynamic and difficult to control against the goals we strive to attain. I promote research and development of socio-cybernetic systems that model complex systems of human behaviour. The word 'model' has many connotations, of which the most fundamental is that we perceive our world entirely through the models we construct in the mind. The notion that these can be supported by automation challenges current thinking and also the prejudices that seek to limit the sphere of computing's involvement. The Metaloger seeks to extend computer support to the complex, dynamic, and interlinked models we choose to apply to our world. Put another way, currently the technology of information handling stops at the point where people get on with using what the system provides. They then determine the real-world processes by which it is put to use. The Metaloger supports the people world with automation of the processes plus the knowledge that puts flesh on them (indeed this is a vital two-way thing). Thus the dynamics begin to be directly processed in the automated environment. In the real-world as in the modelled world, the connections between models and behaviour are one. The connections reside in exceedingly complex structures of metamodels, that can be modelled by complexity theory. Processing these extend current thinking and practice in some novel and radical directions. Metamodelling offers the ability to support complex dynamic human systems, going beyond current decision support which aims (ineffectively) to programme-out the human dynamic. It does this by extending the ideas behind business modelling and process automation to the way people think and manage in today's global emergent conditions. We have got to the conceptual design stage and worked out how to apply this to advanced virtual operations support systems. Current pattern recognition technologies, such as are used in large search engines, work on huge databases which are essentially static data. The Metaloger works on the dynamic processes that cause the data to exist and make it meaningful. The fundamental technologies required are in the research stage, and involve leading edge computing algorithms, complexity theory, and knowledge codification. The unique feature is to process the structures of metamodels that give significance to gathered knowledge by showing usage, preference and trends. The search for 'meaning' is the basic human quest that this technology supports. Researching the operation of metamodels and how these can be codified and modelled dynamically is the goal of this research. Harnessing computer technologies to do so dynamically is an extension of current practice but already in early form being done in virtual operations support systems. These Operations Support Systems (OSS) are the business area we have cut our teeth on. Typical future applications are in anticipating and meeting individual customer preferences (a key business imperative across most industries and services). More advanced applications are the reverse of this where the chosen customer preference is not the outwardly manifested process, but some covert one, which is a cover for the real aims. Here the 'conforming' behaviour is scrutinised for hints and patterns that suggest the tie-in with the codified metastructures that we define even though their proponents try to conceal them, (this includes forensic investigation, forensic accounting, security, organised crime, and above all counter terrorism. This is reverse customer preference). The generalised potential of this product is as a core component of every kind of system that supports the

way people work, behave, and live. This work is ready for exploitation. It will become a core intelligent component of all Knowledge Management and business processing solutions. We have a virtual team of highly original thinkers, most of whom have worked on the earlier (V)OSS prototype. The business plan has immediate practical potential, while positioning a world informatics leader as the leading practitioner of process automation. We seek a world-class partner with the vision and ambition to exploit this work. Our chosen partner will bring their own leading-edge research and facilities as well as providing the means to bring the Metaloger to the market."

"'Best Practices' are generalised design patterns that help communicate in common terms. However, application of best practices is context specific and must be adapted to the situation at hand. Identifying what criteria must be present for a 'best practice' to be successful is also important."

Summary of scenario 5

Whilst some specialists appear to have a very articulated grasp of the essentials of this approach, perhaps the majority are responding in terms of a generalised uncertainty and complexity in the world rather than having an insight into complexity theory itself. On balance we belief we have surfaced some evidence to support the notion about more static views of KM losing ground to these more dynamic necessities. This takes us into those views which involve integrating different visions of KM.

Integrative visions of Knowledge Management

One respondent commented:

"Undoubtedly the ability to meaningfully combine the viewpoints, mind-sets, and disciplines across the socio-technocratic divide, into common goals, beliefs, commitments and actual focused research in the field of 'society' without defining that. (I mean to get away from the current techy or social separateness of much R&D, and do not differentiate between the myopia of the techies or that of the sociologists)."

"Overcome cultural barriers and barriers in terms of language, overcome the barrier of competitiveness/distance among eastern and western countries, provide reliable and usable technology, combine the technology with the right implementation strategies (change management, total quality management etc.), combine KM with more traditional management tools."

"Embedding KM in central and eastern European members. Growing KM in SMEs which are culturally effective and not mere imitations of USA and UK. Overcoming traditional defensiveness and secrecy in eastern European members when implementing a sharing culture."

"KM will more and more recognised as an important corporate process while being more and more embedded in technologies such as portals, content management systems etc. It could lead to a confusion..."

"Closely linked development of new products and services and to innovation management as specific context for application of different approaches what we call 'KM' today strong orientation of developed and deployed tools, systems and strategies with respect to specific organisational contexts and social mechanisms of strategy making and innovation in organisations."

"Knowledge Management has almost disappeared as a discipline in 2010. Organisations have long understood the importance of knowledge as the process of knowing - and see this process as inseparable from doing business. Thus knowing is managed in an integrated manner. Advanced technology (agents, knowledge-based systems etc.) will be used by many organisations to automate white collar work. Europe is making a break through in productivity - highly and broadly educated employees and managers can concentrate their brain power, experience and creativity to make the relevant decisions, since technology (or outsourcing to developing countries) deals with the 'lesser' kind of brain-work. Trust, privacy, security etc. are world-wide big problems that still are unsolved. The world experiences many approaches to these issues. US & UK tend towards corporate and governmental solutions - occasionally supported by technology but mainly driven by the paranoia of protecting intellectual property and government intelligence. 'Old Europe' approaches the issues by partly copying the US/ UK ideas, partly by educating people to a great extent. This difference is obvious in the MBA programmes for Trust & Co. where US/UK teaches IP protection, electronic tagging systems etc. Old Europe teaches cultural difference, diversity and integration. In Africa a stream has developed that builds on the tribal traditions. Even other approaches come from China and India - again heavily based on their different culture."

European policy suggestions

Several questions invited respondents to suggest ways in which European knowledge policy might be developed. We can infer ways in which our scenarios appear to be reflected in people's thoughts about the future:

Question: What actions will be instrumental to achieve the Lisbon objective, ie making Europe the most dynamic knowledge economy by 2010? What research actions are appropriate?

"Currently Europe is not well represented in most International boards for Internet standards (W3C). Support European experts of KM to give visibility to UE positions in International boards."

"No patents for ideas. Cheap technology for everybody".

"Get innovators who may think outside of the box involved, and not just the predictable interested parties. The whole world will be a dynamic knowledge economy by 2010. And Europe will just be a part of this community. The European Commission should be aware of this, or suffer the myopic consequences of starting out on the wrong footing."

"Understanding the similarities and differences among the European community and committing funds to move towards a KM implementing society. Research towards setting achievable goals for the next decade. Interdisciplinary research towards aggregating the technology available, and a study to assess the present state of the art in KM awareness and applications."

"I doubt that Europe will be the most dynamic knowledge economy. There is much too much political bloody mindedness over cultural and political boundaries to work together to lead."

Question: How can the cultural diversity in Europe and multilingual issues best be approached within a Knowledge Management context?

It is evident that some respondents see language both as an opportunity and as a constraint to be tackled through technical advances and social processes:

"KM today looks too much at avoiding the hurdles instead of taking them. Only through a interdisciplinary approach a solution can be found. This is the sole structural barrier to cross-European knowledge sharing. It will only be lifted through change management (as outlined before)."

"The key is to consider local differences and local languages and to have a local correspondent ensuring the adaptation and acceptance of a KM initiative."

"It is important to let people contribute with their knowledge in their own language. One possible solution would be to have translators that permit the communication between people that can´t speak the same language."

"Multicultural, polylingual diversity is an advantage in a similarly diverse world. THIS is what KM is about, not how wriggley-amps and binary data can be stored or the practice of SOPs re-invented (or rather resold as new)."

"Make knowledge available to as many people as possible in as many languages as possible. Technology can be used to help overcome linguistic issues. Education in cultural diversity needs to be increased."

"There needs to be automated or by request translation of material into the requestor's native language. We need to maintain the cultural diversity, not look to come to some agreed upon commonality."

"This multi-linguistic European approach may be the best… for Europe to understand the multilingual problems in the world: this understanding may be able to give Europe the capacity of preparing the best multilingual tools for all the world, also for languages non spoken in Europe."

Policy for SMEs
Given the significance of SMEs in the European economy, we asked respondents to consider how they might best be assisted.

Question: The majority of European organisations are Small and Medium-sized Enterprises (SMEs). In what ways can Knowledge Management be made more accessible and relevant to SMEs?
"Knowledge Management should become automatic in the way data is filed on PCs BUT this will only happen if methods are taught in schools etc and becomes a way of life for individuals. In larger organisation protocols can be set (although often are not) by IT departments, in smaller organisations most staff/management will not be aware of even simple systems of information filing and indexing. Addressing these aspects will make SMEs more aware, and potentially access external information."

"KM is not only a technology… it is more a 'philosophy' that can be easily implemented at SME level, without any cost-effective technologies IF there is a commitment from the management."

"Forget about KM as a silo discipline (I seem to be repeating myself) teach them how to manage their business having knowledge in mind and managing knowledge as the process of knowing and the potential to engage in such a process (I developed this definition is really with SMEs in mind)."

"By providing SMEs with forums where they can meet other SMEs and share their issues and concerns. These forums can be associations, training seminars, institutions… where SMEs will see in action how exchanging with others can help. That will drive them to do the same in their organisation."

"From a more practical point of view, develop guidelines on how to deploy KM in an SME and direct them towards the most useful technology tools for their structure, will give them good starting point."

"For SMEs knowledge about and from customers is a resource of innovation that makes them more flexible than bigger enterprises. Customer Knowledge Management is a field of interest in SMEs."

"Through ASP applications and through the help of consortiums, professional and category associations."

"Through SME Support Agencies (govt), and social networks and professional associations, joint ventures."

"Scalable advice/tools to match the resource/funds available. Central provision at lower cost for consortiums of SMEs."

"KM will lead to cross-SME supply chain applications, KM communities and the governments of EU should strive in building this next generation KM-ERP along with communication, transportation and infrastructure innovations."

"Promote the benefits of KM through case studies of organisations who have successfully implemented KM. Providing the opportunity for SMEs to learn from each other - form COP's within sectors or industries."

"Through online tutorials/toolkits/best practice guides prepared by the Commission. Many SMEs will not have the resources for a dedicated Knowledge Manager and will rely on such assistance to progress their own KM strategies at minimal cost and effort."

"By providing tools that ease/simplify business, especially in the areas of regulation, tax and reporting."

"Increase job mobility between different sized firms."

Conclusions

We conclude the section on KM2010 scenarios with a summary of the most important points extracted from the questionnaire feedback.

Respondents were from a broad range of job grades and titles, industry sectors and research areas. We have to be careful in drawing conclusions, however a number of issues summarised from questionnaire feedback are significant for our Knowledge Management scenario model.

As expected, most KM practitioners in small, medium and large organisations perceive Knowledge Management in a similar context as they perceive general organisational theory and management styles.

If the organisational style is predominantly traditional, based on the scientific management perspective, which corresponds to our engineering perspective, then the tendancy is towards respondents exhibiting a strong engineering preference in their attitude to Knowledge Management. The same is applicable to the human-centred and consensus approaches.

Respondents outside management or from middle to non-management positions were generally more critical of their organisational position towards Knowledge Management. In particular they were critical on issues of formality, incentives, coherence and inter-department or divisional communication.

With the predominant practice of Knowledge Management being equated with IT tools, respondents also criticised the lack of training and formal approaches towards the creation of a culture of sharing. Those criticising Knowledge Management as an institution would see this as argument that Knowledge Management should be embedded into the organisation as part of its culture and way of life, thereby overcoming the need for extensive training.

There was little direct response on the issue of tacit and explicit knowledge, although there was recognition of the need either for initiatives to encompass both, or a need to focus on tacit knowledge. Those highly supportive of the human perspective were obviously very sensitive to tacit knowledge, although we think that there is much confusion over the meaning and implication of these two terms. But of even greater interest is the diversity in understanding what knowledge is, and how KM should be viewed. Some respondents used this problem as a criticism of Knowledge Management as a practice, suggesting (in a manner consistent with the engineering and consensus perspectives) that KM should be abandoned.

The high proportion of the acceptance of best-practice and consensus views of KM is understandable, given the predominance given to this approach in all areas of management and management consulting. It is low risk, but as indicated in the main text, lacks capabilities for future innovation.

But the responses in the questionnaire highlighted a gap here in current practice and academic research, especially outside the mainstream business schools. Very few of our respondents were able to indicate knowledge of the many state-of-the-art research established in FP5 (Fifth Framework programme) or those coming from leading universities exploring post-industrial theories of the firm. Hence there is a perceivable gap between leading research and current organisational practice that needs to be addressed at the European level.

A positive aspect was the level of understanding shown by SMEs responding to the questionnaire. Most SMEs work via networking, and while many KM experts are advocating greater inter-company networking, SMEs survive and grow through their cross-organisational and social networks. Interestingly, many respondents in larger organisations found cross-departmental and divisional communication lacking, indicating this as an obstacle to Knowledge Management. Those from smaller firms seemed to take this issue in their stride, but then criticised many formal approaches as being too restrictive or expensive.

The age old debate between KM as technologies, human interaction or practices is clearly visible in the responses. There is a strong tendency to respect both sides of the equation, although we have not been able to ascertain whether the bifurcation in understanding human factors between the engineering and human perspectives is refelected in the results. Typically, an engineer speaking on, and supporting, the importance of human factors in Knowledge Management has a diametrically opposed conception of the contribution of human aspects to organisational dynamics than those belonging to the human perspective.

One particular response of critical importance for our longer term views of KM is that KM technologies are still too focused on the currently available, and not on new solutions. While it is difficult to quantify and fully vindicate this criticism, we recognise that too little effort is been taken to grow truly commercial products from the research efforts in the mathematical and social complexity perspectives. But the reason may simply be a timing one. However, we should take a more careful account of how we can accelerate new ideas to commercial fruition. Of particular concern, is the lack of common appreciation of techniques and technologies available in, or reliant on, the mathematical or social complexity perspectives. As mentioned in the body of this section, a number of respondents correctly recognised the problems associated with the left hand and bottom perspectives, and even used in their responses, some of the key indicators of the complexity sciences (examples: complexity, adapt, complex human system, self organising, non-deterministic). This is an encouraging find, which may become more common as the complexity sciences gain a greater respect inside business school curriculum in response to mainstream business strategists (such as Ralf Stacey) taking up ideas from the complexity sciences.

As expected, a number of respondents commented on the view of KM as a fad, outdated or passed its sell-by date. We have indicated in the report that this view, while quite understandable and to a certain extent true, misses the important point brought out my many respondents that KM needs to be more embedded in an organisation and that more attention needs to be taken on understanding the dynamics and influences of knowledge on the firm and how organisations can better exploit this dynamic to their advantage.

Views of our respondents on the role of the EC vary in quality. In line with the terms of reference, respondents criticised the lack of European involvement in international standards bodies. Whether this is entirely correct, the suggestion is serious and should be investigated. The EC already have research programmes aimed at providing SMEs with cheaper access to technology (the FP6 DBE project, for example). But we cannot take seriously any suggestion that private firms give up all their intellectual capital on their ideas and technologies. If anything, the balance between IPR and open standards comes into tension at this point and is a subject of considerable importance to the EC. But it is worth noting that the issue of IPR has been raised by those responding to the KM questionnaire.

A more critical view indicated that there are too many predictably interested parties within those innovating. So the question of how we can diversify R&D in innovation is important. Are we providing enough simple avenues for European SMEs to participate in innovation activities such FP6?

The Knowledge Management cluster in Framework Programme 5 (KMME initiative)

Assessment

This section assesses the impact and potential of the Knowledge Management cluster in FP5, otherwise known as the Knowledge Management Made in Europe (KMME) initiative. We have done this by assessing the objectives of the cluster and KMME programme, then assessing whether projects that were funded contributed to these objectives. In order to do this we have carried out a high level analysis of the funded projects and mapped these against the KM2010 model which we introduced in Section 3. We have also taken into account comments and suggestions from the interviews and surveys we carried out in the course of the study, interviews with FP5 Knowledge Management cluster project leaders and comments we have received following the second KM2010 study steering group meeting in October 2003.

Context

Under the Information Society Technologies (IST) programme, the European Commission launched KMME. The purpose of the initiative, which was launched after the start of the Fifth Framework programme (1998 - 2002), was to, 'create a strong brand for European KM research and practice', to 'bring into the portfolio quality proposals' and 'to make (project) constituents proud to be part of the KMME programme'. The overall goal of the initiative at the outset was to, 'increase European competitiveness, improve the working life of European individuals and to build on European strengths of languages, cultural diversity and industrial leadership.'[89]

One of the major epistemological directions the initiative declared was to pursue the challenge of complexity as a key factor in the knowledge economy, using a holistic approach. This in fact is very close to our KM2010 model, within which social complexity and a holistic approach are seen to be key competitive areas for European advantage in Knowledge Management.

CHALLENGE from the knowledge economy is COMPLEXITY

Approach is HOLISTIC

NEW RESEARCH
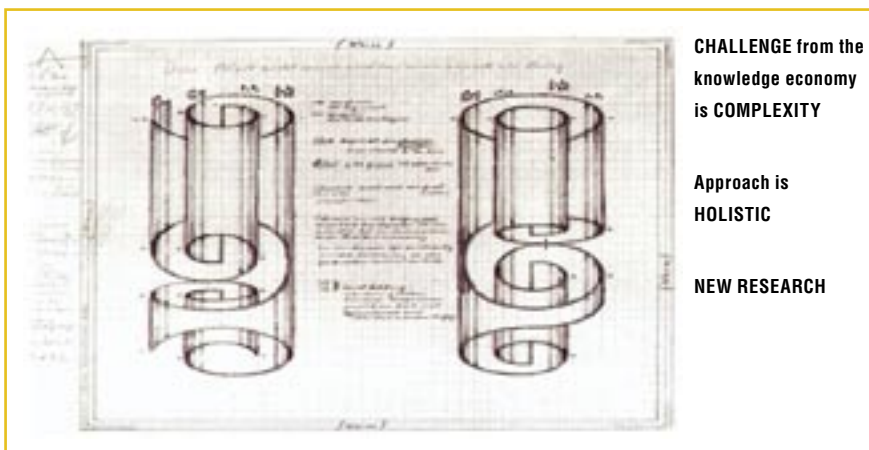
Figure 2 - Slide from KMME presentation in 2001

---

89   Presentation by Agnes Bradier, Oct 2001 Athens conference

Through these goals, the initiative was expected to make a significant contribution to the fulfilment of the Lisbon Objectives. A later objective which is evidenced in papers published on November 2002[90] was to build a community around the subject of KMME.

To date, and according to information on the projects which are not complete[91], the initiative has involved approximately 58 research, take-up and cluster projects. The average level of funding per project by the European Commission was EUR 1.35 per project, which amounts to total investment form the European Commission of approximately 65 MEUR.

Projects funded during FP5 fell into three categories:

The first category, or first set of projects to be funded, were denoted 'First generation KM (1998)' and concentrated on the following themes and concepts:

- *Information portals - tools and methodologies integrating to a large or lesser extent information necessary for back and front office processes in organisations.*

These projects can be situated on our KM2010 model in the following way (for an explanation of the KM 2010 model, which is used here as the background for clustering FP5 projects according to trends, please go back to page 98):
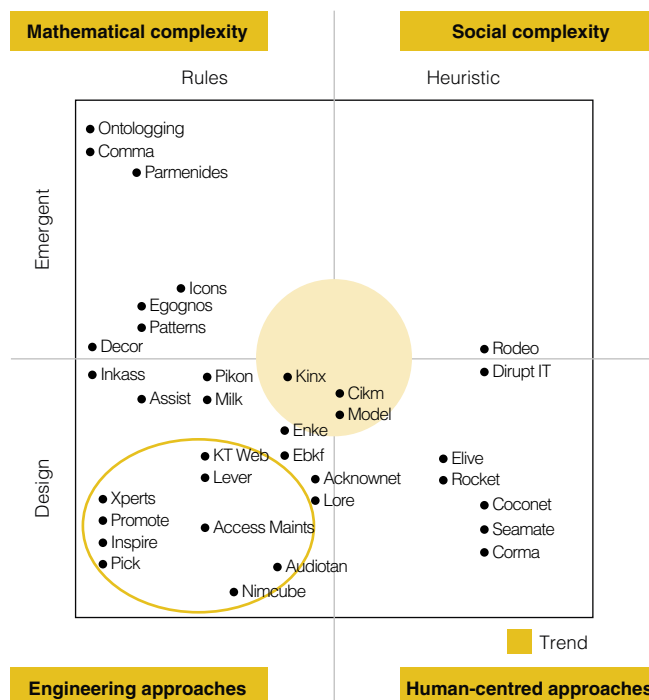
The European Commission itself recognises that these early projects within FP5 "suffered from a lack of a holistic framework or people or community-centred approach."

---

90   Paper published by Agnes Bradier, Paul Hearn and Anne Jubert on Knowledge Management Made in Europe, Organisational Knowledge
      Management within the EC IST programme.
91   IST project results on www.cordis.lu

The second wave, from 1999 to 2000, aimed at a more holistic treatment of primarily tacit knowledge in organisations and funded projects with the following concepts and themes:

- *Knowledge processes to business processes - tools and methodologies linking knowledge and business processes*
- *Assessment or measurement-type projects - which attempt to measure and benchmark Knowledge Management implementation within and between organisations and to manage and measure impact of knowledge life cycles within the enterprise*
- *Collaboration and innovation spaces - tools, methodologies and good practices which accelerate creative exchange between people working within and across organisations. The end objective of such projects is to support the transition of organisations into knowledge-based communities.*

The third generation KM (2001-2002) represented a further movement away from the classical Knowledge Management engineering approach and aimed at funding projects with the following concepts and themes:
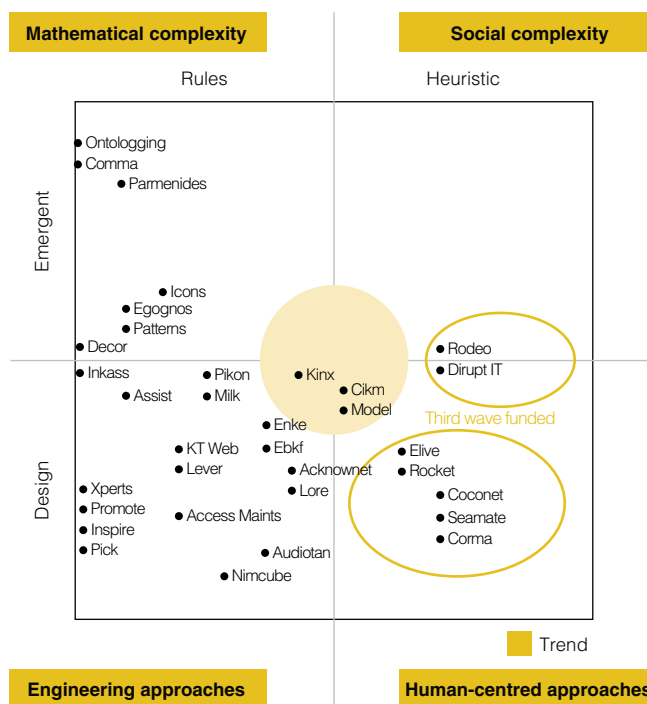
- *Knowledge and innovation ecologies - tools, methodologies and good practices which identify contextual barriers and enablers of absorptive and innovative capacities of organisations and attempt to replicate co-creation abilities across the enterprise or network*
- *Human-centred Knowledge Management - focus on people as unique holders of knowledge, and exchanges between people as primary generators of new knowledge for innovation*
- *Networks and working groups - which attempt to build critical mass within and outside the IST programme.*
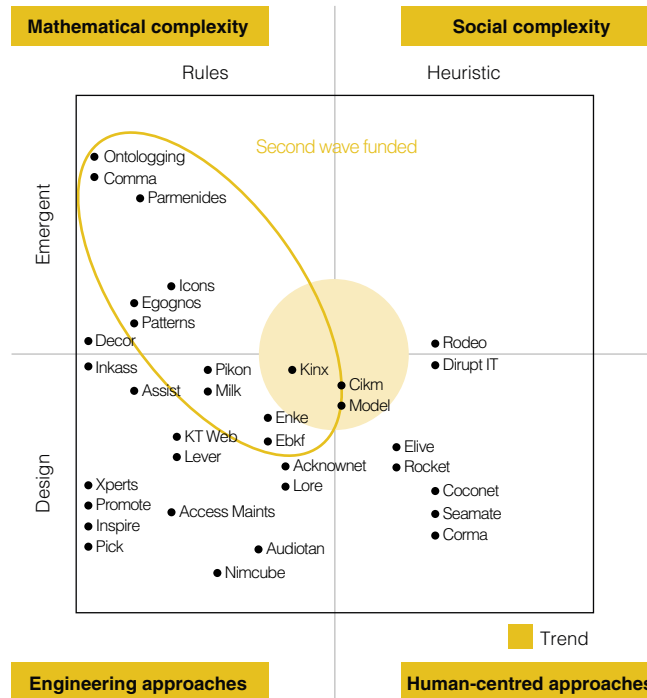
One of the most conspicuous and most mentioned projects with the largest international profile is the European Knowledge Management Forum cluster project which attempts to "build a sustainable network of Knowledge Management theoreticians and practitioners who are interested in Europe's journey into the knowledge economy, and what Knowledge Management methods and tools can contribute to this journey".

If we examine the spread of funded projects in FP5 that fall within the KMME initiative (Knowledge Management having been one of the key drivers of the project) we can see that the overall spread of projects using the KM2010 matrix shows a marked bias towards the bottom left quadrant, ie classical Engineering approaches.

An assessment of the success of the KMME initiative to date shows that indeed projects funded in the first wave are concentrated in the bottom left sector of the KM2010 model, indicating their focus on what we have determined as classical, engineering approaches to Knowledge Management. This concentration is typical of early projects in Knowledge Management programmes. The same phenomenon was observed in the US in Knowledge Management research. Many of the projects in the first phase were industry or sector specific and helped to solve problems specific to the sector or industry, without addressing issues which were of benefit across different sectors or with impact on the industry value chain.

The second wave marks a shift from the engineering approach to a more centralist best practice approach. In the third wave a significant number of projects were funded that are advanced on the mathematical complexity scale and address concepts such as intelligent agents and the Semantic Web.

However very few projects address the area of social complexity, which we contend in this study has high potential for European specific Knowledge Management. This is surprising bearing in mind the objectives of the KMME initiative were to focus on the concept of complexity a holistic approach to Knowledge Management. The subject of complexity is not widely recognised within the KnowledgeBoard community (only several references made on the Web site).

The phenomenon of divergence between focus areas in Knowledge Management research in Europe as demonstrated by this analysis, and the false dichotomy between human-centred approaches and engineering/mathematical approaches has been observed in the US as well. The opportunity for Europe is to fund and initiate more research which is related to human-centred approach, but pushes into the quadrant of social complexity.

However, certain factors are recognised that make the fulfilment of the KMME objectives, to move to a holistic, human-centred view of Knowledge Management difficult. The perception of business value and return on investment arguments are strong in the engineering approaches and become more difficult as one moves left across the model towards the human-centred approach and towards the top right, social complexity. This factor has most likely had an impact on the success of proposals, in the evaluation phase, causing more proposals to be funded on the left hand side of the model, in which the business case is stronger, the risk of failure is lower, but the potential for impact and innovation is not as great.

The clustering of funded projects also shows a clear separation between projects that concentrate on mathematical complexity, most often developing from the engineering approaches and projects funded in the systems thinking, human-centred area. Very few projects contain elements of both.

Thereby, we can observe a polarisation effect in terms of projects funded (technology related versus human-centred). In addition, the actual current organisation of the European Commission units dealing with Knowledge Management shows a polarisation, with units in Brussels dealing with e-business applications and human-centred approach and Luxembourg units dealing with knowledge interfaces and technological aspects.

FP5 projects and the Knowledge Management cluster

In relation to FP5 projects and the Knowledge Management cluster, a second e-questionnaire was launched in order to sound the opinion of all the main contact points or coordinators for an FP5 research and technology projects or accompanying measures, which belong to the Knowledge Management cluster. Around 40 people were invited to answer this questionnaire (list of projects concerned are provided in the annex) and 40 percent filled it in. This section provides a summary of the subjectively judged success of projects within the cluster as well as of the awareness levels, understanding the KMME initiative as an umbrella for Knowledge Management topics in Europe.

The Knowledge Management Made in Europe (KMME) initiative

When examining the answers, it is apparent that most of the respondents are familiar with the KMME initiative: 64.3 percent of the respondents declared that they were indeed familiar with the concept or knew about it. It is however surprising that a third of the respondents mention they have not heard about it or are not sure what it is since they are involved in a project in which the Knowledge Management dimension is a key factor. This probably reflects a relative lack of communication around the initiative.

■ Agree strongly
■ Agree
■ Neutral
■ Disagree

Are you familiar with - or have you been involved in - the EC's Knowledge Management project cluster, otherwise known as the 'Knowledge Management Made in Europe (KMME)' initiative?
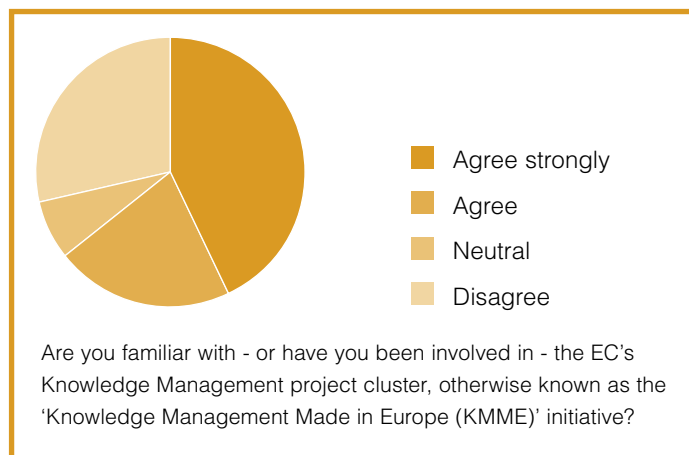
This analysis seems to be confirmed by the answers provided to questions 2 and 3 related respectively to the level of understanding of the initiative and its success. While 64.3 percent of the respondents declare knowledge about the KMME initiative, only a little more than the half believe that the concept has been correctly understood by the Knowledge Management community, interested parties and individuals. 45 percent are indeed persuaded that the concept has not been understood as an initiative aiming to provide an umbrella and discussion space for discussing advances in Knowledge Management in Europe. This is a worrying signal because the understanding of the concept and its objectives is in essence a sine qua non for the success of such initiative.

■ Yes
■ No

In your opinion, has the KMME concept been understood by the KM community, interested parties and individuals as an initiative aiming to provide an umbrella and discussion space for discussion advances in KM in Europe?
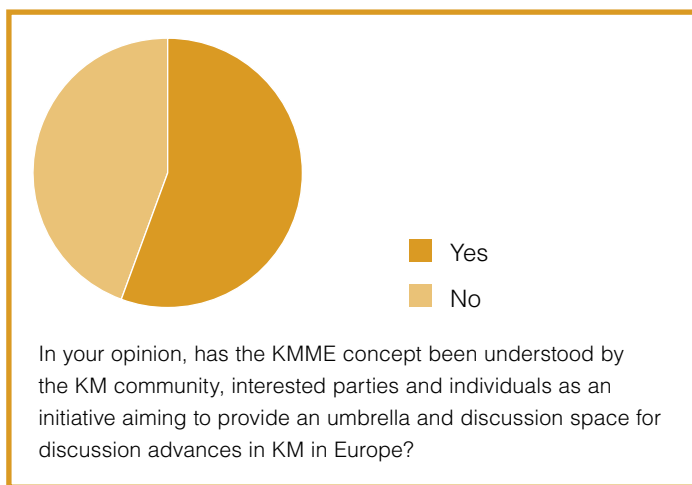
The answers provided to the third question demonstrate that we had good reason to assume that the initiative has failed in reaching all its objectives. A massive majority (88.9 percent) of the respondents believes that the KMME initiative has not completely succeeded in building a European community around the topic of Knowledge Management. However, nobody has declared that the initiative completely failed. The initiative enabled the building or activatation of some networks between KM people or organisations, as we will be able to notice further.

Do you think that the KM initiative or 'Knowledge Management Made in Europe' concept has succeeded in building a European community around the topic of KM and communality in terminology, application and implementation?

Legend:
- Yes
- Not completely
- No
- No opinion
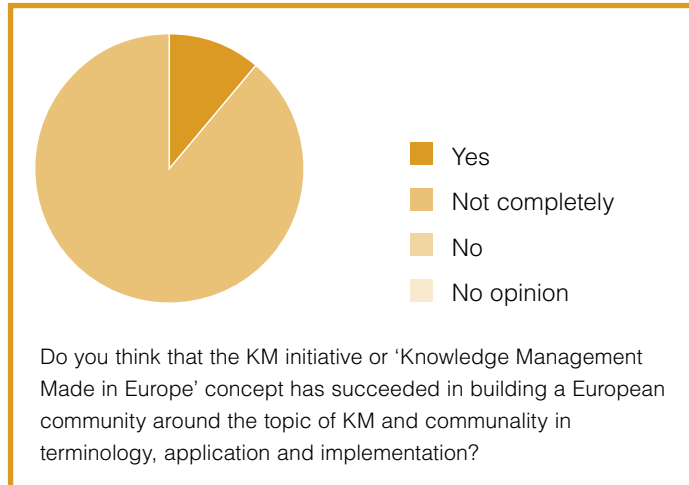
Impact of the Knowledge Management cluster

This set of questions aimed to assess the way organisations are working as from now, having been influenced by the Knowledge Management cluster, and the impact of FP5 projects within this cluster on the marketplace. In other words, we wanted to evaluate whether the Knowledge Management cluster within some FP5 projects really had an impact on those projects and their ability to disseminate their results and to strengthen the collaboration between participants as well as to develop their market presence.

Impact within the organisation

When asking people whether their own FP5 project has changed the way they are now working internally, we are faced with contrasting results. Indeed, the same proportion of respondents believed their own project has had an internal impact as did respondents who think the opposite. While people confessed that their project has not changed the way they work with colleagues, other respondents said they more focused now on transferring data into tangible knowledge for other internal teams compared to the past. A respondent added, "we are now much more using the community approach as a strategic networking method. We are building our own KM tools and method blocks to exploit and build on the experience we have made".

With regard to your own FP5 project, has the project changed the way you are now working internally within your own orginisation (either based on 'anecdotal' or measurable changes)?
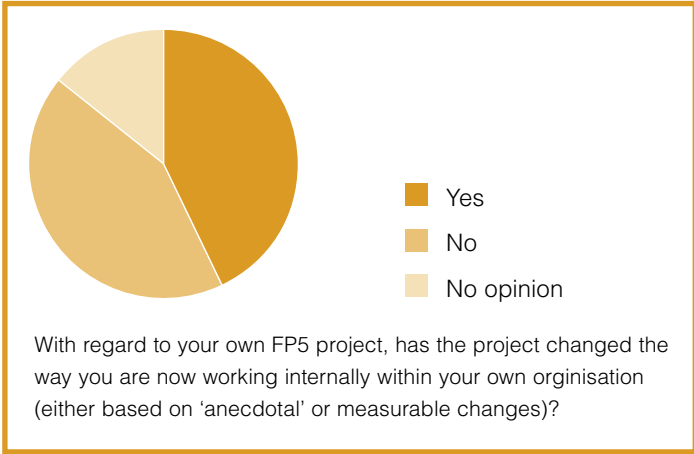
Impact outside the organisation

The results to the question 'has your project impacted the way you are now working with external partners?' are less diluted. Half of the respondents declared their own FP5 project has positively impacted their external processes while less than a third thinks the opposite. Even if it happens some time, we can not declare that those who confess their project did not impact their internal way of working are systematically the same who think it also did not impact their external processes. Some respondents indeed have noticed either a positive internal impact or a positive external impact, but not necessary both of them.

Has your FP5 project changed the way your orginisation is now working externally with your clients or with your suppliers?
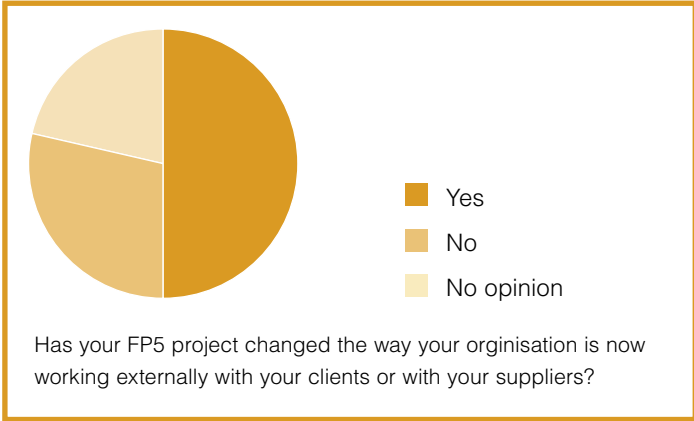
For some respondents, their FP5 project has enabled them to set up communities for networking among partners and business contacts while other declare they mainly put the focus on collaboration within project teams. A respondent acknowledges that, "the concepts developed in the project are influencing our offer of services and systems". Another stresses that, "being an applied research institute, we learned about the importance of addressing the clients own business processes. Without this effort to understand the emerging needs there is no big acceptance of proposed technical/organisational (KM) approaches".

In parallel to this question, we asked FP5 coordinators to which extent they observed that their FP5 project changed the way their partners in the consortium worked internally. This question enabled people to give their opinion on the way others are now working since the launch - and certainly the end - of their project. It was indeed expected that the Knowledge Management cluster facilitates cross-border collaborations and knowledge sharing between partners within a consortium in order to improve both the global quality and the effectiveness of their work and to reinforce the framework - and brand - for European Knowledge Management research and practice.

One of the objectives of the Knowledge Management cluster was indeed to create collaboration and innovative spaces by encouraging, "tools, methodologies and good practices which accelerate creative exchange between people working within and across organisations". The end objective of such projects being to support the transition of organisations into knowledge-based communities. So, having a look to the answers to the above mentioned question (the way others are working) in parallel with the answers to the previous ones, we can have doubts about the success of this key objective. If it is true that the Knowledge Management cluster within the FP5 projects has enabled some organisations to work differently both internally and with external parties thanks to this cluster, it is also true that not a large majority of respondents seems to be convinced that the cluster has had a strong impact on knowledge lifecycles within the enterprise.

Yes
No
No opinion

Has your FP5 project changed the way other orginisations in the consortium are working internally?
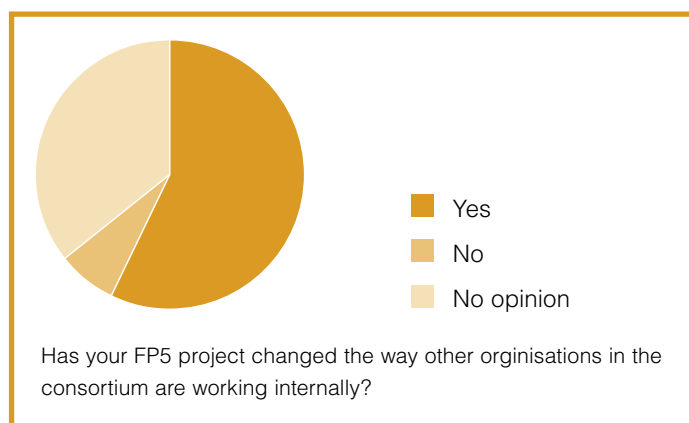
People are also very suspicious when evaluating the impact of their own project on the way others are working with their clients and/or suppliers. Only half think their project has had a real impact. Normally, working in a consortium on a FP5 project within the Knowledge Management cluster should facilitate exchanges between people and partners and exploit them as primary generators of new knowledge for innovation. Some positive comments can be underlined:

"New strategic goals have been defined and implemented inside the company"

"Methods and tools developed in the FP5 project are now in use in commercial activities of other consortium partners."

"Knowledge sharing is now available, going to a structure were the knowledge domain is central, were people team up with the same interest in a practical domain, eg knowledge transformation and knowledge centric approach in stead of functional structures."

"Results of the FP5 project are used in consulting and development business."

■ Yes
■ No
■ No opinion

Has your FP5 project had a real impact on the way other orginisations in the consortium are working with their clients and/or suppliers?
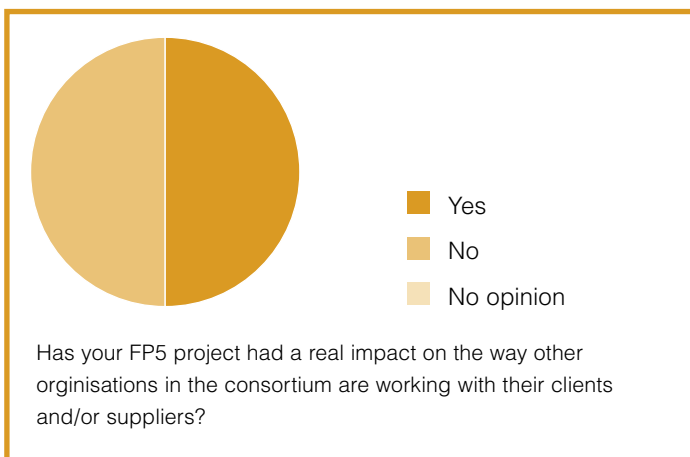
The only undeniable result is the development of new networks and collaborations between project partners. This is per se a significant and very positive result. A massive majority of respondents declared that their FP5 project within the Knowledge Management cluster strengthened collaboration and knowledge exchanges. However, when putting this result into perspective with the previous observations, it seems that, though the exchanges and co-operation have been facilitated, they have not led to a significant growth of the exploitation of those exchanges for business purposes. The transition from knowledge processes to business processes seems not to be systematic enough. It still needs to be encouraged.

Has the FP5 project led to the development of new networks and
/or new collaboration between project partners?
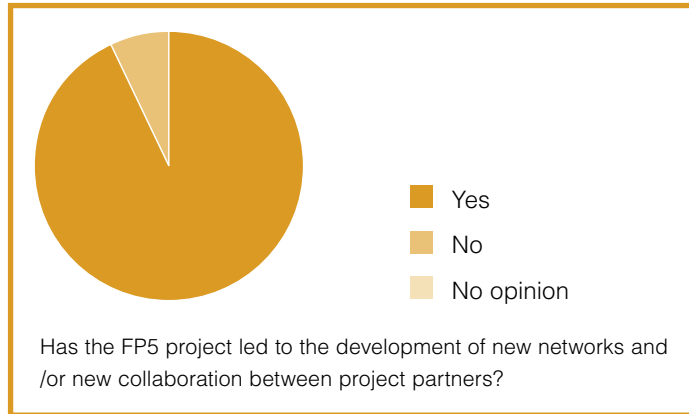
Although the FP5 projects did not impact in a significant way the working processes between
and within the organisations of each consortium - networks and collaboration practices
have been built, but they have not been clearly used as a primary source for innovation and
business improvement opportunities - all the respondents seem to be convinced that their
project has had an impact on the market or, at least, is expected to have such impact in the
coming years. In one word, their projects succeeded in providing the market with new service
or tool while they failed to reach their objectives within the different consortia (results are
'outside' the consortium).

Has the project had any impact in the marketplace, through the
development and/or market presence of a new service or tool?
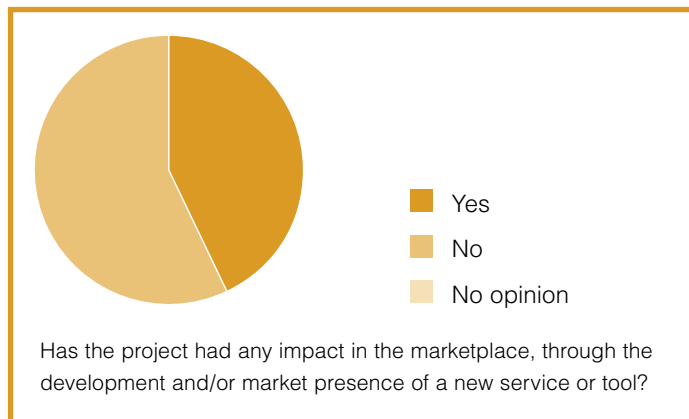
A large majority of those FP5 projects should have an impact at European level.

At what level is this impact expected or already happening?
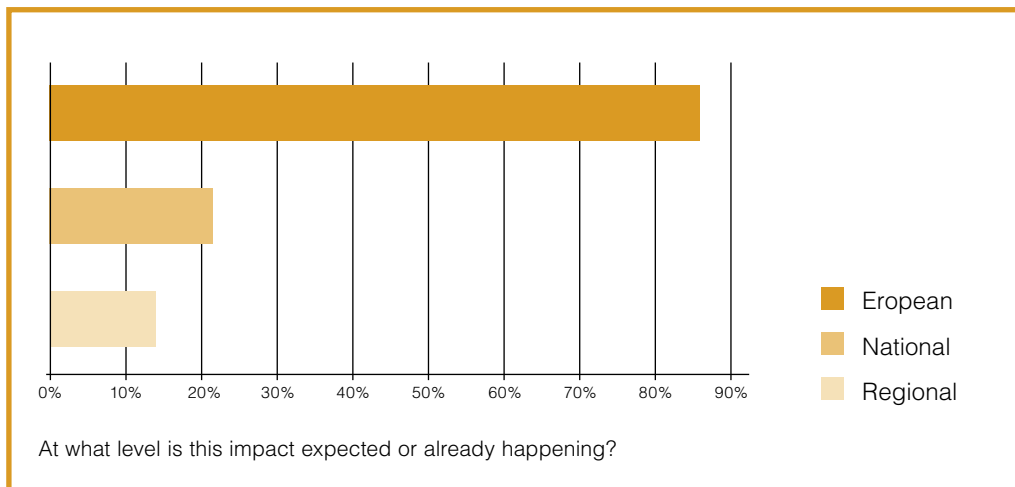
When discussing with respondents the improvement opportunities for the future projects ('what actually did not work very well within the project, either in terms of achieving project deliverables, exploiting the project, working within the consortium or working with the Commission?'), one aspect appears with recurrence: the payment.

"The delay of payments from EC to the Project was and still is a disaster throughout the whole project duration. Information about any financial issues is almost impossible to get."

"The delay the commission accepts payments."

Others emphasise the difficulty of being a SME when working on EU funded project:

"Our project does have a split administration (financial/technical), which imposes overhead and causes irritation in flow of information. Good co-operation started after intense travelling (face-to-face meetings), which is typically not covered by the claimed travelling budget. Being an R&D project, the pressure to exploit undermines to some extent the will to play and test innovative approaches with unsure results."

"The exploitation of the project is difficult since it requires the creation of a new business and neither the EC nor the financial institutions are really helping to overcome the problems."

However, when asking people what would be different now for them and/or for their consortium whether there had not been European research funding for their FP5 project, most of them confess that it would be difficult, indeed impossible, to launch it.

"The research as it's in course wouldn't have been possible."

"The project would not have taken place."

Many of the respondents also acknowledge that it would be difficult to improve their business or to gain their reputation in the Knowledge Management field.

"Without there were no new good business contacts and even friends and we did not get the good reputation we have now in the field of KM."

"We would have the same good ideas, but neither a prototype nor the experience of using it."

"Our access to innovation would be limited therefore the KM platform we would develop any way would not be so competitive."

"We would not have improved our KM products."

"The industrial partners would not have taken this effort. The research partners would have researched less integrated in more detailed areas with less application and exploitation orientation."

"Viability of some principles would not be demonstrated (yet) - the FP5 project did speed up the transfer of scientific results into industry."

"We would not have been able to develop our KM method and KM tool. Beside this we would not have such a KM competence and no possibility to join the European KM Community on such an integrative level."

Nevertheless, a respondent notices that without EU funding, he would have, "less paper work, shorter communication lines, faster results".

Among all those positive and less positive elements, the chart below can be seen as a cause for satisfaction. Indeed, more than 70 percent of the respondents consider that their results and findings have been sufficiently disseminated in the public. Dissemination and exploitation of the results are of course two essential dimensions for the success of a large initiative like the Framework programme. For lack of such broad dissemination, risks of overlaps between projects and of under-exploitation of the findings which could provide a competitive asset for the European Union would be bigger. The more the results are disseminated and shared between interested parties, the more an innovative network can be built, supported and developed in the EU's own interest.

Do you think that the results and findings of your FP5-funded project have been sufficiently disseminated in the public?

As one of the recommendations of the KMME study, we are considering organising a public workshop for all FP5 KM projects. Would you be interested in sharing your learnings or exhibiting the results you achieved (or will achieve) through your FP5 project?

Such a dissemination of the results is perhaps an explanation to the answers collected to the next question: only a fifth of the respondents (21.4 percent) thinks that there is not enough interactions between the different FP5 projects. 64.3 percent are convinced that there are not many overlaps and similarities between the funded projects thanks to good interaction.

Do you think that there is not enough interactions between the different FP5-funded projects (so it generates overlaps and similarities between projects)?
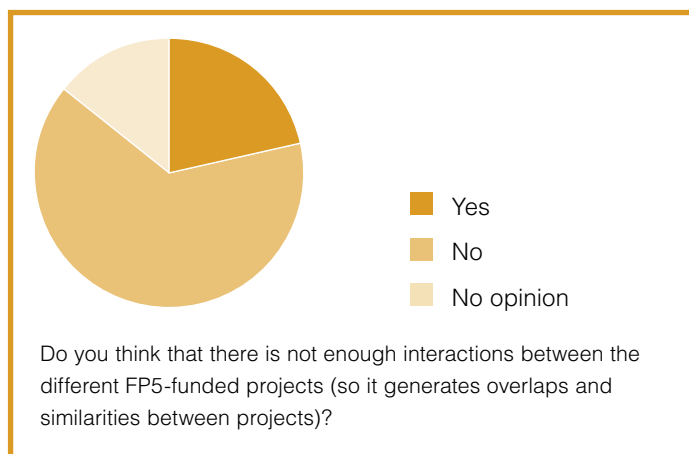
Finally, we propose to you some of the comments made by the respondents about FP5, the effective application of European funding and/or the KMME initiative:

"Within FP5 it was much easier to win a proposal or to be part of a consortium being a small and relatively unknown organisation. I would like to see KMME keeping an eye on this and not only follow the big players and who did the best lobbying."

However…
"EU projects are very complex to handle. They go well with larger enterprises but SMEs can hardly participate. On the other hand the will and the flexibility to exploit results are much higher among the SMEs as they have vital interests in exploitation."

"Now, small organisations (SME of 5 employees) like ours are no more able to participate to such projects because of financial reasons : guarantee required at the beginning of the project."

And also…
"All the projects in the area should engage themselves in the creation of something that is truly European, and funds should go to those projects that are really innovative and capable to give raise to an European KM".

"The funding of small focused projects is a much better use of resources than the funding of IPs".

"Focus must be on innovation and providing a knowledge centric work environment, in stead on focusing on paper work".

Conclusions to be drawn related to the FP5 Knowledge Cluster and KMME initiative

The following conclusions can be drawn from our analysis:

1. The KMME initiative has been a well-positioned programme which, in our opinion, rightly addressed concerns that arose at the beginning of FP5. These concerns were that funded Knowledge Management projects were too heavily oriented towards a traditional Engineering approach to Knowledge Management. This approach was unlikely to have a large impact on European innovation and the achievement of the Lisbon objectives.

2. The objective to focus more on human-centred Knowledge Management and mathematical complexity as potential areas for European leadership were also clearly indicated and very appropriate at the time.

3. As our analysis has demonstrated, although there is a discernable trend towards funding more human-centred and mathematical approaches to Knowledge Management throughout FP5, the majority of projects funded were in the bottom left sector. It would have been arguably beneficial to European research to have funded more human-centred projects and possibly more scenario 5 social complexity projects.

4. More of the 65 MEUR budget could and arguably should have been allocated to projects in line with the original KMME objectives. Overall, the KMME initiative has only partially succeeded in fulfilling its original objectives and it must therefore be questioned whether the 65 MEUR investment has yet had a major impact on fulfilling the Lisbon objectives. We can observe, through our analysis and through comments of respondents in the KM2010 interviews and eSurvey, the following factors (a full analysis is provided later):

- *Difficulty of assessing the impact of RTD projects beyond funding. In many cases the relevant consortia do not appear to be pursuing the project beyond the funding phase and have not even kept the project Web site running or published the URL. This does not necessarily mean that the project has not had the desired impact. Participant organisations may have benefited from the process and/or results of the project in a number of ways (more specific results provided in this section).*
- *In many cases project results are unpublished due to Intellectual Property considerations and therefore the impact is difficult to assess in a study of this nature. It appears that some projects have shown no discernable results whatsoever.*
- *There is a high concentration of projects funded in the classical engineering approaches quadrant which are not likely to have a major impact on European innovation or competitiveness.*

- *In terms of KMME specific communications, there has been concentration on the European Knowledge Management Forum KnowledgeBoard project, which has been very successful in building a community but may not have succeeded in being truly representative of European Knowledge Management thinking. There are high registration numbers but relatively low number of regular contributors and difficulty in maintaining highquality, up-to-date content within budget constraints.*

5.   There has been relatively low visibility of the FP5 Knowledge Management cluster and KMME initiative in spite of considerable personal engagement of key project officers and a resulting relatively low level of awareness[92]. The branding campaign did have some impact but this is only marginal. This is in part due to the KMME initiative being arguably under-resourced in terms of investment and related branding and awareness activities and partly because awareness of the KMME initiative is not at a sufficient level to have any real impact in Europe and beyond Europe, beyond a group of researchers and communities on KnowledgeBoard. In addition, and very importantly, the KMME campaign was not distinctive enough in its subject matter, or rigorous enough in its published research, under the KMME brand to attract wide interest. Web searches reveal that few documents were published related to KMME and those that are found are repetitive. In fact we think that the success of the EBKF project lead to a drift in the original KMME strategy and the two initiatives became very tightly linked (KnowledgeBoard/EKMF and KMME). This is already evident in the Terms of Reference of this study.

Roadmap for European competitiveness in Knowledge Management

Actions that are appropriate as the first draft road map for the future are as follows:

1.   Determine the future strategy regarding European Commission Knowledge Management initiatives, based on this study, other inputs and other consultative actions. It is, in our view, necessary to include relevant units from both Brussels and Luxembourg in this process to avoid polarisation. Our recommendation in this study is that the top right hand quadrant in the KM2010 model represents the main opportunity for Europe to create the world's most dynamic knowledge economy and future efforts should be focused, at least in part, on achieving more awareness of unique European abilities in this area and position of world leadership.

2.   The KMME epthitet if at all known is associated with FP5. There is no reason to continue with this concept in FP6. There are however advantages in using a campaign name to bring about change. Using the concept of KM2010 may have advantages in that this is more forward looking and directly linked to the Lisbon objectives.

---

92   Google search on Knowledge Management Made in Europe makes some references to papers published by the EC or references on the KnowledgeBoard site.

3. Carry out dissemination and exploitation in line with the campaign suggested in step 2. This can be in the form of publicly funded accompanying measures (or specific support actions that are aimed at exploiting results from Knowledge Management projects in FP5.) These actions should be closely linked to European SMEs and enlargement countries. Link this action to global initiatives in Knowledge Management, such as the Europe-based IBM Cynefin Centre, results from the FET project on complexity and other initiatives such as the network of organisations associated with the Finland Futures Research Centre in Helsinki.

4. Organise a consultative workshop for the purpose of steps 1 and 2, involving relevant EC units from Brussels and Luxembourg, industrial players, SMEs, business communities and representatives from key FP5 KM projects. Precede this by an internal meeting to ensure there is a common view.

5. Based on outputs from this meeting and conclusions from this study, keep Knowledge Management on the agenda for one of the future FP6 calls, which fund research on linking traditional Knowledge Management with advanced human centred approaches .We are under the impression that few KM projects (at least within the networked businesses and governments) are being negotiated in the first call, which is a worrying trend.

Furthermore, not directly related to the road map but important:

Knowledge Management standards
The recent movement through the CEN initiative to develop a European standard for Knowledge Management on the basis of the British Standards Institute (BSI) Good Practice initiative has not yet been published. It is too early to know what the impact of these standards will be. It is our view however, that any standards initiative related to Knowledge Management needs to follow a path of diversity and informed clarity, rather than use prescriptive methods. In the course of this study CEN and BSI representatives were asked about their view on how standards add value to SMEs. Their response, in summary, was that they were concentrating at this time upon writing informative good practice guides, rather than prescriptive methods, which they claim is the only reasonable way ahead for Europe.

While standardisation is an important part of take up and is a cornerstone for e-business and interoperability (particularly the whole concept of open standards), we contend, from the study team viewpoint, there is a risk and danger in the future that over-standardisation will take place.

While it is legitimate to define technological standards, many of these either have been, or are in the process of being, defined outside the realm of Knowledge Management. It is not legitimate to define standards that impinge on social, human-centred aspects.

In fact the over-application of standards can actually create barriers for implementation.

With regard to standards in European Knowledge Management, it is the view of this study that standardisation efforts should be around 'creating processes' by which novel trends and approaches to European Knowledge Management are recognised, well-documented and properly disseminated. An approach to recognise and credit innovative practices would help remedy the current situation, whereby there are countless 'KM experts' without any formal recognition. The BSI have carried out some important work in this area, relating to general management standards, that could be a starting point for such an initiative.

In particular, there is a specific risk of addressing SMEs with standard practices, giving them a recipe or menu of best or good practices. Although there is evidence to suggest that SMEs are very keen to be given advice in the area of Knowledge Management, one of the insights from the IST eLIVE project is that SMEs operate naturally in socially complex spaces and are thus already in a strong position to benefit from advanced Knowledge Management thinking about networks, communities of practice, ecologies and collaborative alliances for innovations.

Knowledge Management technologies

With regard to technologies, we have already described the most important current technologies in section 2. Currently, with the degree of technology innovation which is visible in the capabilities of wireless networks, pervasive and ambient computing and the emergence of GRID are all key factors which are likely to provide an enabling environment for Knowledge Management in 2010.

However, it is important to understand that technology in Knowledge Management is first of all the supporting infrastructure and toolkit upon which Knowledge Management approaches should be developed. Technology should be a tool for the KM practitioner (the analogy with the craftsman and his/her tools needing to be a perfect fit with the craftsman's hand is useful here).

However, once technology is better aligned to actual Knowledge Management processes and once these processes are themselves better understood, technology will have more possibilities to play out its transformative power - that is to alter organisational KM processes instead of simply making them more efficient. Technological development in KM has therefore to be understood as co-evolving with the organisational ways of using KM technologies. In this sense, innovations are expected to happen on the KM technology development as well as the usage side.

This makes it impossible to predict which technologies will be particularly important in 2010 beyond those mentioned here. Equally though, all aspects of Knowledge Management today, and in the future, are underpinned with technology whether these be human-centered or mathematical complexity-based.

Business communities, support groups and the public sector
It is crucial for the success of a European Knowledge Management initiative that business communities and support groups are deeply involved at ground level. It is very difficult to achieve a degree of attention and buy-in from such groups if they are not directly involved. An example of a highly visible pan-European initiative is the EBKF project which was funded in the knowledge cluster within FP5. Though the KnowledgeBoard portal is successful from certain dimensions, it did not succeed in engaging a broad range of European regional business communities.

It is our recommendation that any future pan-European initiatives in Knowledge Management work at integrating different European schools of thought and approaches, as well as different industry sectors and business communities.

In addition, the public sector can benefit from principles learnt in the private sector since the mid 90's. The recent movement towards eGovernment in Europe is displaying many of the symptoms of overhyping and over reliance in technology approaches that plagued early private sector Knowledge Management initiatives, described earlier in this study as the engineering approach.

Recommendations

In the final section we propose 7 concrete recommendations, which are the result of our survey, consultation with experts and our own analysis in the course of the study. These are closely linked with the roadmap provided in the last section. We also propose 5 concrete action areas that could be funded to support these recommendations. Since it has not been possible to organise a workshop yet to test these ideas, they remain at a theoretical level, though supported by our research and views from the consultation and survey we conducted. This workshop was a key part of our methodology and specific project plan and should be convened at the earliest possible opportunity.

Knowledge Management is an important theme for Europe. The initial hype surrounding the topic has diminished but Knowledge Management is emerging as a well-established discipline within the modern business enterprise. It is not clear whether Knowledge Management will remain a discipline in its own right or whether it will merge with other business disciplines by 2010. In our opinion, supported by the results from our survey, the relevance of Knowledge Management for Information Society Technologies in Europe is high.

There is a risk that, through the degree of confusion about what Knowledge Management is, Knowledge Management is overlooked in the current and future work programmes of the Commission.

Rectifying action is necessary which is provided in other recommendations here and within the roadmap presented in the last section. This study should be considered as a blueprint for European competitiveness in Knowledge Management.

This study forms the basis for a fresh European approach to Knowledge Management which is inclusive of the very different approaches and supports specific European strengths, which can in turn contribute to the Lisbon objectives.

Recommendation 1

It is our view that measures can be taken within the FP6 programme to support the emergence of a specific European school or approach to Knowledge Management which supports the Lisbon objectives. This European school as we have described earlier in this study is particularly active at the intersection between Artificial Intelligence and human-centered computing. This window of opportunity for Europe, which we have labeled 'social complexity,' represents a new approach, combining advanced thinking in mathematics and Artificial Intelligence with emerging thinking in the area of social sciences.

In terms of the FP6, this study should form an important input into the new Work programme.

Specific project proposal 1

As a specific measure, a network of excellence can be funded to link research resources which are at the moment disparate and making this emerging European school more effective and influential in terms of European Knowledge Management and the Lisbon objectives. This research effort should not only encompass the large European business schools, such as INSEAD, London School of Economics and London Business School, who are already conducting research into this area, but also other European business schools and practitioner circles.

Recommendation 2

Knowledge Management as it is broadly described and documented today through publications, conferences, white papers and the like (bearing in mind that there is no clear common understanding) is not geared to helping SMEs. The reason for this is that SMEs are typically small enough to have rich exchange in experience and know-how at an informal level. A structured, scientifically-based approach to generating, approving, storing and disseminating knowledge, which is commonly advocated as best practice, is not necessary or beneficial to smaller organisations/communities in which knowledge exchange is based on trust and natural informal interactions within the right context. Hence there needs to be research into how Knowledge Management should support growth in SMEs, where rapid organic expansion or growth through acquisitions leads to informal natural processes breaking down.

Evidence suggests that the threshold for natural interactions and communities breaks down when organisations grow beyond the 200 employee level and/or are highly dispersed. Arguably the skillset that SMEs have that should be further developed is that of competing and collaborating in dynamic networks and how this leads to innovation and growth. This probably needs to include guidance on trust and intellectual property rights. SMEs need to be able to do a few simple things well and Knowledge Management for SMEs needs to be focused in this area. Research should be funded in this area within the FP6 programme, through introducing strategic objectives focused on assisting micro-enterprises and SMEs with new style Knowledge Management approaches.

Recommendation 3
An important issue with European Union enlargement is how to ensure that accession countries have access to the collective experience of organisational Knowledge Management in FP5 and FP6. There is a risk that new members will not benefit quickly enough from current advanced thinking in the European school of Knowledge Management and are likely to be over-influenced by the American schools of thought, vendors and consulting houses who are currently very active in these geographies. Specific actions should be funded to enable current projects to take on partners in the enlargement countries. In addition, actions are necessary to make key universities and business schools, as well as other influencers, aware of current thinking. The third call of FP6, which is not published at the time this study is being completed, appears to be a good opportunity to provide funding for initiatives in this area. We fully support and endorse this idea.

Specific project proposal 2:
An academic exchange programme should be set up, possibly using a Network of Excellence or the Marie Curie instrument, to enable new members to benefit from and contribute to the uniquely European school of Knowledge Management. Clearly there needs to be further research into the area of emerging social complexity, which needs to take place beyond academia. Field work needs to be carried out which should involve European-style companies and typical European sectors, for instance Italian fashion-houses, Swiss watchmakers of German car manufacturers.

Recommendation 4

At a tactical level this study can form the basis of a number of initiatives within the FP6 programme itself. Should the project be funded, there should be explicit linkage between the KnowledgeBoard 2.0 project (which is being funded under the first call) to ensure that this initiative builds on the success, as well as the failures of the predecessor project. Members of the KM2010 study are willing to act as a 'Special Advisory Board' to this project. Knowledge Board 2.0 is a follow-on from the FP5 Knowledge Board initiative, and is a Specific Support Action in the first call which is being negotiated with the Luxembourg team. First discussions have already taken place with a member of the consortium.

Recommendation 5

The European Commission should support the hosting of a key Knowledge Management consultation workshop in 2004 addressing the issues raised in this study through funding a strategic support action in this area[93]. The idea is that this consultation would form an important input into the Work programme 2005/2006 and the Seventh Framework programme (FP7). The following thematic area is recommended:

- *What are the specific European trends in Knowledge Management that deliver competitive advantage for Europe?*
- FP5 Knowledge Cluster projects should be invited to present their results and impacts.

Recommendation 6

Specific research areas should be supported through FP6 or FP7, which we regard as being deficient at the moment. There is already interest in specific research areas for which there are initial ideas below, from European research centres such as IBM Cynefin Centre, IESE/ Catalonia, e-business Management School-ISUFI University of Lecce and Finnish Futures Research Centre:

Specific project proposal 3

Research into the area of social network stimulation, which uses novel approaches to Knowledge Management such as narrative databases.

Specific project proposal 4

Research into the area of new economic modelling related to complexity according to advanced management thinking, taking into account new econometric models and new economic gaming approaches from a European perspective, which are currently being researched in the US.

---

93 The study team (supported by the European Commission have already participated in key Knowledge Management events over the last six months. These were the eChallenges 2003 event in Bologna and the KM 2003 event in Amsterdam, the Institute of Business Value event in Amsterdam, whereby a presentation based on the study was used. Participation in these key European events have provide an additional input and the basis for discussion on what specific European KM is. A brief overview of the KM2010 study and early outcomes was also presented at the eBRF conference in Tampere, Finland.

Specific project proposal 5

Research into the area of technology applications that are deeply embedded in social interaction, while not invading privacy and intellectual property rights at legal/government regulatory level, corporate level or at a personal level, through dynamic application of rules. A number of FP6 projects, such as TRUSTCOM and PRIME, aim to touch on these areas. More needs to be done if Knowledge Management is to have the desired impact in Europe, related to the Lisbon objectives.

While this study has been primarily focused on the needs of European business organisations. and hence the private sector, one of the most active sectors in the uptake of Knowledge Management in recent years has been the public sector. This sector has also seen rapid growth, phases of adoption being later than in the private sector and being very similar in their adoption patterns. Though this study has been primarily focused at business organisations, its relevance for not for profit and public sector organisations is high, such as social enterprises. Hence the study should be used within other units to create a more consistent view of what European Knowledge Management is and how it can relate to the public sector. The eGovernment unit is a good starting point for this.

Recommendation 7

Europe must take a strong lead in key strategic areas of Knowledge Management - if competitive advantage is to be derived from Knowledge Management within Europe within the next ten years and the Lisbon objectives are to be achieved.

Policy groups such as the IST advisory group (ISTAG) and other strategic fora should be involved in the exploitation of the results from this study and outcomes should be asked to take it into consideration for the shaping of future work programmes. The IBM team, as well as other contributors to this study, are willing to support the Commission in this activity through presenting conclusions from the study and consultations in a follow-up phase.

Appendices

Appendix 1 - List of reviewers and contributors

The following is a list of people who contributed to the review of the current state of KM section, the scenario's building exercise, the quality check of our questionnaire or/and the dissemination of the link (URL) to our e-survey.

We would like to thank them for their contribution.

- *Amy Casher (IBM BCS US)*
- *Anne Jeanblanc (IBM BCS US)*
- *Charles Despres (head of KM reserach institute and author)*
- *Daniel Ranta (IBM BCS US, KM Consultant, On Demand Workplaces)*
- *Dave Snowden (Director of the Cynefin Center for Organisational Complexity)*
- *David Ewebank (CK Aventis, www.aventis.com)*
- *David Gurteen (www.gurteen.com)*
- *Dominic Kelleher (Freelance KM consultant, Belgium)*
- *Doug Jennings (IBM BCS Canada)*
- *Elizabeth Lank (one of the first CKOs, www.think.plus.com)*
- *Elmar Husman*
- *Eric Lesser (IBM Institute for Business Value, Knowledge and Organisational Performance Forum)*
- *Fanuel Dewever (IBM BCS Belgium)*
- *Françoise Schoumaker (IBM BCS Belgium)*
- *Göran Roos (Centre for Business Performance, Cranfield University & www.intcap.com)*
- *Heidi Amponsem (IBM BCS Canada)*
- *Helen Baxter (www.knowledgeboard.com)*
- *Huigh Wilmott (University of Cambridge, www.jims.cam.ac.uk)*
- *Jacky Boonen (IBM BCS Belgium)*
- *Jennie Starr (www.KMTool.net)*
- *John Sparrow (University of Central England, www.uce.ac.uk)*
- *Joseph A. Horvath (Director KM, Millennium Pharmaceuticals Inc., www.mlnm.com)*
- *Joseph P. Kristy (IBM BCS US, KCM Technologies)*
- *Judith Quillard (IBM BCS US, Institute for Business Value)*
- *Karen Chiang (3waynet Inc., www.3waynet.com)*
- *Kevin R Gordon (Synecta Ltd, www.synectaltd.com).*
- *Leif Edvinsson (Prof. Lund, first ever Director of Intellectual Capital Sweden, www.unic.net).*
- *Lisa Abrams (IBM BCS US, KM expert).*
- *Lynn Martin (University of Central England, www.uce.ac.uk)*
- *Marija Pavkov (Telekom Austria, www.aon.at)*
- *Mark Renom (www.kmeurope.com)*
- *Martin Röll (e-business consultant, www.roell.net)*
- *Michael Bradley (IBM BCS UK, Knowledge Consultant, Cynefin Center for Organisational Complexity, http://www.ibm.com/services/cynefin)*

- *Michael Fontaine (IBM BCS US, IBM Institute for Business Value's Cross-Industry Knowledge Forum)*
- *Mireille Edin (www.eChallenges.org)*
- *Nancy Dixon (author of Common Knowledge, www.commonknowledge.org)*
- *Nathalie Fannes (IBM BCS Belgium, Learning & Knowledge: Content Harvesting, Packaging & Delivery)*
- *Peter Korsten (Director IBM Institute for Business Value, IBM BCS The Netherlands)*
- *Peter Schütt (IBM Germany, LoB Leader for Knowledge Management Central Europe)*
- *Remo Burkhard (Competence Center Knowledge Media, www.unisg.ch)*
- *Rita Zilich (IBM BCS Italy, KM Solution Area Leader Reg. South)*
- *Salvatore Parise (IBM Institute for Knowledge-Based Organisations)*
- *Shawn Callahan (IBM Australia, IBM Cynefin Centre, www.ibm.com/services/cynefin)*
- *Steve Barth (Editor and publisher of www.destinationKM.com)*
- *Steve Denning (Former CKO World Bank, www.stevedenning.com)*
- *Steve Ellis (HSBC Bank, www.hsbc.com)*
- *Vanessa Kim (IBM BCS Canada, Human Capital Solutions)*
- *Victoria Ward (Founder Spark Knowledge, former CKO Nat West and one of the first CKOs).*

Appendix 2 - Terms of reference of the assignment

The terms of reference are provided at: www.km2010.org

Appendix 3 - Actions carried out for the completion of the study

- *Wide ranging research carried out on leading white papers and publications from both internal (IBM) and external sources*
- *Documentation of our method taxonomy*
- *Validation of our methodology by the Liaison Group*
- *Identification of stakeholders groups*
- *Validation of the stakeholders groups (exclusion of the public sector - focus on business needs /SMEs) by the Liaison Group*
- *Identification of the potential panel of worldwide leading thinkers in KM*
- *Agreement on the composition our panel of experts*
- *Preparation of the questions for our expert panel survey and recruitment to the project*
- *Obtaining the commitment of worldwide KM leading thinkers for interviewing them*
- *Making arrangements for interviews*
- *Conducting all the interviews*
- *Transcription of all interviews*
- *Analysis of expert inputs and ideas*
- *Development of draft paper about the current state of KM*
- *Review of our paper by an international network of experts*
- *Discussion and agreement with EU officials regarding the approach to adopt for assessing the KMME initiative*
- *Building scenarios for KM 2010*
- *Drawing first set of recommendations to the EU*
- *Attending training about how to use the ConfirmitTM tool (application for our e-survey)*
- *Preparation of the questionnaire (first set of questions)*
- *Draft structure of our final report*
- *Finalisation of our questionnaire and validation by the European Commission*
- *Preparation of the Web-based survey tool (from a technical point of view)*
- *Testing the first version of our e-survey (limited consultation)*
- *Collecting feedback and adapting our e-survey*
- *Exploring responses to scenarios via a broad consultation of actors and organisations (via the second version of our Web-based questionnaire)*
- *Core secondary desk research*
- *Analysis of responses to those scenarios (gap analysis)*
- *Sounding board with regard to our pre-final recommendations*
- *Delivering a high quality (pre-) final report*
- *Presenting the results and disseminating the report at the eChallenges workshop.*

Appendix 4 - European projects within the KMME initiative
(depending on the availability of information in the public sector)

Project acronym	Stands for	EU Funding	Starting date	Finished
ACKNOWNET	Active Knowledge Manager Using Dynamic Self-Modifying Knowledge Models	0.35	Nov 2001	Jan 2002
ACCESS-MAINTS	Advanced Cross-Communication Environment Providing Support Services to Dispersed Maintenance and Technical Support Engineers	1.60	Feb 2000	Feb 2002
AIM	Acceleration of Innovative Ideas to Market	2.83	Jun 2002	Dec 2003
ASSIST	Achieving global Sustainability by using Substitutive Information Society Technologies	0.54	Nov 2000	Feb 2002
AUDIOTAIN	Empowering AUDIO content providers through e-work and interactivity management to exploit audio knowledge bases in the market for interactive audio entertainment	1.70	Sep 2001	Mar 2003
CIKnowledge Management	Context-Aware Collaborative Environments for Next Generation Business NETworks	1.35		
COCONET	Corporate Memory Management through Agents	0.30	Jul 2002	Jun 2003
COMMA	Practical Tools and Methods for Corporate Knowledge Management - Sharing and Capitalising Engineering	0.98	Feb 2001	Jan 2002
CORMA	Know-How in the Concurrent Enterprise	1.40	Feb 2000	Jul 2002
DÉCOR	Delivery of context-sensitive organisational knowledge	1.40	Jul 2000	Sep 2002
DISRUPT IT	A dynamic management methodology which fosters disruptive innovation in smart organisations	1.35		
ECOGNOS	Methodology, tools and architectures for electronic Consistent Knowledge Management across projects and between enterprises in the construction domain	1.98	Jul 2001	Jun 2003
ECOLNET	European Collaboration Networks	0.90	Jan 2000	Dec 2001
EKnowledge ManagementF	European Knowledge Management Forum	1.35	Jan 01	Dec 03
ELIVE	Accelerated eLearning and Innovation Network for European SMEs	0.75	Aug 01	Dec 03
ENKE	Enhancing Knowledge Management in Enterprises	1.09	Sep 01	Oct 03

Web site	Objective
www.tupaisystems.co.il/AcknownetSite/	The project introduces a new platform that will transform knowledge into an active, functional asset ready to be shared, integrated and traded, ready to power an unlimited number of applications as well as new knowledge trading businesses in areas as diverse as e-commerce, CRM, insurance, finance, telecommunications, aerospace, health and many more.
www.metriqs.it/accessmaints/overview	The main issue of this project is to research and develop an integrated set of tools and best practices supporting the effective work of European engineers within the different European learning cultures.
www.ecdel.org.au/scienceandtech	The goal of the AIM project is to develop a system to support the collection of innovative ideas and relevant knowledge throughout the extended enterprise for new and existing process and product developments, and to develop these ideas and knowledge into a means of fostering industrial innovations.
http://fekb259.vwh.net/assist/	The ASSIST study is developing and expanding the potential for achieving sustainability by encouraging the development of Information Society Technology based alternatives to material consumption, and so reducing consumption of all kinds.
www.audiotain.com/	AUDIOTAIN is a challenging project, that tries to tackle the aspects of e-learning and Knowledge Management by developing an innovative technological platform capable of communicating the right knowledge, to the right place at the right time by making use of gaming concepts, that have proven to be successful for motivating people.
www.coconet.telin.nl	COCONET aims to prepare a strategy and road map for RTD of high industrial impact in the area of next generation contextaware collaborative environments. Focus of COCONET is in identifying the key research tasks and the key players in Europe and beyond, in developing a RTD agenda for the next 5-10 years, and in discussing possible business implementation paths and innovative applications of next generation contextaware collaborative environments with potential industrial stakeholders.
www.si.fr.atosorigin.com/sophia/comma/Htm/	The main objective of the project is to implement and trial a corporate memory management framework based on Agent technology.
www.corma.net	The CORMA project aims to develop a Knowledge Management environment to support the new product development processes in concurrent enterprises in the telecommunications sector.
www.dfki.de/pas/f2w.cgi?Knowledge Managementc/decor-e	DECOR attempts to develop integrated methods and tools for active, context sensitive and self- adaptive delivery and organisational knowledge at the process level.
	To help enterprises to continuously enable, create, use and manage disruptive innovation as a major competitive capability and strategy
www.e-cognos.org/	This project aims at specifying and developing an open model-based infrastructure and a set of tools that promote consistent Knowledge Management within collaborative construction environments.
	With the move towards globalisation of economies, many organisations choose to compete by merging or acquiring competitors in their particular markets or in upstream or downstream business processes. ECOLNET proposes to validate a different business strategy that is suited to independent European SMEs, which have traditionally focused on their national markets. This strategy develops the concept of collaboration through clustering of knowledge provided by different, independent organisations.
www.knowledgeboard.com	The European Knowledge Management Forum strives to build up a Knowledge Management community in Europe and through the community to support and identify commonality in Knowledge Management terminology, application and implementation.
www.elive-online.com	The purpose of the project is to create a pan-European learning exchange and innovation network for SMEs, based on adult learning and Knowledge Management principles and processes.
http://195.90.8.41/enke/site/default.php	The proposal aims to contribute to enhance the take up of Knowledge Management in enterprises by showing some way for doing it. It features a pragmatic approach based on two concrete significant industrial applications, which will provide guidelines for the development of methods and tools to support Knowledge Management. One application deals with complex system manufacturing and client support, it concerns the design and development of customised courses for helicopter buyers in distributed sites. The other application is in the area of waste processing and recycling.

Project acronym	Stands for	EU Funding	Starting date	Finished
H-TECHSIGHT	A Knowledge Management platform with Intelligence and Insight capabilities for Technology Intensive Industries	2.00	Apr 2002	Mar 2004
ICONS	Intelligent Content Management System	1.90	Jan 2002	Dec 2003
INKASS	Intelligent Knowledge Assets Sharing and Trading	1.70	Mar 2002	Feb 2004
INSPIRE	Intelligent Support for People Oriented Process Re-Engineering and Change Management	2.10	Mar 2000	Aug 2002
KNOWCOAT	Neural Knowledge Management solutions for the coating market value chain	2.00	Jan 2002	Dec 2003
LENSIS	Leveraging non-profit sector towards the Information Society	1.40	Jan 2001	Dec 2002
LEVER	Leveraging Knowledge in the Software Industry	0.65	Nov 2000	Oct 2001
LIRIC	Leveraging Intra and Inter-Countries Territorial Marketing in the Eastern European Manufacturing Sector	1.35		
LORE	Leveraging Operational Resources Expertise	1.20	Feb 2000	Jul 2002
MILK	Multimedia interaction for learning and knowing	1.35		
MIRROR	Mirror World Communities of Practice for Learning and Innovation in Natural Scienc	1.40	Feb 2002	Jan 2004
MODEL	Multimedia for open and dynamic executives learning	1.40	Jan 2000	Jan 2002
MUMMY		1.35		
NIMCUBE	New-use and Innovation Management and Measurement Methodology for RandD	1.60	Jan 2000	Jun 2002
ONTO-LOGGING	Corporate Ontology Modelling and Management System	1.85	Jul 2001	Dec 2003
OPAL	Integrated Information and Process Management in Manufacturing Engineering	1.35		
PARMENIDES	Ontology Driven Temporal Text Mining on Organisational Data for Extracting Temporal Valid Knowledge	1.35		
PATTERNS	Patterns To Adopt Knowledge Based Solutions To Software Management Problems	0.70	Jan 2001	Jan 2003

Web site	Objective
	The project promotes Knowledge Management practices to technology intensive industries. The development of a platform is described that enables the discovery of technology trends, expertise in demand, new dynamics and markets and, by the same token, declining fields and professions.
www.icons.rodan.pl	The ICONS project focuses on bringing together into a coherent architecture the research results, technologies and standards, in order to develop and exploit a Web-based, knowledge and multimedia content management platform. Integrating and extending results from the AI and database management fields, combined with the emerging information architecture technologies, will result in a novel Intelligent CONtent Management System (ICONS) platform.
www.inkass.com	The INKASS project addresses the area that is at the intersection of Knowledge Management and electronic commerce. The INKASS project aims at the development of an Internet-based marketplace of knowledge assets that will be targeted at European SMEs and their knowledge needs in the areas of professional services for business management and engineering.
www.bmtech.co.uk/inspire/index.html	INSPIRE will create an intelligent support tool to increase the success rate of Business Process Re-engineering (BPR) by providing real help in process modelling, design and implementation and by explicitly taking the human factor into account at all stages of the BPR initiative.
www.knowcoat.net	The objective is an operational knowledge development, management and distribution platform for the coating industry. Transparent information within the coating industry will result in more correct and timely information at decision level. This results in higher quality products and processes reducing economical and environmental waste.
www.leap.lensis.org/	
www.Knowledge Managementlever.org	The overall objective of the LEVER trial is the customisation and validation of a total Knowledge Management solution (the result of the highly successful KNOW-NET, ESPRIT 28928, project) in the software sector.
www.liric.net/	The LIRIC project is aimed at developing a novel open and interoperable platform and at exploring and validating novel technologies, application, architectures and practices at supporting the transformation of Eastern European industrial agencies into 'smart' organisations: knowledge driven, inter-worked, dynamically adaptive to new forms and practices.
http://lore.cezannesw.com/	The LORE project's goal is to deliver an integrated Knowledge Management technology and human resource management system for exploiting human and knowledge capital value.
www.milkforum.com	MILK goal is to create a solution supporting knowledge and working processes in knowledge intensive organisations. MILK embraces the Internet-enabled possibilities to access knowledge 'nywhere and anytime, according to the business needs of organisations working in the Internet economy.
www.syntax.gr	The objective of the proposed project is to establish a Europe-wide community of practice for learning and innovation in the area of natural science. In order to meet this objective, novel Knowledge Management techniques in combination with social theories of learning and scientific discourse will be coupled with state-of-the-art information technologies including Internet acceleration and 3D multiuser environment.
www.lrf.gr/model	The MODEL project aims to develop a Knowledge Management system (methodological framework, software tools etc.) which enhances the organisational ability to capture, structure and transfer knowledge across the different organisational groups (departments etc.) and over time (from project to project).
	The overall objective is to develop a holistic reference methodology for new use and innovation management and measurement in RandD. NIMCube will provide methods and IT solutions for measuring, managing and optimising re-use of knowledge and innovation.
www.ontologging.com	The ONTO-LOGGING project brings together the expertise of three industrial companies in the areas of Knowledge Management systems, intelligent agents and user interface; two research organisations in the areas of ontology formalisation and user modelling to build a set of tools on which to base the next generation distributed Knowledge Management systems.
www.crim.co.umist.ac.uk/parmenides/index.asp	The Parmenides project aims to contribute to the economic development and scientific/ technological prospects of the community by providing a unified framework to support organisational Knowledge Management, with tools derived from applied research in temporal text mining, information extraction and ontologies.
www.esi.es/Patterns	PATTERNS provides an Internetworked software application that allow users to obtain a rapid solution to a context based problem. This solution will be provided according to the knowledge available locally at each knowledge centres and to the one available in the network.

Project acronym	Stands for	EU Funding	Starting date	Finished
PICK	Tools for Process Improvements Based on Corporate Knowledge Management	1.50	Jan 2000	Sep 2002
PIKON	Personal Information and Knowledge Organiser Network	1.60	Feb 2002	Jan 2004
PRESERVE	Productivity Engineering for innovative Production Technologies by Knowledge-Based Service Networks	0.90	Jan 2001	Jun 2002
PRIMA	Project risk management	1.60	Jan 2000	Dec 2001
PROMOTE	Process oriented methods and tools for Knowledge Management	1.40	Mar 2000	Aug 2002
RIMSAT	Remote Intelligent Management Support and Training	2.15	Nov 2001	Mar 2004
ROCKET	Roadmap to Communicating Knowledge Essential for the Industrial Environment	1.35		
RODEO	Robust Development of Organisations - Adaptation through Complex Business Development within Turbulent Environments	1.35	Apr 2002	Sep 2002
SEAMATE	Socio-Economic Analysis and Macro-modelling of Adapting to information Technologies in Europe	0.99	Jan 2002	Dec 2003
SYMPHONY	A dynamic management methodology with modular and integrated methods and tools forknowledge-based, adaptive SMEs	2.43	Dec 2001	Nov 2004
VISION	Virtual Incubator System for the Initiation and Operation of Networks	0.85	Jan 2001	Sep 2002
WISE	Web-enabled Information Services for Engineering	2.15	Nov 2001	Mar 2004
XPERTS	Experts Enablers in the Machinery Engineering Domain	1.20	Jan 2000	Mar 2002

Web site	Objective
www.atb-bremen.de/projects/pick/index.html	The objective of PICK is to develop two innovative methods and tools for effective management of corporate knowledge needed to support main process improvement (PI) steps, specifically for manufacturing processes.
www.pikon.zia.ms.it	The PIKON Project will develop an integrated Information and Knowledge Management Environment that supports personal information and Knowledge Management needs and enables effective sharing of information and knowledge in the extended/virtual enterprise.
	The overall objective of PRESERVE is to raise the availability of innovative and complex production technologies by installation of an international knowledge network comprising the operating company and the suppliers. The project aims at improving the service co-operation when a machine malfunction occurs or when preventive measures to maintain the system have to be carried out.
www.esi2.us.es/prima	The PRIMA project proposes a risk-based business approach established through: a) A design to risk method, which is a pro-active risk management approach focused and starting from the bidding process. b) A decision support system (DSS) tool which assists and promotes the bidding method with a pricing decision support connected to risk knowledge processing.
www.boc-eu.com/promote/promote.htm	The overall goal of PROMOTE is to adapt the existing business process management systems methodology (BPMS), to validate it by developing a prototype named Process Oriented Knowledge Management System (PO-Knowledge ManagementS), and to test it in three end-user companies from the financial sector, thereby realising a full cycle.
	RIMSAT objectives are: a) To develop an innovative, learning knowledge-based decision support system aimed at organisations involved in highly complex, safety and/or mission critical activities and events, irrespective of their location; b) To elicit both tacit and explicit knowledge, information and data from a variety of formal and informal sources to provide a best practice, dynamic advice and guidance system available at any fixed or mobile location that has access to any terminal with wired or wireless communication capability; c) To ensure that the system will continually learn from previous experiences, enabling the advice and guidance it determines to represent the best practice available at that specific moment in time; d) To prove the concept of the system through real-world trials in a highly complex, safety critical environment; e) To use the system as the basis for collaborative distance learning/training through customisable event/incident simulation.
http://rocket.vub.ac.be/	Rocket will prepare a strategic road map for future developments in organisational learning relevant to the education of engineers and knowledge workers.
www.cranfield.ac.uk/sims/ecotech/projects/rodeomain.htm	The vision of the RODEO project is to build up a coherent perception of modern business organisation, grounded in complexity theory. Based on that construct, an integrated approach and respective instruments for business development will be built, where the key focus is on achieving adaptability and robustness in turbulent environments.
www.seamate.net	The project examines the economic and social impact of IST on EU-15, Norway and Switzerland using a variety of analyses including E3ME a dynamic macroeconomic model with detailed treatment of 49 industrial sectors.
www.ims.org/projects/project_info/symphony.html	The overall objective of SYMPHONY is to equip the target group of SMEs with a dynamic management methodology with modular and integrated methods and tools supporting them in their management activities.
www.mjc2.com/VISION/	The objective of VISION is to create an Internet-based system to promote rapid industrial reconversion and development in Europe. The aim of VISION is to launch the idea of the Virtual Incubator, a Europe-wide network linking potential industrial sites, start-ups, venture capitalists, technopoles and local authorities.
www-eurisco.onecert.fr/Wise/	WISE will provide a platform for knowledge sharing and management in product development and manufacturing. This platform will not only provide IT tools and methods for handling knowledge assets but will also specify processes and organisational changes to make the smart organisation feasible. WISE will model and analyse workable processes for typical multipartner networks engaged in product creation.
http://xperts.fatronik.com	XPERTS aims at providing manufacturing and engineering companies with the means to manage the knowledge of experts effectively, considering the entire cycle of expertise acquisition by young engineers, the use of design knowledge in daily design activities and the avoidance of the loss of knowledge when experts leave an organisation.

Appendix 5 - Our e-survey questionnaires

Two surveys were conducted in the course of the study. We have not included all the questions in this publication. You can find these at: www.km2010.org.

Below is the first screen of the questionnaire as launched on the ConfirmIt tool:

Appendix 6 - List of products and vedors

Knowledge activities	2Bridge	Aeneid	Arial Systems	Aurigin Systems	Autonomy	Avail Technologies	Baan	BackWeb	blaxxun interactive	Blue Angel Technologies	Blue Isle Software	Brio Technology	BroadQuest	BroadVision	Business Engine Software Corp.	ByteQuest	Cambridge Information Systems	Cartia	Chrystal Software	Cipher Systems
Access	⁞	⁝	⁝	⁝	⁞	•	⁝	⁝	⁝	⁝	⁝	⁝	⁝	⁞	•	•	⁝	⁝	⁝	⁝
Share	⁞	•	⁝	•	⁝	⁝	⁝	⁝	⁞	⁝	•	•	⁝	⁝	•	•	•	•	⁝	⁝
Organise	⁞	⁝	⁝	⁝	⁞	•	•	•	•	⁝	•	⁝	•	•	⁝	⁝	⁝	⁞	⁝	⁝
Collect/Capture	⁝	⁝	•	⁝	⁞	⁝	⁝	⁝	⁝	⁝	⁝	⁝	⁝	•	⁞	⁞	⁝	•	⁝	⁝
Discover/Create	•	•	⁝	⁝	⁝	⁝	⁝	•	⁝	⁝	⁝	⁞	•	⁝	⁝	⁝	•	⁝	•	⁝

Common KM functional attributes	2Bridge	Aeneid	Arial Systems	Aurigin Systems	Autonomy	Avail Technologies	Baan	BackWeb	blaxxun interactive	Blue Angel Technologies	Blue Isle Software	Brio Technology	BroadQuest	BroadVision	Business Engine Software Corp.	ByteQuest	Cambridge Information Systems	Cartia	Chrystal Software	Cipher Systems
Workflow management	›					›	›		›	›			›		›	›	›		›	›
Visualisation	›				›	›				›		›			›	›		›		›
User interface/portal	›	›		›	›		›	›	›	›	›	›	›	›	›		›	›	›	
User profiling				›			›	›		▲		›	›	›						›
Taxonomy/mapping		›		›	›					›			›	›	›		›			
Search		›	›	›	›				›	›	›	›	›			›	›	›	›	›
Personalisation	›		›		›		›	›	›	›	›	›	›			›	›			›
Natural language queries		›	›	›	›		›					›	›	›			›			›
Metadata management				›		›						›		›			›	›		
Messaging					›				›	›	›		›	›		›	›		›	›
Linguistic/semantic analysis				›														›		
Expert/skills location	›		›	›	›	›		›	›	›		›	›	›	›	›				›
Document management				›						›						›	›		›	
Distance learning									›											›
Data warehouse						›				›	›		›	›						›
Data mining	›					›			›	›	›									
conferencing/whiteboarding									›											
Communities		›		›					›	›			›							›
Collaboration	›		›		›	›	›		›				›						›	›
Clustering		›		›						›			›							
Categorisation		›		›	›		›			›			›							›
Agents/push	›	›	›	›	›	›	›	›	›	›	›	›	›	›	›	›	›	›		›

Product vendors

183

Common KM functional attributes / Knowledge activities by Product vendors

Attribute	Cogito, Inc.	Cognitor	Cognos, Inc.	Compassware	Contigo Software	Correlate	DataChannel	Dataware Technologies	Dialog	Docent, Inc.	Documentum	e-content Company	eHNC	Engenia Software, Inc.	Enigma, Inc.	Epicentric	Excalibur Technologies	FileNET	Global Recall	Glyphica
Access	:	:	:	:	:	:	⋮	⋮	:	:	:	:	:	⋮	:	:	⋮	:	:	:
Share	•	:	•	:	:	:	:	:	:	:	:	•	•	:	:	:	•	•	•	:
Organise	:	•	:	:	•	:	:	⋮	:	:	:	:	:	⋮	:	•	:	:	⋮	:
Collect/Capture	:	:	:	:	:	:	:	•	:	:	:	•	⋮	:	•	:	:	:	:	•
Discover/Create	:	⋮	⋮	:	:	•	:	⋮	•	•	:	:	:	⋮	:	:	:	:	•	•
Workflow management					›					›		›		›					›	›
Visualisation	›		›	›	›	›	›	›		›	›			›	›		›			›
User interface/portal		›	›		›		›	›	›	›		›	›	›	›	›	›	›	›	›
User profiling		›		›	›	›	›	›	›	›	›	›	›	›		›	›	›	›	›
Taxonomy/mapping	›		›			›	›	›	›		›		›				›	›		›
Search	›	›	›	›		›	›	›	›			›	›	›	›		›	›	›	›
Personalisation		›	›	›	›	›	›	›	›	›	›	›		›	›	›	›		›	›
Natural language queries				›		›		›	›		›	›	›	›	›		›	›	›	
Metadata management	›	›	›				›					›	›		›		›			›
Messaging				›	›								›							
Linguistic/semantic analysis		›		›						›			›				›	›		
Expert/skills location				›			›	›	›		›			›		›	›		›	›
Document management	›			›			›		›		›	›		›	›	›	›	›	›	›
Distance learning					›					›		›								
Data warehouse		›	›				›	›												
Data mining		›	›							›				›						
Conferencing/whiteboarding					›	›				›										
Communities					›	›	›	›	›	›	›			›		›	›		›	›
Collaboration					›	›	›			›				›	›					
Clustering	›	›						›					›					›		
Categorisation	›	›				›	›	›	›		›		›	›			›	›		›
Agents/push		›	›	›		›	›	›	›	›	›	›	›	›		›	›	›	›	›

Knowledge activities (top five rows) — *Common KM functional attributes* (remaining rows) — *Product vendors* (column headings)

184

	Hummingbird	Hyperknowledge	Hyperwave	IBM Lotus	Inference	InfoImage	InfoRay	Information Discovery, Inc.	Inktomi	Inovie Software, Inc.	Insight Technologies	Inso Corp.	Inspiration Software	Instinctive Technology	IntegrationWare, Inc.	Interwoven	InTEXT
Knowledge activities																	
Access	:	•	:	⋮	:	:	:	:	:	:	:	:	•	:	:	•	⋮
Share	:	:	:	⋮	•	⋮	•	•	•	⋮	:	:	•	⋮	:	•	:
Organise	⋮	:	:	⋮	:	:	:	:	:	:	:	•	:	•	:	:	:
Collect/Capture	⋮	:	:	⋮	:	⋮	:	:	:	•	:	:	:	:	⋮	:	•
Discover/Create	:	•	:	⋮	:	⋮	⋮	⋮	•	:	:	•	:	:	•	:	•
Common KM functional attributes																	
Workflow management		›		›		›				›	›		›	›			›
Visualisation	›	›	›	›		›	›	›		›	›		›	›	›		
User interface/portal	›	›	›	›	›	›	›	›			›	›	›	›	›	›	›
uUer profiling	›		›	›	›	›	›	›	›		›			›	›		›
Taxonomy/mapping	›	›	›	›	›	›	›	›			›		›	›	›		›
Search	›		›	›	›	›	›	›	›	›	›	›				›	›
Personalisation	›		›	›		›	›		›	›	›			›	›		›
Natural language queries	›		›	›	›	›		›	›		›	›		›			›
Metadata management			›	›				›									
Messaging			›	›		›				›				›			
Linguistic/semantic analysis	›		›	›	›			›									›
Expert/skills location	›	›	›	›		›	›				›			›	›		›
Document management	›		›	›	›				›		›	›				›	
Distance learning				›							›						
Data warehouse	›	›		›		›		›									
Data mining	›			›		›		›									
Conferencing/whiteboarding			›	›							›						
Communities	›	›	›	›		›	›			›	›	›		›	›		
Collaboration	›	›	›	›		›				›	›		›	›	›	›	
Clustering				›		›	›								›		›
Categorisation	›	›	›	›	›	›	›	›	›		›				›		›
Agents/push	›		›	›	›	›	›	›		›	›			›	›		›

Product vendors

	Intraspect	Inxight	J-Space	Kanisa, Inc.	Keymage	Knowledge Discovery Systems	Knowledge Track Corporation	KnowledgeSoft	Knowlix Corporation	LexiQuest	Marratech AB	MatrixOne	Meta4	Microsoft	MindJET, LLC	Multicosm	NetMap Solution Pty	Netopia	NetPerceptions, Inc.	Netpresenter
Knowledge activities																				
Access	:	:	:	⋮	:	:	:	:	:	:	:	:	•	⋮	:	⋮	:	:	:	:
Share	⋮	:	•	:	⋮	•	⋮	:	:	:	⋮	⋮	:	⋮	:	:	:	•	:	⋮
Organise	:	⋮	:	:	:	⋮	:	:	:	•	•	:	:	:	⋮	:	:	•	:	•
Collect/Capture	⋮	•	:	:	:	•	:	:	:	:	•	:	:	⋮	:	•	•	:	⋮	•
Discover/Create	:	⋮	•	⋮	:	:	•	:	:	⋮	•	:	:	:	:	•	⋮	:	:	•
Common KM functional attributes																				
Workflow management					➤				➤			➤	➤							
Visualisation	➤	➤		➤									➤	➤	➤	➤	➤	➤		
User interface/portal	➤	➤		➤	➤		➤	➤	➤	➤	➤	➤	➤	➤	➤	➤	➤	➤	➤	➤
User profiling	➤			➤	➤			➤		➤		➤	➤	➤		➤			➤	
Taxonomy/mapping	➤	➤	➤										➤	➤	➤	➤	➤			
Search	➤	➤	➤	➤	➤	➤	➤		➤	➤			➤	➤		➤	➤	➤	➤	
Personalisation	➤	➤		➤	➤	➤	➤	➤	➤	➤		➤	➤	➤		➤			➤	
Natural language queries	➤	➤	➤	➤	➤	➤	➤		➤	➤		➤		➤		➤			➤	➤
Metadata management		➤												➤		➤				
Messaging											➤	➤		➤						
Linguistic/semantic analysis		➤	➤	➤		➤				➤				➤		➤				
Expert/skills location	➤			➤	➤			➤				➤	➤	➤		➤			➤	
Document management		➤	➤				➤							➤		➤				
Distance learning							➤				➤		➤					➤		
Data warehouse					➤									➤						
Data mining	➤													➤			➤			
Conferencing/whiteboarding											➤			➤	➤			➤		
Communities	➤						➤	➤			➤	➤		➤	➤	➤			➤	
Collaboration	➤				➤		➤	➤			➤	➤	➤	➤	➤			➤	➤	
Clustering	➤		➤											➤		➤	➤		➤	
Categorisation		➤	➤	➤	➤	➤	➤		➤					➤		➤	➤		➤	
Agents/push	➤			➤			➤	➤				➤	➤	➤		➤				➤
Product vendors																				

	Netscape	NeuraTech Ltd.	Novell	nQuire Software	Object Design, Inc.	Open Text	Oracle	Orbital Software	Pacific Edge Software	Pensare	Plumtree Software	Polygenesys	Powerize.com	Primus	Saba Corporation	SageMaker	Sageware	SAS Institute	Semio	ServiceSoft Corporation	ServiceWare, Inc.
Knowledge activities																					
Access	⁝	⁝	⁝	⁝	•	⁝	⁝	⁝	⁝	⁝	⁝	⁝	⁝	⁝	⁝	⁝	⁝	⁝	⁝	⁝	⁝
Share	⁝	⁝	⁝	•	•	⁝	⁝	⁝	•	⁝	⁝	⁝	⁝	⁝	⁝	⁝	•	⁝	⁝	⁝	•
Organise	•	⁝	•	⁝	⁝	⁝	⁝	⁝	⁝	⁝	⁝	⁝	⁝	⁝	⁝	⁝	⁝	⁝	⁝	⁝	⁝
Collect/Capture	•	⁝	⁝	⁝	⁝	⁝	⁝	⁝	⁝	⁝	⁝	⁝	⁝	⁝	•	⁝	•	⁝	•	⁝	⁝
Discover/Create	•	⁝	⁝	⁝	⁝	⁝	⁝	⁝	•	•	•	•	⁝	•	⁝	⁝	•	⁝	⁝	⁝	⁝
Common KM functional attributes																					
Workflow management			✓			✓			✓				✓							✓	✓
Visualisation		✓				✓	✓	✓	✓		✓	✓							✓		
User interface/portal	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓
User profiling	✓		✓			✓	✓	✓		✓	✓		✓	✓	✓	✓			✓	✓	✓
Taxonomy/mapping		✓				✓			✓		✓		✓			✓	✓		✓		
Search	✓	✓				✓	✓	✓	✓		✓	✓	✓	✓		✓	✓	✓			✓
Personalisation	✓	✓	✓			✓	✓	✓		✓	✓		✓	✓	✓	✓		✓	✓	✓	✓
Natural language queries	✓	✓	✓			✓	✓			✓	✓	✓	✓	✓		✓		✓	✓	✓	✓
Metadata management			✓	✓		✓													✓		
Messaging			✓			✓															
Linguistic/semantic analysis												✓		✓					✓		
Expert/skills location						✓		✓	✓	✓	✓	✓		✓	✓	✓		✓		✓	✓
Document management			✓			✓	✓		✓												✓
Distance learning										✓					✓	✓					
Data warehouse		✓		✓				✓										✓			
Data mining		✓		✓			✓							✓				✓			
Conferencing/whiteboarding																					
Communities		✓				✓		✓	✓	✓	✓					✓		✓			
Collaboration		✓				✓		✓		✓	✓				✓	✓		✓		✓	
Clustering							✓	✓		✓	✓	✓							✓		✓
Categorisation	✓	✓	✓	✓		✓	✓	✓	✓		✓			✓		✓	✓	✓	✓	✓	✓
Agents/push	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓		✓		✓		✓	✓

Product vendors

Table — Common KM functional attributes and Knowledge activities by Product vendors

	SmartSources.com	Soft Bicycle Company	SoftArc, Inc.	SRA International, Inc.	Sterling Software	Tacit Knowledge Systems, Inc.	TeamWARE	Trellix	Tribal Voice	TRION Technologies	Verano	Verge Software	Verity	Viador	Vidya Technologies	Vignette Corp.	Visionael	WINCITE Systems	WisdomWare
Knowledge activities																			
Access	●	●●	●●	●●	●●	●●●	●●	●●	●●	●●	●●	●●	●●	●●●	●●	●●	●●	●●	●
Share	●●	●●●	●●	●	●●	●●●	●●●	●	●●	●	●	●	●	●●●	●●	●●	●●	●	●●●
Organise	●	●●	●	●●●	●●	●●	●●	●●	●	●●	●●	●●	●●	●	●	●	●●	●●	●●
Collect/Capture	●	●	●●	●	●●	●●	●●	●●	●	●●	●●	●●●	●●	●●	●●	●●●	●●	●●	●●
Discover/Create	●●	●●	●●	●	●	●●●	●●	●	●●	●	●●●	●●	●●	●●	●	●●●	●●	●●	●●
Common KM functional attributes																			
Workflow management							›	›						›	›	›			›
Visualisation	›	›	›					›				›			›		›		
User interface/portal	›	›	›		›	›	›	›	›	›	›	›		›			›	›	
User profiling	›	›			›	›	›				›	›	›	›		›			›
Taxonomy/mapping		›		›				›		›	›	›	›		›		›		
Search	›	›		›	›	›	›		›	›	›		›	›			›	›	
Personalisation	›	›			›	›	›	›	›	›	›	›	›	›	›			›	›
Natural language queries			›	›	›					›		›	›	›				›	
Metadata management			›									›		›					
Messaging				›	›				›										
Linguistic/semantic analysis			›							›			›	›					
Expert/skills location					›	›			›		›	›			›			›	›
Document management			›						›		›				›	›		›	›
Distance learning		›																	
Data warehouse					›				›	›	›	›				›		›	›
Data mining														›					
Conferencing/whiteboarding		›	›						›										
Communities		›	›			›	›		›									›	
Collaboration	›	›	›			›	›		›						›	›			›
Clustering				›				›		›		›							
Categorisation		›			›		›			›	›	›	›					›	›
Agents/push	›		›		›	›	›		›	›	›	›	›	›	›	›		›	

Product vendors

188