

The PROMOTE[®] approach: Modelling Knowledge Management Processes to describe an organisational KMS

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Abstract. This article introduces the EC-Project PROMOTE[®] (IST-1999-11658) [1], [2], [3], where an overall framework for process-oriented knowledge management is being developed. The focus of the project is to introduce a modelling language that is sufficient to describe the organisational memories and implement a Knowledge Management System (KMS). These models are seen as an overall management view that is tool and method independent. The Use Case “Software Development” where a software development process is supported to enhance quality is introduced, example models are depicted and the realisation concept is pointed out. The evaluation of knowledge management is briefly mentioned by introducing a Balanced Scorecard model that has been adapted to the needs of knowledge management.

1. INTRODUCTION

There is a significant gap between the importance of knowledge management and the realisation on all levels in an organisation: There are many surveys that show that knowledge management is recognized as a management task with high priority. When looking at concrete projects and initiatives, however, knowledge management receives much less attraction. Lack of time is a main reason that knowledge workers mention when asked why they do not support knowledge management.

A possible reason for this gap between necessity and reality is separation of knowledge management from the core business. Another reason is the difficulty to access available knowledge. Identifying an expert or finding documents with relevant information is a time consuming and often frustrating task. Even worse,

people often are not aware that helpful knowledge or information might be available.

To overcome these barriers the PROMOTE[®] approach provides a solution to two critical challenges of knowledge management

- integration with the operational business: knowledge management tasks are associated with activities in business processes.
- providing access to available knowledge: explicit graphical knowledge structures help to get an immediate overview of available knowledge - people with required experiences - and information - codified explicit knowledge.

Knowledge management consists of many subtasks like identification, access, storage, use, distribution, etc. From these the use of knowledge is the most important. Why should vast amounts of lessons learned be stored in a service database if the service agents do not access it? What does it help to distribute experiences of successes and failures if the workers do not remember them when a new problem arises? What does it help to store product specifications if a technician developing a new product does not recognize the analogy to a similar solution?

An important challenge for using knowledge is to assess the relevance for an actual task. Knowledge is relevant if it helps to solve the problem at hand. The problem can be characterized by two criteria:

- The knowledge content: It is an obvious distinction whether we must calculate the premium of a life insurance, fix the interest rates of a mortgage or diagnose the error in a defect computer device.
- The work context: The work context consists of the overall process and the persons involved. Activities in general are part of a business process; the information gathered and decisions made in preceding activities of the process have a significant influence on the relevance of knowledge. For instance, the premium of a life insurance depends on the medical risk assessment.

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PROMOTE[®] [1] is a model-based and IT-based approach to knowledge management using the concept of an organisational memory information system to store relevant information and provide pointers to people with relevant know how.

The benefits of using a model based knowledge management approach like PROMOTE[®] are listed as follows:

- On the base of business processes, knowledge intensive activities that strongly influence time, quality and cost of an process are easily identified and supported.
- The integration of knowledge models with business process models, and evaluation models supports an overall management view with consistent analysis, evaluation and coordination.
- The definition of an knowledge management approach by knowledge models is tool and method independent. To realise the approach several different knowledge management tools are able to be combined.
- With evaluation models like Balanced Score Card Models it is possible to evaluate the knowledge management approaches, successful approaches are able to be distributed through knowledge model documentation.

PROMOTE[®] supports various model types to deal with the above-mentioned content and context characteristics:

- Topic maps are knowledge structures that model the knowledge content. They are semantic networks consisting of knowledge objects (topics) and relations between them. A graphical representation of topic maps helps a knowledge seeker to navigate in the organisational memory: If, for instance, he is looking for knowledge about cancer, a medical topic map shows all the related topics like smoking etc. Thus the knowledge seeker gets hints about relevant knowledge he/she did not think of.
- Skill models relate topic maps to people and represent the skill status of a particular person with respect to topics in a topic map.
- Process models represent the work context. Knowledge objects and people can be associated to knowledge-intensive activities via so-called knowledge processes.

The PROMOTE[®] approach has been developed in an EU-funded project having the same name. It has successfully been applied in two trial cases. The following section gives an overview of the knowledge management methodology of PROMOTE[®] and the application within a test scenario.

2. PROMOTE METHOD TO DEVELOP AN ORGANISATIONAL KMS:

This section describes the previously mentioned access to available knowledge. The PROMOTE[®] approach uses the business process as a starting point of the knowledge management approach as this process is not only seen as “a set of manual, semi-automatic or automatic activities, that are executed under the restriction of certain rules to achieve an organisational goal” (translated) [4], but also as the Know-How-Platform of an organisation, that will be realised by value chains to achieve the strategic goals of an organisation. Supporting the critical tasks of business processes automatically leads to a knowledge management approach that assists users in their daily work and therefore directly focuses on the operational knowledge. The authors are well aware that there exists several definitions of knowledge and knowledge management, within PROMOTE knowledge is seen as “humanised information” [3]. PROMOTE has therefore the aim to support users at critical tasks with information in a way the user can interpret this information. This information exchange will be defined by so-called “knowledge management processes” (KMPs) that define the building-, identification-, access-, storage-, distribution-, and evaluation-process of an organisational memory.

In PROMOTE these KMPs are seen as important, as the interaction between users and the organisational memory can be defined, distributed and evaluated. The KMP-categories used in PROMOTE are described as following:

- **Knowledge model building processes:**
This category of knowledge management processes includes the analysis of business processes, the modelling of knowledge models and the validation of knowledge models.
- **Knowledge identification processes:**
This category of knowledge management processes includes the identification of critical business processes, the analysis of skills and competences, and the analysis of the business processes supported by knowledge management processes.
- **Knowledge access processes:**
This category of knowledge management processes includes the interactions between human knowledge workers and the organisational memory as well as the interactions with the internet.
- **Knowledge storage processes:**
This category of knowledge management processes includes the storage of micro articles, the categorisation of documents and the description of knowledge resources with textual annotation.

- **Knowledge distribution processes:**
This category of knowledge management processes includes the co-ordinated generation, validation and distribution of new entries in the organisational memory.
- **Knowledge evaluation processes:**
This category of knowledge management processes includes the definition of knowledge evaluation criteria, the modelling of such evaluation criteria and the monitoring of knowledge management processes according to the defined criteria.

Each of these KMPs categories has a different effect on the organisational memory. The definition of strategic knowledge goals help to focus on the right category. The next step is to define tools to support the selected KMPs. In today's literature there are many approaches to classify knowledge management tools, within PROMOTE these tools have been mapped to the previously mentioned KMPs.

Table 1 gives an overview how KMP-categories could be mapped to KM-tools.

Table 1 KMP categories and KM-tool mapping

	Tool Mapping
Builder	Workshops, Questionnaires, Interviews
Identification	Analysing tools, Knowledge maps, Yellow Pages, Expert reviews, Skill-games
Access	Quality circles, Project organisations, Communication platforms, Virtual teams, Distributed Project teams, Groupware, Discussion forum, Document management systems, lessons learned databases, Frequently asked questions, Organisational memory information systems, Search and retrieval, Guidelines, checklists, Organisational handbook, Micro Articles.
Storage	Discussion forum, Document management systems, lessons learned databases, Frequently asked questions, Organisational memory information systems, Guidelines, checklists, Organisational handbook, Micro Articles, Blackboard, Data base
Distribution	Knowledge Brokers, Incentives, Groupware, E-mail, Video conference, Multimedia databases, E-Training.
Evaluation	Balanced score card

Using such mapping tables, each critical task can be supported individually depending on the problem category, the KM-strategy and on the user. To ensure an overall knowledge management framework each knowledge management approach is defined by knowledge models that enable a complete documentation, an analysis of the "overall system" and

a tool independent evaluation. Describing the organisational knowledge system using knowledge management processes enables a process based analysis and a tool independent design of an overall knowledge management approach.

The main focus of PROMOTE[®] is therefore the design of an organisational knowledge system using knowledge models, to enable an export of this model information to external knowledge management tools. Some of the above mentioned tools like Yellow Pages, Micro Articles, and Search Engines are realised in the PROMOTE-prototype as so-called Web-Components to enable a rapid prototyping approach of a knowledge management system. For a complete scenario other tools have to be accessed via interfaces like Meta Search Engines, Databases and Document Management Systems. A Knowledge Management Cockpit can be realised by modelling evaluation models linked with the knowledge management models and generating an Evaluation Web-Component out of this model information.

The next section describes the realisation of the PROMOTE[®] method by introducing the PROMOTE-Knowledge model types. Realisation of the PROMOTE method to define an organisational knowledge system

This section describes the realisation of the above mentioned PROMOTE[®] method during the project, introducing the knowledge model types to describe an organisational memory on a model basis.

The following three axioms explain the specific PROMOTE[®] approach:

1. Process Based Knowledge Management as Modelling Framework:
A model-based approach based on Process models (PM) was selected.
2. Formal Model as Knowledge Processing Framework:
A formal model to evaluate and specify the model language was defined.
3. Meta Modelling as Conceptual Framework:
The modelling concept is based on a Meta² Model.

These three axioms of PROMOTE[®] distinguish this approach from existing tools and methods. Knowledge modelling tools describing Mind-Maps or Topic Maps are not covering the dynamic aspects of knowledge management like the KMPs and they are not supporting the integration of Knowledge management approaches with Business processes.

Existing tools providing this integration of knowledge models and business processes suffer from lack of individualization that can be implemented through the Meta-Modelling concept. The PROMOTE[®] idea is to analyse the existing business processes and the existing working environment and to identify so-called "knowledge-intensive-tasks". These knowledge intensive tasks are further analysed and described using various model types to define an organisational

knowledge system based on knowledge management processes.

Table 2 gives an overview of the PROMOTE®-model types and a short description of making the models operational.

Table 2 The PROMOTE® Knowledge models and their possible realisation

Model type	Description	Making models operational
Business process related model types (BPM)		
Business processes:	Definition of distributed business processes.	Business process- and Workflow Management.
Working environment:	Definition of a role-based working environment.	Business process management, Organisational handbook, HRM.
Knowledge processing model types (KPM)		
Skill documentation	Definition of competences, skills and interests.	Training concepts, Yellow Pages, Project Team Selection.
Knowledge structure	Definition of topics, keywords and semantic categories.	Search engines, Meta Search engines, Content Management.
Knowledge resource pools	Definition of knowledge resources.	Document Management, Groupware, Portals.
Knowledge process models	Definition of knowledge intensive tasks.	How-To Databases, Micro articles.
Knowledge management processes	Definition of the knowledge management processes.	Organisational KMS, Best practice databases, Realisation of Push-Technologies.
Security models	Definition of user rights and access profiles.	Portal Management, Single user login.
Workbench models	Definition of an individualized Web-portal.	Configuration of "MyPortal".
Overview model type (OVM)		
Knowledge landscape	Overview of the organisational memory.	Individualize the view of the organisational memory.
Community model	Overview of the teams within a working environment.	Groupware, Discussion forum, virtual Project teams.
Process pool model	Overview of the dynamic aspects within OM.	Visualisation of companies processes.

It has to be pointed out that for the realisation of knowledge management approaches it is not necessary to define all model types in detail. During the analysis of the knowledge management approach the used concepts are selected and the according knowledge models are defined. This procedure is briefly described

in the next section introducing a Trial Case of PROMOTE®.

3. REALISATION OF THE PROMOTE PROTOTYPE AT USER TRIAL CASE

This section describes the trial scenario "Software development" of the PROMOTE project and discusses the tools and models that will be used to realise an organisational knowledge system in that area.

First the business process was defined and the critical tasks were pointed out.

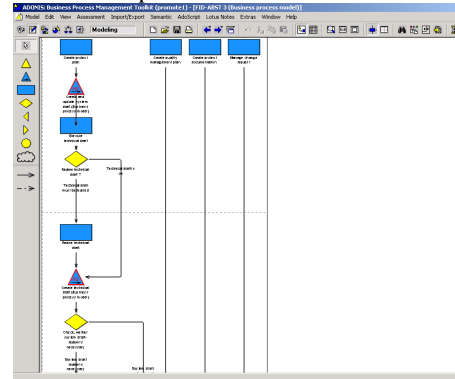


Figure 1 Screen shot of a Development process including knowledge intensive tasks

Figure 1 depicts the basic business process of the trial scenario "Software Development" where the critical tasks "Create system draft", "Create technical draft" and "Create program draft" are identified and described in more detail.

Topic maps for each of the critical task will be modelled and the necessary keywords and transformations are discussed.

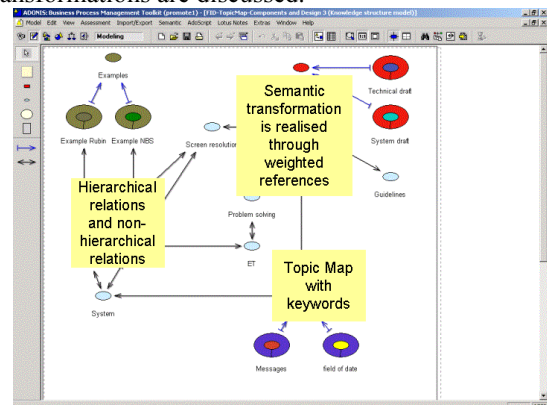


Figure 2 Topic map of the trial case

Figure 2 depicts a topic map that is realised as a knowledge structure model in PROMOTE® that has been linked to a knowledge intensive activity. One major problem of modelling semantic networks is the "knowledge transformation problem" that occurs, when departments have different views on topics.

PROMOTE solves this problem by defining several topic maps that can be linked to each other by using a “transformation link”.

These topic maps are used to define the skill profiles and the search engine interfaces. In the following, the concept of the skill documentation is briefly pointed out.

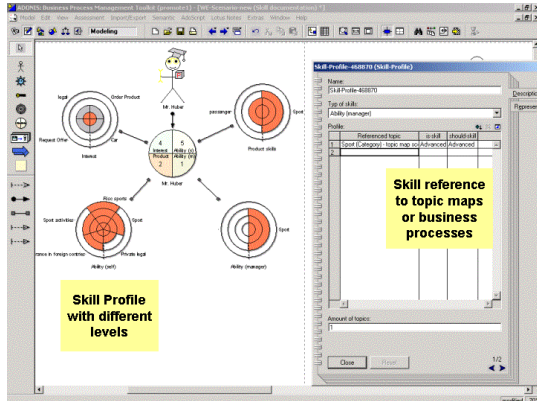


Figure 3 Skill documentation detail

Figure 3 shows a simple skill-documentation of a person. Each person has different skill-profiles that are aggregated to a so-called “Aggregated Profile”. In PROMOTE there are the following Skill-Profile types:

- **Skill Profile Interests:** This Skill Profile is used to describe the interest of employees and the level the employee is interested in being trained. This profile is used to build new project teams and to document the potential of new topics.
- **Skill Profile Ability (self):** This Skill Profile is used to describe the abilities of employees on a voluntary basis. Users are able to enter skills they think they have. This profile is used to identify knowledge carriers and to access the knowledge of experts. This Profile is difficult to get, as many users simply do not want to document their skills. There are different ways of motivating users to keep this profile up to date.
- **Skill Profile Ability (Management):** This Skill Profile is used to describe the abilities of employees by the manager. The manager has the possibility to document the skills of his group by editing the skills of his employees.
- **Product Skills:** This skill profile reference to products of the company. Each product manager or product specialist is linked to products. This profile clearly documents the responsibility of each user.

The Skill Profiles describe the competence of either a topic (from the semantic network) or of activities within a business process. Using this framework, it is guaranteed that the skills of a person are well designed and categorised. There is also the possibility to enter “Should-” and “Is skills” at each profile. This “skill gap” has not been modelled in this trial case, as the

focus of this approach was not to identify skill gaps, but to identify experts who voluntarily enter the skill documentation.

The skill documentation will be automatically imported by using existing Lotus Notes Databases.

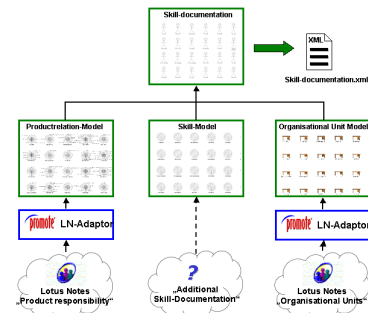


Figure 4 Automatic generated Skill documentation

Figure 4 depicts the scenario to generate this complex skill documentation using several Lotus Notes Databases. All Product Skill-Profile are generated from a Lotus Notes Database for “Product responsibilities”, the necessary information for modelling “Organisational Units” are imported from a different Lotus Notes database, finally all “Aggregated Skill Profiles” and their references are automatically generated by merging the results of the model import.

The third Skill Database is concerned with Interest Profiles and Ability Profiles and is still in the design phase. This database will be implemented during the realisation phase of PROMOTE either as another Lotus Notes database, or as an XML Database using the PROMOTE® model base.

Another concept used in this Trial scenario is a best practice database that should support users in critical decisions. PROMOTE defines the access of the database and the structure of the content of the experience base.

The content of such a database is defined with a so-called “Knowledge Process”. The authors are well aware that the terms “knowledge management process” and “knowledge process” are used differently in today’s literature but to express the PROMOTE idea, these terms are specially treated in this text:

- the Knowledge management processes defines the interaction with the organisational memory as described in section 2
- and the “Knowledge Processes” describes the content of the database. This “Knowledge Process” can be seen as a sub process of a business process, where a knowledge intensive activity (called KIT) is the “Sub-procedure call” and the “Knowledge process” is treated like a sub-process.

The reason for implementing a new model type named “Knowledge Process” and not just using a sub-process is, that additional information is needed, if an article should be generated out of such a process. The idea is

to generate a short article (like a micro article [5]) out of such process models [6].

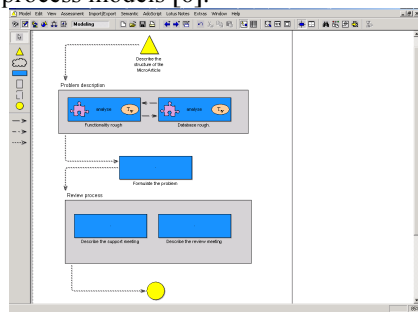


Figure 5 Definition of the structure of a short article using a „Knowledge Process“

Figure 5 depicts a definition of an article in a process-oriented manner. The start- and end-object points out that this concept can be seen as a sub-process. The previously discussed knowledge management process define how these concepts are applied. As an example the interesting Knowledge storage management process is shown, defining the usage of a best practice database.

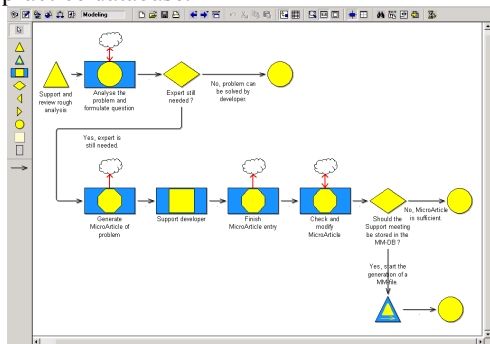


Figure 6 Example of a Knowledge Storage Management Process

Figure 6 depicts a Knowledge Storage Management Process that defines the storage of a micro article. Such a micro article should not be stored in the best practice database without the review of an expert. The above Knowledge Storage Management Process defines that the user has to suggest a consulting pool session to an expert for a specific problem. The expert can accept or deny this consulting session. If the session is accepted the review will take place and the results are stored in a best practice database.

These knowledge management processes define the interaction between users and the organisational system. The planned realisation of this user trial is mentioned in the next chapter.

4. MAKING KNOWLEDGE MODELS OPERATIONAL IN THE TRIAL SCENARIO “SOFTWARE DEVELOPMENT”:

This section describes the tools that are used for the realisation of the previously mentioned knowledge management approach in the Trial scenario “Software Development”. PROMOTE® has standard modules such as a Model editor, Yellow pages, Search engines, a Micro Article Generator, a Model viewer and a Knowledge management control cockpit.

In the following each concept described before is listed below and the realisation either by PROMOTE® Web-Components or by external tools is explained.

Process documentation via HTML:

The process models will be exported to HTML-Pages and can be viewed via Internet Explorer. The Processes are visualised, and descriptions and documents are attached at each critical task. Microsoft Office Documents, and Lotus Notes Databases can be accessed by clicking on the Models and by following the HTML-Links.

Meta Search Engine for Information retrieval:

A powerful information retrieval will be realised through the interaction of PROMOTE® and the U.S.U. Knowledge Miner [7]. This Meta Search engine exchanges the Topic Maps on the ISO/IEC 13250 [8] standard with PROMOTE and enables access to log data of the search engine to evaluate the tool. The search engine can be integrated in the PROMOTE Web portal through Java Servlets if appropriate.

Yellow Pages:

This concept will be realised by the PROMOTE® Web-Component called “Yellow Pages” that accesses the previously described Skill Models through the model database. The skill information can be accessed either by full text search, business processes or semantic networks through the PROMOTE® Web-Interface.

Best Practice Database:

The Best practice Database in this Trial Case is implemented as a Lotus Notes Database that stores short articles generated by the PROMOTE® Web-Component “Micro Article Generator”. These short articles are defined in the models shown in Figure 5 and generated by the “Micro Article Generator” either in html or pdf format. The article are then reviewed by an expert.

Knowledge Management Process Interpreter:

The PROMOTE® portal provides a Process engine, that supports the user by starting Knowledge management processes. The knowledge management processes can be viewed in HTML. The user can start the process either as a public or as a private process through the Web-Interface. The “Tasklist” of the participating users will show that this process has been started and will

display the responsible user and the status of the process.

These concepts are planned to be implemented and evaluated during the project. The next section describes the project status and the evaluation approach of PROMOTE.

5. EVALUATION APPROACH AND PROJECT STATUS:

The PROMOTE project now finishes the implementation phase and starts the evaluation and implementation phase. The implementation of the concepts is planned to be realised according to the above mentioned scenario till summer 2002 when the project ends.

An evaluation approach will be realised to define evaluation criteria and goals that are linked to knowledge management concepts.

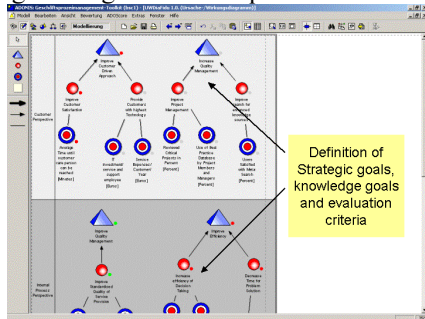


Figure 7 Knowledge management evaluation using the knowledge score card

Figure 7 depicts the evaluation of the previously described trial case using the PROMOTE® evaluation approach. PROMOTE® introduces the concept Knowledge Score Card that is based on the Balanced Score Card and adapts this approach to the special needs of knowledge management. These evaluation models can be viewed via the HTML-component of PROMOTE® to check the performance of the organisational knowledge system.

The market launch of the first product version of PROMOTE® is planned at the beginning of 2003.

6. REFERENCES:

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