



WP3 - KM Framework

Task 3.1: Definition of the general KM framework

Task 3.2: Organisation, management and methods

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Executive Summary

The aim of this task is to select and define a common framework for the successful implementation of KM. The framework is compliant with the functional specification defined in WP2, but focuses more on business processes and the other issues that must also be taken into consideration in a successful implementation of KM. For the purposes of clarity and coherence, the partners decided to combine Tasks 3.1 and 3.2 into one single document (the current document D4-1)

The framework selected is the EKMF Framework Model Version 1.4 currently being developed by the European KM Forum in IST Project 2000-26393. Our analysis of other framework models showed this framework appears to include all the aspects considered necessary by the ENKE partners for successful implementation of KM.

The EKMF framework consists of eight interlinked modules designed to support both the innovativeness of the system and secure the reuse of existing knowledge within the system on the other, both key factors in the ENKE applications and the ENKE project. These modules are:

- KM strategies,
- Human & Social KM issues,
- KM organisational aspects,
- KM processes,
- KM technologies,
- Leadership
- KM performance measurement, and
- KM business cases & implementation aspects.

The framework was then analysed in detail and guidelines produced for its application in a business environment (see Chapter 3.8). A description of each individual module in the framework is given in Chapter 3 along with suggestions for appropriate methods and tools. The descriptions and methods chosen are based on the work done for WP2, discussions with and visits to the two industrial partners as well as a consideration of current literature and discussions in the KM field.

A KM framework should serve as a concise description of the major elements, concepts and principles that need to be considered in the introduction of KM. It should illustrate the interaction between these elements and serve as a reference for implementation. However, it should also leave room for interpretation in the actual situation. It is not intended as a step-by-step guide, rather as an indication

of appropriate measures and direction. It should provide an introduction for KM to beginners and act as a reference guide for more experienced practitioners.

To test the framework, it was applied step-by-step to the two ENKE applications and any feedback received integrated in the framework description. A detailed report was produced for each application identifying the key issues to be addressed. For this purpose, two separate documents were created (D4-1a and D4-1b), which also form part of this Deliverable and will also provide significant input for Work Packages 5 and 6.

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1. Introduction

This document is the result of work carried out from May to September 2002, mainly by DUK and Produotec, including the detailed discussion sessions at the 3rd ENKE Partner Meeting in Krems on 20th and 21st June 2002 and continued at a 3 day workshop at UN from 12th to 14th August, 2002 attended by DUK, Produotec, Quest and UN. The partners have decided to incorporate Tasks 3.1 and 3.2 in one single document.

When the ENKE Description of Work was drawn up at the end of 2000, KM had been around for approximately five years and was just emerging from the end of its initial IT-based phase (where many initiatives had failed as a result of inadequate solutions, over-ambitious promises by software providers and a lack of attention to the organisational aspects of KM) into a new, more inter-connected phase. Indeed, a great deal of work has been carried out in the field of KM both in Europe and the rest of the world, which was not really foreseen at the time the ENKE Description of Work was written. Numerous frameworks and models for introducing and implementing KM have appeared in the meantime, with some of these even developed under the framework of similar EU programmes. Software tools have improved and there is an increasing number of tools available. As a result, the consortium has focused on defining methods suitable for the two industry partners. We feel that these are generic and representative enough to produce results suitable for a wider audience.

Perhaps of particular relevance to ENKE is the work being done by the European Knowledge Management Forum (EKMF), whose main tasks are to define a common framework for KM in Europe, create a European Guide to Good Practice in KM and establish a common terminology for KM in Europe. The ENKE team is collaborating with this forum and a number of meetings have already been held with the forum members. Both the ENKE and EKMF consortiums feel that this collaboration and the results of applying the EKMF draft framework in the ENKE project will be extremely valuable. Two of the ENKE team members also participated at the KM Summer School organised by the EKMF as part of the framework research.

However, it should also be emphasised that KM is an individual organisational issue and the introduction of a technical solution for KM will now, more than ever, need to be accompanied by an appropriate set of organisational measures and recommendations to ensure its acceptance and success. Furthermore, the issues addressed by a KM tool will always differ from organisation to organisation, emphasising the benefits of easily adapted, yet customised tools such as those being developed in the ENKE project.

2 KM Framework Selected for ENKE

A KM framework should serve as a complete and concise description of the major elements, concepts and principles that need to be considered in the introduction of KM. It should illustrate how the interaction between these elements and serve as a reference for the implementation and application of KM. A KM framework should explain the KM domain, yet still leave room for interpretation in the actual situation. It is not intended as a step-by-step guide, rather as an indication of appropriate measures and direction. It should provide an introduction for KM to beginners and act as a reference guide for more experienced practitioners.ⁱ

In the course of our research for this work package, a number of possible KM frameworks (for details see below) for the ENKE project were identified and analysed. Following a detailed discussion among the partners, the EKMF Framework Model Version 1.4 was selected for use in ENKE. The following frameworks were considered:

- **EKMF KM Framework Model Version 1.4**

- **Knowledge Management Process Framework (KM Fieldbook)ⁱⁱ**

This is a simplified method of looking at the way organisations generate, maintain and use knowledge-based assets to create value for the organisation. The framework follows two lines of activity that occur simultaneously in organisations, namely the day-to-day use of knowledge and the long-term process of matching intellectual capital to strategic requirements. It is split into *four tactical processes* (namely, Get, Use, Learn and Contribute) and *three strategic processes* (namely, Assess, Build/Sustain and Divest).

- **Building Blocks of Knowledge (Wissen managen)ⁱⁱⁱ**

This framework differentiates between eight KM processes (so-called building blocks). These are knowledge *identification, acquisition, development, distribution/sharing, application/use, storage, goals* and *measurement*. This framework has already been described in more detail in Task 2.3. KM General Problem Analysis.

- **APQC KM Framework (<http://www.apqc.org/>)^{iv}**

This framework describes a road map to KM which includes the following stages: *Getting started, Strategy Development, Design and Launch, Expansion* and *Support* and *Institutionalisation*. It differentiates between KM *enablers* (strategy and leadership, culture, technology, measurement) and the stages in the KM *process* (create, identify, collect, organise, share, adapt, use).

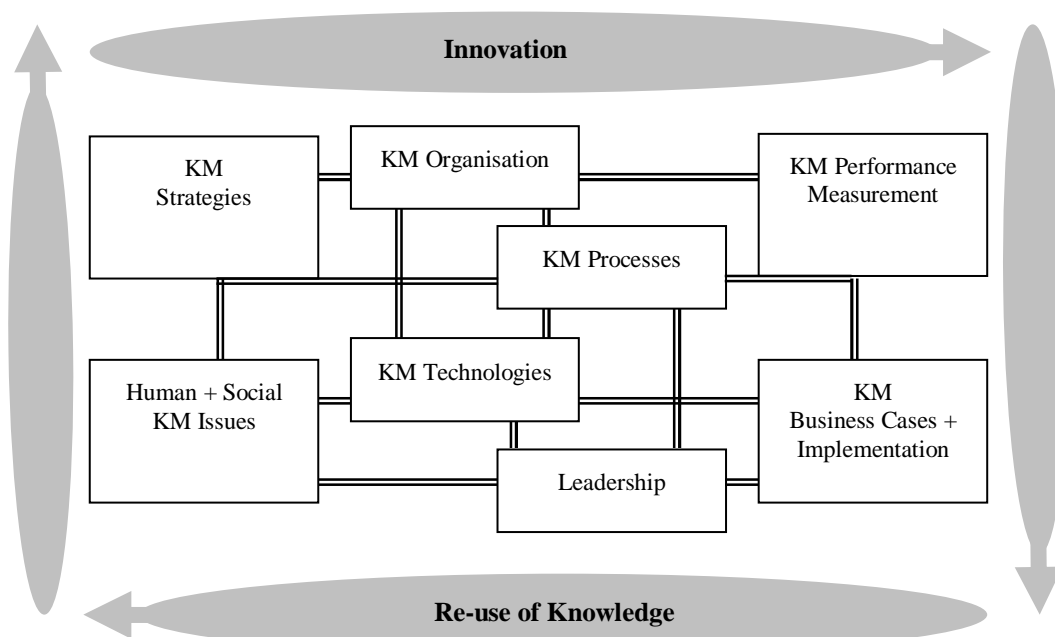
- **Basic KM Model** ^v

This model differentiates between three levels, namely the *data*, *knowledge* and *action* levels. These are combined with five core processes (*information*, *documentation*, *communication*, *application* and *learning*) to build the Basic KM Model.

A number of other framework models were also studied and described in detail in the analysis work for the definition of the EKMF model and as a result have not been included here. To make use of the synergies between two IST projects, it was agreed to adopt the framework under development by the European KM Forum (Project No 2000-26393), who were contacted to discuss collaboration possibilities.

There are a number of benefits to using this model. Firstly, and most importantly, it appears to contain all the elements considered necessary by the ENKE partners, described in KM literature and identified in the other analysed framework models for implementing KM (see also WP2). Secondly, this approach is mutually beneficial and utilises the synergies between two related IST projects, thus sharing knowledge and avoiding duplication of work. Thirdly, since this model is still in an early phase of development and the EKMF has a more academic and theoretical focus than ENKE, it will benefit greatly from feedback from the practical application and testing of the framework in the two ENKE industrial applications. This collaboration was agreed with one of the key members of the EKMF (BIBA) in August 2002 and intensified at their KM Summer School in September 2002. Further meetings are planned for later this year.

2.1 European KM Forum Draft Model



The EKMF KM Model Version 1.4 (draft) consists of eight interlinked modules designed to support both the innovativeness of the system and secure the reuse of existing knowledge within the system on the other, key factors in the ENKE applications and the ENKE project.

These modules are:

- KM strategies,
- Human & Social KM issues,
- KM organisational aspects,
- KM processes,
- KM technologies,
- Leadership
- KM performance measurement, and
- KM business cases & implementation aspects.

Each of the individual modules will be discussed in detail in Chapter 3. This discussion is based on an analysis of current KM literature and activities and input from the experiences of the individual ENKE partners. This will include a generic description of state-of-the-art supporting methods and tools for each module.

3 EKMF Framework– Detailed Discussion

KM should not be thought of as a separate process in an organisation and should be seen instead as a fully integrated part of existing structures, management and work processes. A separate, additional system only involves extra work for all concerned and is unlikely to achieve the desired results.

As mentioned above, a KM framework should serve as a concise description of the major elements to be considered in the introduction of KM. It is not intended as an all encompassing checklist, but rather should serve to encourage users to consider aspects they might previously not have considered in their KM deliberations.

This chapter provides a generic description of the framework selected and suggests appropriate KM methods and tools for each of the modules. The EKMF framework is particularly suited to the aims of the ENKE project, since it includes all the issues that need to be addressed in the implementation of KM and places emphasis both on the human aspects of KM (to create innovation through knowledge sharing in organisations) and on the reuse of organisational knowledge through the incorporation of technical solutions.

3.1 KM Strategies

Effective KM needs a clearly defined and well-communicated strategy, goals and direction. These should include:

- **normative** goals (aimed at the creation of organisational knowledge awareness, environment and culture open to effective KM and the sharing and development of individual skills and knowledge),
- **strategic** goals (to provide a definition of organisational core knowledge and a description of the future needs and competencies required by an organisation), and
- **operative** goals (to enable the implementation of KM and success of KM initiatives and ensure that normative and strategic goals become definite and can be achieved).

Knowledge goals provide the direction for KM activities and determine which skills need to be developed and on which level. Strategy and goals must be clearly communicated to all concerned. Determining and defining a knowledge strategy requires an understanding of the business needs. The implementation of new technologies is expensive and time-consuming and a bad choice could affect productivity and often block the way for a later, "better" application.

Strategy and goal definition are generally top down activities, reaffirming the need for management support in KM activities. Furthermore KM goals should be ultimately closely linked to corporate business goals. However, KM initiatives can often grow out of a bottom up approach, with an individual or department realizing the benefits of KM and acting as a catalyst for further KM activities throughout the organization.

3.1.1 Supporting Methods and Tools

- Identify KM management approach (bottom/middle-up or top-down)
- Ensure management support for KM, since ultimately they will set strategic goals. This support is imperative to the success of KM initiatives, regardless of the level on which they begin.
- If management support is not available from the outset, briefing or brainstorming sessions to convince them of the benefits of KM and obtain their support for continued efforts.
- Definition of normative, strategic and operative goals and alignment with corporate/organisational goals
- Kick-off meeting/workshop with staff to introduce KM and communicate the goals and strategies.
- Determine expectations and goals of employees for KM (e.g. in workshops, through questionnaires)

3.2 Human & Social KM issues

This module defines the roles of the people involved in the KM process and should result in a clear definition of the specific human-oriented KM issues. The inclusion of this module (and also the Leadership module) recognises that much work has been done in the field of KM and that an emphasis now needs to be placed also on non-IT issues, since it is now widely recognised that knowledge resides in people and cannot be stored in a database.

KM is no longer seen simply as the managing of knowledge, but rather as the introduction of organisational and management methods to ensure knowledge transfer and its contribution to the value creating process. As a result, KM initiatives must now actively look to include human resources activities and methods for organisational development. These include recruitment activities, training measures, mentoring systems, support for formal and informal communities and networks, space management and motivation schemes.

The reasons and motivations for creating and sharing knowledge differ from person to person. KM must create a climate of trust for knowledge sharing by addressing fears and barriers and, if

appropriate, introducing incentives or rewards for knowledge sharing. These need not be financial motivations, indeed KM is far more likely to succeed if staff recognise the benefits of KM in their daily working lives.

3.2.1 Supporting Methods and Tools

- Inclusion of HR department and organisational development aspects in KM activities
- Recruitment and training (e.g. additional training on new systems)
- Mentoring schemes
- Space management
- Motivation schemes (inclusion of knowledge goals in employee assessments, financial/material rewards for successful knowledge sharing, recognition of efforts, personal balanced scorecards)

3.3 KM Organisation

This module provides important information on how to create, run and maintain a knowledge friendly organisation. This will include the suggested structure and the roles within a 'KM organisation'. This module should be seen as providing guidelines for aligning existing organisational structures to KM.

3.3.1 Optimal Organisational Structure

Whilst recommendations can be made, it is impossible to define a generic "optimal organisational structure" valid for all organisations, since their needs and requirements are and will all be different. However, we feel that the differences in the organisational structures of the two industrial partners in ENKE will provide a good background to make solid recommendations widely valid for the effective introduction of KM. Since these recommendations will then be tested in two entirely different business settings using two distinct IT applications and the lessons learned then incorporated into the suggested ENKE framework, we feel sure that the final set of recommendations and applications will be highly beneficial for other organisations.

Organisational culture is extremely important for collaborative working and KM is more likely to succeed if it fits in with the existing corporate culture. Organisational culture is best described as the way things work in an organisation. No two organisational cultures will ever be the same. Unfortunately, KM will rarely (if ever) encounter an organizational culture that is totally open to KM and the real problem starts in ensuring that the necessary cultural changes are made to build an organisation geared to knowledge sharing and exchange. Organisational and behavioural change are the most difficult part of implementing KM.

Edgar Schein^{vi} identifies various dimensions that are characteristic for a learning culture. However, the term "learning culture" in itself appears to be contradictory, since culture is defined as a stabilising process, a conservative force, a way of making things predictable, while learning indicates change. In his definition of a learning culture, the organisation assumes that the environmental context in which it exists is to some extent manageable. The more unstable and turbulent the environment, the more an organization has to adapt to these changes and try to control them.

Human activity is a combination of proactive problem solving and learning on the one hand and passive acceptance and slow reaction on the other. In a learning culture, solutions to problems are derived from a pragmatic search for truth and wisdom, and truth can be found in any one source or method. Learning culture is also characterized by a positive attitude to human nature, i.e., human nature is basically believed to be good. Human relationships in a learning organisation are a blend of individualism and groupism.

Communication and information are central elements in a learning culture where multi-channel communication systems allow everyone to connect to everyone else.

3.3.1.1 Learning Organisations

A learning organization is an organization that creates new knowledge, i.e., creates a process of innovation. The learning organisation recognises that the ability of an organisation to solve problems does not lie in the individual expertise of the employees but rather in the collective components of the organisational knowledge base. It concerns the changing of the organisational knowledge base, the creation of collective frameworks and the increase in the organisational ability for problem solving and action. The binding of key knowledge holders to an organisation provides a challenge for innovative human resources strategies.

In learning organisations, managers or even project leaders act more as coaches (knowledge farmers) than superiors. It is their role to take care of their staff and enable them to work and learn together for their own benefit and for the benefit of the organisation as a whole.

3.3.1.2 The "Hypertext Organisation"

Nonaka/Takeuchi propose the concept of a "hypertext organization" as the best form for supporting organisational knowledge creation. A hypertext organisation assumes a non-hierarchical, self-organizing structure, which works in tandem with the hierarchical formal structure. As business organizations grow in scale and complexity, they need to maximise flexibility on both a corporate and a local level. Corporate vision provides the direction for product or service development and determines the appropriate market. Organisational culture orients the mindset and action of every

employee. While corporate vision and organisational culture provide the knowledge base to tap tacit knowledge, technology taps the explicit knowledge generated in the two other layers. These three totally different layers or contexts coexist within the same organization. The key characteristic of the hypertext organization is the ability of members to shift contexts to accommodate changing requirements (within and outwith the organisation). It benefits both the bureaucratic structure and the task force, e.g. by implementing, exploring and accumulating new knowledge through internalisation and combination, as well as generating new knowledge through socialisation and externalisation.

3.3.1.3 The Shamrock Organization

Charles Handy uses the shamrock symbolically to illustrate that modern organisations are made up of three different groups of people. The **core employees** (core activities) are the knowledge owners in an organisation. They are generally highly skilled, educated and experienced professionals, who set strategy and manage the organisation. All non-core activities can generally be performed cheaply and effectively by **outsourced contractors**. The organisation is thus more flexible in adjusting to market needs and can focus properly on core activities. A **flexible labour force** (of part-time and temporary workers) enables an organization to deliver services just in time, without the need to carry unnecessary resources when order volumes are low. All three groups are managed and paid differently and have different expectations. As far as the organization is concerned, all three groups are critical for organizational success.

3.3.1.4 External Knowledge Network

Organisations also need to mobilise the tacit knowledge held by outside stakeholders such as customers, suppliers, competitors, the regional community, or the government, through social interactions. Tapping these sources is a key activity in the knowledge-creation process.

3.3.2 Communities and Networks

CoPs, formal and informal networks play an increasing role in business life and are a fundamental part of learning and knowledge exchange. Whilst the social aspect of learning and knowledge sharing plays a key role in these types of networks, the need to network and share knowledge through a chain of interdependent organisations (globalisation) means that members of such networks are often not located at the same site or even in the same country. This has led to the emergence of virtual communities (of practice) to keep the members of these networks in touch even without face-to-face meetings.

The role of existing and new communities should play a key role in the human and social KM issues and the knowledge identification process for the ENKE applications as the way knowledge is currently

shared in networks an organisation is of utmost important. ENKE must look to build on these networks, without over formalising them. Any attempts to exclude their relevance would be counter-productive.

3.3.3 Organisational Culture and Barriers

There can be many barriers to be overcome in the implementation of KM, especially in knowledge-hostile corporate cultures. These include lack of balance between knowledge givers and receivers, lack of trust, diverse cultures and group thinking, different organisational perception and context, lack of value placed on the importance of knowledge (time restraints, lack of space and procedures for knowledge exchange), lack of tolerance of mistakes.

Identifying and addressing these barriers is one of the hardest issues in the implementation of KM and may often only be possible in the form of methods for organisational change and development.

3.3.4 Supporting Methods and Tools

- Selection of methods appropriate to the actual organisation
- Encourage/create a knowledge-friendly organisational structure appropriate to the organisation in question (e.g. by demonstrating the individual and group benefits of knowledge exchange)
- Focus on (inter-)cultural aspects (if appropriate)
- Identification, encouragement and support of existing communities of practice, formal and informal networks
- Identification and addressing of barriers (IT, training, awareness programmes, organisational development methods)
- Awareness creation

3.4 KM Processes

This module deals with the relevance and importance for KM of business and general processes in organisations. It provides guidelines for the whole target group to become more efficient in acquiring, sharing and maintaining knowledge. A knowledge-oriented organisation must understand the internal processes in their organisation that support the creation, acquisition, sharing and storing of knowledge. Technology only plays a small role in these activities. The more important issues here are identifying and managing the types of knowledge that need to be acquired and shared and creating a culture that encourages and promotes knowledge sharing. This includes the creation of appropriate systems to enable the efficient and effective use of knowledge in the organisation and providing different user groups with access to the information they need at the right time and in the right place.

Probst^{vii} differentiates between eight KM processes: Knowledge identification, knowledge acquisition, knowledge development, knowledge distribution, knowledge use, knowledge preservation, knowledge goals and knowledge measurement. The "goals" and "measurement" processes are covered in this document by the modules KM Strategies (Section 3.1) and KM Performance Measurement (Section 3.7). A description of the other six processes is given below.

The aim of these processes is to identify existing knowledge sources and analyse their use, identify existing knowledge activities and content and identify any gaps in existing knowledge activities, content, tools and methods. KM links knowledge processes to business processes and plays a connecting role between individuals, groups and the organisation by uniting members of individual groups in a common strategy.

3.4.1 Knowledge Identification

To manage knowledge effectively, a common understanding of what is meant by knowledge and what constitutes the organisational knowledge base must be reached. This is crucial for the future KM process. It is also important to identify and evaluate what knowledge is critical to success and how that knowledge is spread across the organisation.

Knowledge identification plays a key role in the complete KM process. In the identification process, the organisation in question defines what it actually considers to be knowledge, the purpose(s) this knowledge should fulfil and which knowledge is relevant for success. Knowledge identification includes establishing transparency over existing internal and external knowledge and expertise. Maintaining a general picture of existing knowledge, expertise and skills helps companies to become more efficient, make informed decisions and avoid duplication of efforts.

Identifying and capturing tacit knowledge is one of the most difficult tasks in knowledge management and as a result the following section describes one of the most widely discussed approaches, namely the SECI process or Knowledge Spiral developed by Nonaka and Takeuchi^{viii}.

3.4.1.1 The Knowledge Spiral

Nonaka and Takeuchi see the mobilisation and conversion of tacit knowledge as the key to knowledge creation. **Tacit knowledge** is highly personal and hard to formalize, it is not easily visible and expressible and consequently difficult to communicate or to share with others. It includes subjective insights, intuitions and hunches. Tacit knowledge is deeply rooted in an individual's action and experience, as well as in ideals, values and emotions. **Explicit knowledge** is formal and systematic. It can be expressed in words and numbers and easily communicated and shared as hard data, scientific formulae, codified procedure or universal principles.

The interaction between tacit and explicit knowledge from a lower ontological level to higher levels (individual, group, organisational, inter-organisational) emerges as a spiral (knowledge spiral) that includes four layers of knowledge conversion: **socialisation** (from tacit to tacit), **externalisation** (from tacit to explicit), **combination** (from explicit to explicit), and **internalisation** (from explicit to tacit), or SECI for short.

Socialisation is the process of sharing experiences and thereby creating tacit knowledge (e.g. apprentice master relationship, where craftsmanship is learned not through not through language, but through observation, imitation and practice). The key to acquiring tacit knowledge is shared experience. **Externalisation** is a process of articulating tacit knowledge into explicit concepts (i.e. documenting knowledge). Making tacit knowledge explicit is a key criterion in the knowledge-creation process. Externalisation runs into problems when specific skills cannot be documented or processes are purposely based on old traditions and methods. **Combination** is a process of systemising concepts into a knowledge system. New knowledge can be created by combining different forms of explicit knowledge (e.g. files, graphics, databases, paper documents, meetings, telephone conversations, etc.) and reconfiguring existing information through sorting, adding, combining and categorising. **Internalisation** is a process of embodying explicit knowledge into tacit knowledge. It is closely related to "learning by doing". When socialised, externalised and combined knowledge is internalised into employees tacit knowledge bases (e.g. as shared mental models or technical know-how), it becomes a valuable asset.

3.4.2 Knowledge Acquisition

Knowledge **acquisition** activities determine the knowledge and expertise an organisation has to import from external sources and helps it to draw on the expertise in customer, supplier and partner relationships. These relationships often have excellent potential for providing knowledge, yet are seldom fully utilised.

Knowledge acquisition includes buying or acquiring the critical knowledge capabilities missing in a company. Possible sources could be information systems, stakeholders (e.g. customers, partners), other knowledge products (e.g. software or patents) or even production systems. The definition of the knowledge to be acquired can be assisted by defining or classifying types of knowledge, meta information, results presentations (list, tree, net), methods for presenting knowledge (knowledge maps, topic maps, associative nets, contents) and tools for converting, transforming and loading acquired knowledge into existing systems.

3.4.3 Knowledge Development

The knowledge **development** process supports the management activities intended to produce new internal or external knowledge on both an individual and a collective level. It includes the creation of new knowledge and the way the organisation itself deals with new ideas and makes use of the creativity of its employees. It looks at ways of building new expertise (even production processes can be analysed and optimised so as to yield knowledge).

Methods for knowledge capture and management often come from two distinct areas: business management techniques and knowledge techniques used in the development of knowledge-based applications. These include information and knowledge audits and modelling, process flow analysis, SWOT (Strengths Weaknesses Opportunities Threats) analysis, intellectual capital methods (e.g. balanced scorecards) and process modelling methods (e.g. IDEF).

The actual method (or combination of methods) chosen depends on the individual organisation and its business process and culture. However, a number of issues must be considered in effective knowledge capture, including:

- a "standard" company vocabulary to ensure knowledge (and KM) is correctly understood
- methods for identifying, modelling and representing knowledge (existing and future requirements), and
- sharing and reusing knowledge across different applications and users.

3.4.4 Knowledge Distribution

The **distribution** of knowledge is one of the most essential parts in the knowledge management process and looks at getting the right knowledge to the right place at the right time, i.e. what should be distributed to whom, when and how. The sharing and dissemination of knowledge within an organization are prerequisites for turning isolated expertise and information into something of use to the whole organisation. Due consideration must therefore be given to the processes of knowledge dissemination within the organisation.

There are many possibilities for knowledge sharing methods and tools and the three examples discussed below have been selected because they illustrate a technical possibility (KMS/Knowledge Portal), a people-oriented method (Storytelling) and a combination method (Micro articles).

3.4.4.1 KMS/Knowledge portals

KM systems today are comprised of a complex set of processes, usually involving a geographically distributed production team from diverse functional areas, using multiple process steps, and exceptional amounts of information regarding the targeting of content.

A KMS (Knowledge Management System) or Knowledge Portal helps enterprise workers to share knowledge and work together collaboratively in an easy-to-configure desktop workspace environment. For more details on KMS and/or Knowledge Portals see D4-1 – Technical Specifications.

3.4.4.2 Storytelling

Storytelling was developed by David Snowden at IBM and is a useful tool for disseminating information and knowledge in organizations. Stories already form an integral part of most organisations and help to define the organisation what it means to buy from it, what it means to work for it. The use of storytelling can provide major benefits in modern business and knowledge exchange.

3.4.4.3 Micro Articles

The concept of micro articles was developed by Helmut Wilke^{ix}. A micro article generally uses a story and a solution to describe a problem or issue and is no longer than one page. The story format gives subsequent readers a better understanding of the context. Micro articles aim to simplify the documentation and location of context-sensitive knowledge. They usually include a short description of the content (*title*), short narration of the facts (*story*), description of experiences gained (*insights*), conclusion drawn from these experiences (*conclusion*) and open questions and issues (*subsequent questions*).

Micro articles give employees the possibility of using a story to describe an issue and can be easily stored in a KMS/Knowledge Portal for distribution and sharing.

3.4.5 Knowledge Use

The productive use of organisational knowledge for the benefit of the organisation (i.e. making sure that the identified knowledge is applied effectively in the production process) is also one of the main aims and purposes of knowledge management.

Examples of the use of knowledge include the application of customer-related know-how for the preparation of sales and marketing activities, research in other projects for solutions and experience relevant to a new project or for bid creation, the use of information created in the R&D department for building eLearning course modules, the use of project management data to create the basis for a

project final report, the creation of standard reports for controlling or personnel activities, or the identification of internal experts, to name but a few.

3.4.6 Knowledge preservation

The aim of knowledge preservation activities is to make sure we do not actually lose knowledge. It generally requires the efficient use of modern technologies and includes not only the actual storing of information and knowledge, but also the (often complicated) process of selecting what should be stored. It must also look at the aspects of continual updating (e.g. deletion or archiving of out-of-date information), since the more up-to-date a knowledge store is the more effective and powerful a tool it will be.

Knowledge preservation activities shape the processes of selecting valuable knowledge for preservation, ensuring that it is suitably stored and regularly incorporating it into the knowledge base

3.4.7 Supporting methods and tools

- Knowledge and information audits (analysis of knowledge and communication flows)
- Interviews with knowledge holders and users
- Methods to externalise tacit knowledge (e.g. the Knowledge Spiral)
- Methods to transfer/share knowledge (KMS/Knowledge Portal, Storytelling, Micro articles, Best Practices)
- KMS/Knowledge Portal
- Organisational Knowledge Base

3.5 KM Technologies

In the EKMF framework, this module addresses the fundamental question of which technology should be used for which purpose and gives an overall overview over existing and future KM technologies. The aim of this module is to assist organisations in their KM technology decisions.

There are wide range of technological solutions now available for different KM processes, ranging from mind mapping solutions to measurement tools to complete knowledge management solutions. Since one of the primary aims of ENKE is to develop two KM solutions for the industrial partners in the project, this topic is covered at length in the documents D2 State-of-the-Art and D4-2 Technical Specifications.

However, the following table will provide an initial overview of possible tools and technologies for each of the eight KM processes described in Section 3.4 KM Processes. Selected tools will then be described in more detail.

| Process | Possible Tools |
|--------------------------------|---|
| Knowledge Identification | <ul style="list-style-type: none"> • mind mapping tools • database solutions (can also be integrated into a KMS) • data mining • search machines, databases, external knowledge sources, catalogues • terminologies and ontologies |
| Knowledge Acquisition | <ul style="list-style-type: none"> • model-driven knowledge acquisition (e.g. KADS) • data mining • mind maps, knowledge maps • search machines, databases, external knowledge sources, catalogues |
| Knowledge Development | <ul style="list-style-type: none"> • information and knowledge audit tools • knowledge and process modelling tools • SWOT analysis • intellectual capital methods (e.g. balanced scorecards) • process modelling methods (e.g. IDEF) |
| Knowledge Distribution and Use | <ul style="list-style-type: none"> • KMS • knowledge portal • communication tools (Outlook, Notes) • CRM tools • document management tools • workflow tools • search tools • terminologies and ontologies |
| Knowledge Preservation | <ul style="list-style-type: none"> • KMS • knowledge portal • CRM tools • document management tools • archiving tools |

3.5.1 Mind Mapping

Mind mapping is a graphic technique that helps people to think and learn. It can be seen as a type of brainstorming and can be used to encourage the generation of new information and knowledge, e.g. different interpretations and viewpoints. Business maps enable users to quickly capture both structured

and unstructured information which, once captured, can be efficiently organised, prioritised, viewed and communicated.

3.5.2 Topic Maps

Topic mapping is a new paradigm for the organisation, retrieval and navigation of information resources and is the subject of a new international standard, ISO/IEC 13250:2000, intended to provide a unified model for representing knowledge and linking it with the information resources in which it is embodied.

Topic maps allow knowledge to be represented and modelled in an interchangeable form and may provide a unifying framework for knowledge and information management.

The topic map standard is based on the traditional book index, which forms a basis for the map of the book's content and the associations between the entries. Topic maps generalise these concepts for electronic information and may help to bridge the gap between information and knowledge management (e.g. people, roles, products and the relationships between them can all be represented as topics).

3.5.3 Ontologies and Terminologies

In recent years much work has been done in the development of ontologies and there are also a number of EU projects dedicated to this subject. Many disciplines now develop standardised ontologies for their own domain and companies are developing internal ontologies and terminologies to assist communication and knowledge searching activities. Ontologies can range from large taxonomies categorising a complete domain to categorisations of products and services and keyword lists for use in search engines.

An ontology provides a common vocabulary for representing and communicating knowledge about a topic and a set of relationships that hold among the terms in that vocabulary. They are useful for people who need to locate and share information as they enable them to share a common understanding of the structure of information and help to find information in knowledge-based systems. Indeed, there is often a fine line between where an ontology ends and a knowledge base begins.

However, ontologies are more than just an agreed vocabulary and are complicated to design, produce and maintain (with ontology projects requiring a large investment in resources and time). Therefore, companies should consider their actual needs and also investigate the possibilities of implementing or adapting standard ontologies or existing company terminologies into a planned knowledge system.

3.5.4 Supporting methods and tools

- KMS/Knowledge portals
- Combination with eLearning initiatives
- Accompanying measures to ensure that any tool selected or developed is accepted/recognised as a standard tool in the organisation (e.g. incorporation of standard administrative activities)
- Knowledge maps, topic maps, semantic webs
- Mindmapping
- Expert systems, skills DBs, Yellow Pages
- Terminologies and ontologies
- Evaluation of existing/prior systems and their reasons for success/failure

3.6 Leadership

This module looks at the critical success factors in introducing a KM leader within an organisation and includes the desirable or assumed characteristics of such a leader, their situation/position in the organisational hierarchy and their activities.

The term "leadership" prompted some discussion in the ENKE team as it was linked with negative connotations for one of the partners. For this reason, we feel it is necessary to explain that leadership in this context is not meant to mean solely management (e.g. introduction of a CKO), but far more includes those members of an organisation who play a leading role in KM initiatives (knowledge champions, key connecting players, motivators, facilitators, etc.).

Some form of leadership will be necessary for the success of any KM initiative, be it a top-down or bottom/middle-up approach. If nobody takes the lead and promotes the system and its benefits, it will be unlikely to succeed. Furthermore, in the case of IT applications, someone will have to assume a leadership role in system implementation, content and administration. The same applies to communities of practice and formal/informal networks, which form around a key individual or group of players.

The use of a pilot project is a good way of gaining support for a system and the members of the pilot team often then take on the role of "KM leaders" in their organisation.

3.6.1 Supporting methods and tools

- Identification of KM champions or leaders to who actively promote and encourage KM and help to create enthusiasm and commitment and demonstrate benefits
- Gain support of project managers, expert and key communication people
- Introduction of a chief knowledge officer or content manager
- Definition of pilot group / pilot project (quick win, growth of knowledge leaders)

3.7 KM Performance Measurement

This module looks at the importance of measuring the performance of a KM system and the resultant improvements from these measuring methods. It also provides metrics to provide an overview of the maturity of a KM system. In addition, it will include measures for expanding and extending KM activities.

Since one of the main reasons for introducing KM is to increase corporate value, organisations need to also introduce methods of measuring the impact and success of KM measures and of normative, strategic and operative knowledge goals. KM measures take up resources and time and must therefore prove their worth.

Traditional accounting methods are not suitable for measuring knowledge and there is increasing evidence that they do not capture the full value of an organisation. However, there are currently no real tried-and-tested measurement methods available. One of the challenges of effective KM is the establishment of appropriate ways of measuring whether or not goals are being met. One way to do so is to introduce definite, measurable goals for KM (e.g. in the two ENKE applications a reduction in the time required to create courses or prepare a bid) that will show the value of the initiative.

3.7.1 Supporting methods and tools

- Introduction of measurable KM goals and targets
- Introduction of measuring methods (e.g. Market capitalisation methods, Return on Assets methods, Intellectual Capital methods, Scorecard methods)
- User questionnaires
- Inclusion of knowledge goals in employee assessment schemes

3.8 KM Business Cases & Implementation Aspects

This module will provide good and best practices in different areas of KM as well as suggesting a general roadmap to help organizations in implementing and establishing their KM systems. It is

obviously advantageous to look at what other organisations are doing, especially partners and competitors, when beginning KM initiatives. There are now a large number of "best practice" stories published in literature and even on the Internet to be looked at and often partner organisations are willing to share their experiences.

Although KM projects often simply "grow" over the years, if an organisation is looking to implement KM from scratch, then a similar planning approach should be taken to implementation as with other business projects. This is extremely important if the KM approach selected has a strong IT focus, since the introduction of IT tools generally requires a detailed analysis and planning phase prior to installation. However, it is not enough to simply extend project management methodologies to include KM. The reason for this is that KM links both technology and culture and requires KM-specific competencies.

3.8.1 Implementation guidelines

We propose the following step-by-step project guidelines for the introduction and implementation of KM. These steps are based on a study of a number of KM models (including the draft model proposed by the EKMF) in which we identified the following five main phases:

- Initialisation and strategy phase
- Analysis phase
- Planning and design phase
- Development and implementation phase
- Measurement and assessment phase.

3.8.1.1 Initialisation and strategy phase

Each KM project has to start somewhere. Initialisation can be the result of a strategic management decision or a bottom-up approach started by an individual or department in the organisation who has recognised the need for or is interested in KM to increase their own productivity and benefit the value-creating and innovation processes.

This phase is extremely important, as it establishes the prerequisites for the success of KM in an organisation. During this phase, the KM vision and goals are determined and a joint understanding for KM is created for all those involved. It is also essential to secure top management support at this stage.

Much of the initialisation phase for the two ENKE applications has already been completed in the drawing up of the Description of Work and the detailed definition of the applications in WP2.

3.8.1.2 Analysis phase

In this phase, the current knowledge situation in the organisation is analysed to determine how individual divisions and departments deal with knowledge as a resource, the knowledge sources they use, how knowledge is currently stored, identify knowledge gaps, assess current systems, etc.

It is also essential to identify and accept the way an organisation has previously "managed" knowledge and information and use this as the basis for optimal suggestions for change and procedures. KM frameworks often assume that an organisation will have to undergo radical change to effectively implement KM (e.g. change almost overnight from a hierarchical, top-down organisational structure to a learning organisation). Whilst there is no doubt that this would be an optimal situation, ENKE takes a more pragmatic approach and places a strong emphasis on proposing realistic measures that fit the organisations involved. Any organisational measures and changes proposed must also take place at a pace suitable to the industrial partners involved.

Although this approach differs to idealistic, holistic approaches to KM, it is more in fitting with the goals of the project and organisations involved. It will be far better to introduce a gradual change and a successful technical solution on a smaller scale than to try to introduce everything at once and be faced with a lack of acceptance and barriers. Ultimately, this approach will enable us to propose a final framework suitable for other organisations.

3.8.1.3 Planning and design phase

This phase includes the both the planning of the technical infrastructure and the prioritisation of the requirements determined in the analysis phase.

3.8.1.4 Development and implementation phase

This phase deals with the integration of the selected KM solution in the organisation and in the daily working processes of the staff. It includes not only the installation and implementation of selected IT solutions, but also methods to encourage staff to both contribute knowledge and to use the "stored" and "available" knowledge. Indeed, this reuse of shared knowledge is a decisive factor in the success and value of KM.

3.8.1.5 Measurement and assessment phase

The acceptance of KM initiatives is dependent on the proof of their success (above all for management). It is extremely difficult to measure the value of knowledge, and as a result KM initiatives often opt for the measuring of KM activities instead (e.g. through the use of Balanced Scorecards, etc.). The results can be used to determine additional steering mechanisms oriented to the

company's strategy and knowledge vision. Furthermore, they provide a link back to the real reason for starting the KM process, namely to create a competitive advantage and a positive contribution to the value-adding and innovation processes.

3.8.2 Supporting methods and tools

- Literature and Internet research
- Comparison of solutions at comparable companies
- Discussion with peers

This chapter describes in detail the EKMF Knowledge Management Framework selected for the ENKE project. It provides a description of each of the eight individual modules in this framework and suggests possible methods and tools for each one. In their descriptions, the authors have tried to illustrate a balance between the IT and non-IT elements of knowledge management and provide users of the framework with practical guidelines on how to use this framework and implement a knowledge management project.

4 Synergies and Conclusion

This document details the KM framework selected for the ENKE project and provides a detailed theoretical description of the eight modules it contains, whilst also suggesting and describing possible practical methods and tools for each.

To test the suitability of this framework for use in a business environment, it was then decided to apply it step-by-step to each of the two industrial applications in the ENKE project. A detailed description of this work and the results of this process can be found in Deliverables D4-1a (for Eurocopter) and D4-1b (for Umweltschutz Nord).

Applying the framework to the two applications was an extremely beneficial process for a number of reasons. It provided us with a great deal of highly relevant feedback on the comprehensibility and suitability of both the framework guidelines (i.e. this deliverable) and on the framework itself. This feedback was used to optimise this document and provide more information on any points that had proved to be unclear. Relevant feedback will also be provided to the EKMF for integration in the next version of the framework.

Since the work already carried out for the Application Descriptions in WP 2 formed the basis of the framework application activities, this process enabled us to identify and illustrate those KM methods and tools which will be used at each of the industrial partners' companies to accompany the development and implementation of the two software applications. This work is also extremely relevant for the future Work Packages 5 and 6 (Application Development) and provides us with a clear view of the non-IT methods and tools planned to be introduced at the two industrial partners' sites. The work carried out at both sites was extremely useful for contextual analysis. For example, the interviews carried out with the instructors at Eurocopter and the project leaders at Umweltschutz Nord during this framework analysis process also helped to draw their attention to the ENKE project and to knowledge management itself.

We were also able to identify a number of synergies between the two applications. These include:

- The role of informal networks and communities in tacit knowledge sharing and the need to accommodate this in some way in the two applications.
- Both applications take a bottom-up approach to KM and will use the success of the KMS to gain further management support for future KM activities, placing even more importance on the success of the two technical applications to be developed and emphasising the essential role

played by IT as an enabler in KM initiatives. Although top management at both companies are in favour of KM and aware of the benefits it could bring them, getting their further support will still be a challenge.

- The KM initiatives at both sites are largely dependent on a small group of people who play an extremely important role as KM initiators and champions and give up a lot of their own time to promoting this concept in their organisations.
- The application and use of the framework has helped to increase acceptance of the need for an integrated approach to KM and prompted a detailed consideration of aspects outside IT (which often tend to be neglected in IT-based KM implementations carried out without such a framework).
- The role of cultural issues in both applications. The focus at Umweltschutz Nord will be to raise awareness of the benefits of knowledge exchange and will involve addressing organisational culture issues. This is also relevant at Eurocopter, where inter-cultural issues (e.g. between instructors and trainees) will also play a big role.

However, although the partners found the framework extremely useful and comprehensive, it was also criticised for number of points.

- The lack of distinction between the different modules. Many of the suggested methods and tools would have been appropriate for several of the modules and it was suggested that it might be advisable to either reduce the number of modules or provide a clearer distinction between them in a future version. For example, it was at times not clear where to differentiate between KM Organisation and Human & Social KM Issues and neither the framework description published by the EKMF nor the meeting with a representative of the EKMF really provided a clear distinction. The same was true for the KM Strategies and Leadership modules and the ENKE consortium also felt that the Leadership module could also easily have been integrated into at least two other modules (namely KM Organisation and Human & Social KM Issues). Distinguishing between these modules might prove difficult for companies with less experience of KM than the ENKE consortium partners.
- The need for a separate module for KM Business Cases and Implementation was questioned, although the decision by the consortium to use this module to provide a set of guidelines for KM projects was considered useful and appropriate.

- The use of the term "Leadership" was also questioned. Although the ENKE team understood this to mean motivation, support and facilitation, it was felt that this could also be misinterpreted in some cases.
- Although a minor issue, it was also felt that from a practical point of view, the graphical illustration of the framework could lead to confusion. All eight modules are seen by the EKMF to be interacting and of equal importance, yet this is not reflected in the graphic and, indeed, the ENKE consortium had to contact the EKMF for clarification of this point.

These points have already been communicated to the EKMF verbally at their KM Summer School in September and they will also be provided with a copy of this document to illustrate the interpretation of the framework by the ENKE consortium and provide them with written feedback.

In general, the framework was felt to be complete and highly useful for the implementation of KM. It emphasises the fact that companies should avoid trying to optimise knowledge activities in individual areas without considering the wider effects and that KM performs a bridging function among individuals, groups, and organizational structures.

It should also not be forgotten that this framework description is only intended as a kind of compendium of all issues that should be considered. Whilst a framework may serve as an invaluable help in determining possible issues that will need to be addressed, making the selected methods and tools work is a far bigger factor than the actual framework itself. It should also be pointed out that not all the modules and issues will necessarily be relevant or applicable to all companies and organisations. Individual KM projects must select those issues applicable to their own situation.

A KM system will only be truly "successful" if it has the support of management and users and this was clearly echoed in the work carried out on the application of the framework to the two industrial applications. The work to be done in obtaining this support should not be underestimated, but is perhaps now a challenge that is clear to all members of the ENKE consortium.

Although we consider this framework document to be complete at this stage in the ENKE project, any issues that may arise in the next stages of the project and feedback from the actual KM implementation process will be added to this document in the course of the project and, if necessary, an updated version produced.

5 References

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