



# Creating Skill Catalogs for Competency Management Systems with KMDL

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## ABSTRACT

*The efficient use of human capital is one of the most important factors in today's business competition. Competition is strongly influenced by qualified staff. In order to aid the human resources department to keep up with strategic decisions various competency management systems have been created that make the development of human resources easier and more precise. Competency management systems are only as good as the information that they are based on. The mostly used basic information is the skill catalogue. But there are nearly no applicable methods yet to create such a catalogue thoroughly. This paper introduces a reasonable approach to create such a catalogue with the description language for knowledge-intensive processes KMDL.*

## INTRODUCTION

*"An investment in knowledge pays the best interest"  
(Benjamin Franklin)*

Knowledge is one of the most important factors in today's business. By the year 2004, more than forty percent of all employees will be so called knowledge workers [Schu00]. Optimizing their work according to the ideas of Taylor will not work [DP00]. The question how to optimize the thinking processes in the head of the employee and how to accelerate thinking cannot be answered. Companies have to create a culture where knowledge can spread and contribute to the company's assets [HP90]. Competency management systems have proven to be a good solution to spread knowledge at reasonable costs.

## AN INTRODUCTION IN COMPETENCY MANAGEMENT

Competency management is more than just a database tracking the skills and competencies of the companies' employees. It is a combination of knowledge management and human resources management. The real aim has to be the proper and best use of the employee's skills and competencies for the benefit of the company [NT95]. It is therefore necessary to track and record the competencies, skills and abilities of each employee. This information is usually made available to the staff managers by the competency management system. The idea of a competency management process includes several steps that lead finally to a good implementation of this process [DLW99]:

- Step 1: We need a language that makes it possible to describe processes within the company and skills that are used within those processes. The skill catalogue is created from this data.
- Step 2: Picking or implementing an IT-based competency management system, which makes use of the gathered data from step 1 and provides the usual functionality like searches for skills and several analysis methods.
- Step 3: Realization of changes in the company culture like a sensible procedure model to introduce the competency system to the employees and the company or incentives for the employees in order to use the system.

These steps build upon each other chronologically and quantitatively. If the project team causes errors in step 1 which are neither seen nor corrected the whole project can be misled and might fail. Creating the skill catalogue is therefore a very crucial point for the competency management process and should be done with reasonable care [Gr02].

## REQUIREMENTS FOR CATALOGUES USED

There are three main ways to create a skill catalogue. Each method has advantages and disadvantages. The most used methods are:

**Getting the data from post requirements:** Most of the companies track what an employee needs for a certain position. This information is included in each job posting and is checked when a candidate applies for the job. This data can be used to build the catalogue, when an employee has a certain job, he or she must fulfill the requirements. The problem is most people are not new within the company so one could easily forget some skills and some never had all requirements for their positions. Furthermore the data is too old in most cases. This would make the system useless [FBW91].

**Optical character recognition:** Letters of application always include the curriculum vitae or a resume of the applicant. The skills and knowledge can be retrieved using optical character recognition techniques. The software has to scan, find the right key words and build a competence catalogue for each applicant. If he is engaged, the company has his competency history from the start and can add all development measures. This technique ensures a certain quality of the data if the algorithm uses good taxonomies however is it very expensive and fault-prone. Having the latest data seems to be a good way when you start tracking the improvements from the first day on, but if the company does not, the costs are too high [HZ00].

**Process modeling:** Modeling the process in the company always shows post requirements and the flows of knowledge [NT95]. Rating and examining each employee can be the way to get to know every single skill of each employee. This method is not often used because there were no tools or competency management systems existing in the past to support such a method. But it is the most effective way to track the employees' skills.

Since process modeling seems to be the best way to ensure quality, we propose the skill catalogue to be built by analyzing the processes and projects within the company. The idea sounds very simple but the simplicity shows the main problem of creating the catalogue [HZ00]. There are actually no standards to identify the relevant knowledge and to file this knowledge. Apart from this problem there are several other problems which sometimes lead to the failure of a competency management project [Us03].

## Troubles structuring the catalogue

The question which of the employee's competencies are tracked and filed in the system is very important. If the data is filed with continuous text, employees who are able to self-represent themselves in a good way have an advantage over employees who are not well trained

in describing their qualities. Therefore the data is mostly tracked with standardized questionnaires containing fields that have to be marked or filled out. Those questionnaires often contain several categories and sub-categories and lead to structured data that is used to build up the database. But there is still just kind of formal equity between the employees since it is still very important that competencies are tracked and not only how they are tracked [HZ00].

**Troubles giving equal amounts of competencies within the catalogue to each employee**

Normally there is no problem with exaggerated self-portrayal when tracking competencies and skills in a strongly structured database. But there are several other problems emerging. The question which skill is tracked and which is not, is very important for each employee. It is in fact essential. If some skills of an employee are not tracked by the system, the employee might not be in the expert directory. No other user can ask for his expertise and when it comes to the point where managers create teams for projects, this employee has slipped out of everybody's mind. No one will ever choose his for his skills if the amount of skills is too little. This might be an advantage when employees are rated and when status reports where matches between job specification and real skills are examined come up- but mostly it is not an advantage [CM98].

Normally, skills like programming capabilities or other assumed state-of-the-art skills are rated higher than normal skills like typing or good foreign languages. Administrative skills are as important as other skills but they are often omitted and vanish in oblivion when skill catalogues are created. The more skills are in the catalogue the more there are equal opportunities for each employee.

**Troubles caused by type of skill**

The skill catalogue first of all only clarifies which skills are tracked, but not their type. It has to be distinguished between hard and soft skills. The so called hard skills are proven skills and competencies, workings areas, educational ways and skills, certified degrees etc. Soft skills include more or less capacity for teamwork, leadership qualities, toughness and so on. Is it more about capabilities than about competencies. This information is very sensible and diffuse. Who tracks this data, who judges the employee? Does the employee himself track the data or his superior? In some countries with strong worker unions it is uncommon and unlikely to track soft skills because the data is too sensible and could easily be misused [FBW91].

**TROUBLE TRACKING THE COMPETENCIES**

The three described problems are relatively easy to solve but the problem of tracking the competencies is not that easy to be solved. Yet there are few known solutions to solve this problem. The normal way according to [KFG02] is to use software engineering methods for system analysis to create a repository of known skills and to estimate future needs. Those needs are based on heuristics which emphasize the skills that are most likely to be important for the company in near future. There have been attempts to systemize those approaches [FBW91] but competency management systems nowadays still don't realize those approaches and ideas. The whole focus is set on the technology for search and storing, the actual methods for tracking skills and finding out which are really important have been omitted as well as the focus on cultural changes within the company [AMLM99]. The following sections show a knowledge oriented modeling of processes and an implicit modeling of a skill catalogue while modeling the processes. Afterwards there will be a perspective for improvements to standardized export of data and creating the skill catalogue with the XML interchange format [Gr03].

**REQUIREMENTS FOR SKILL CATALOGUES**

Having examined the problems creating skill catalogues, the authors see certain requirements for skill catalogues [DR00], [MA98]:

- Reasonable structure of the data
- The structure of post requirements and employees skill profile has to match
- Skills must be rated
- Tracked skills must be useful for the company
- The tracked data must be complete and up to date.
- It should be possible to import the catalogue to every competency management system

These requirements can be fulfilled by the K-Modeler tool.

**MODELING OF BUSINESS PROCESSES WITH THE K-MODELER**

The modeling language KMDL (Knowledge Modeling Description Language) provides unlike other modeling languages the possibility to model the ways of knowledge externalization, socialization and internalization. A detailed discussion of KMDL can be found in [WG03] and [Gr03a]. The following paragraph will provide and discuss some of the most important aspects.

Apart from the language itself the K-Modeler tool that is used as a graphic user interface for KMDL contains an useful overview on how data is examined and tracked by the K-Modeler. The user gets to know a system which can create skill catalogues in a detailed manner. Many aspects of skill catalogues like scales for knowledge ratings, associating knowledge with certain employees et. al can be easily modeled with the K-Modeler. The K-Modeler uses the symbols presented in figure 1.

With the help of those objects the user is able to model and identify [Gr03a]:

- Posts and persons
- Tasks
- Post requirements and
- Knowledge objects.

**Task:** Tasks are the basic framework for models of engineering processes. The task order determines the temporal structure of the process. A task is defined as an atomic transfer from input to output, represented as information objects.

**Post:** Tasks are related to and be fulfilled by posts. Posts are manned by persons and have the necessary knowledge objects of all persons assigned to them.

**Person:** Persons are the owner of knowledge objects that are necessary to fulfill tasks. The totality of knowledge objects of a person should be equal to the requirements of the task the person has to do.

**Knowledge object:** A knowledge object contains implicit knowledge of persons. Knowledge objects can be available or asked. Available knowledge objects can be used for task fulfilment immediately. Asked knowledge objects are necessary for the task fulfilment, but must be generated by the person responsible for the task. This can be done by internalization or socialization.

**Information object:** It is relatively easy to externalize information by storing on data media or writing documents. New information

Figure 1: Objects of the KMDL 1.0

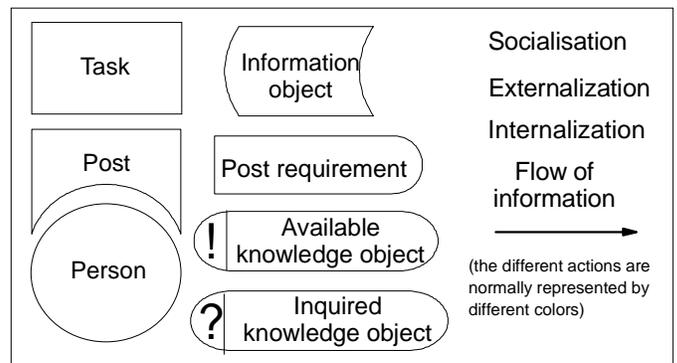
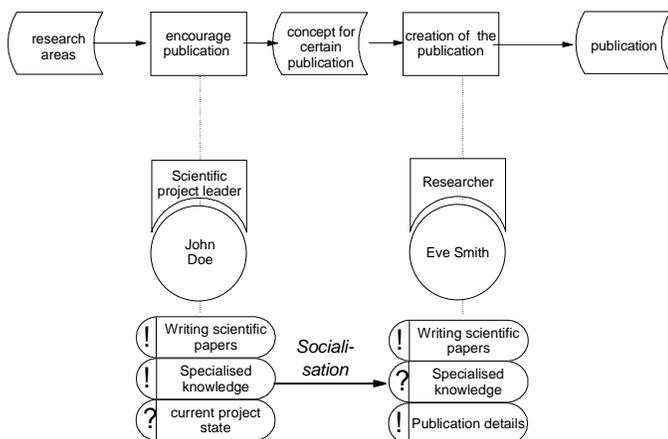


Figure 2: Employees and skills



objects can be created by externalization or combination. Information and knowledge objects that are involved in the creation of a new information object are stored in attributes of the information object.

Multiple attributes can be defined and used to model job demands in detail. Those demands can afterwards be used by the competency management system to create a masterplan for human resources development within the company. Those attributes furthermore make it possible to track the ways how knowledge is distributed within the company through socialization and internalization. The multi-level scale on knowledge objects at last make KMDL a complete language for modeling knowledge processes in order to create a skill catalogue. Every raw data that is needed by the catalogue can be provided by the modeled process. It is possible to show a persons job, his skills and competencies and which skills are needed by other employees at a certain level. An example is shown in figure 2.

Apart from only creating a skill catalogue KMDL can do more. It is possible to create a description of each job demand and to analyze processes in detail and to see their weaknesses. Those weaknesses can be corrected afterwards for further improvement. The K-Modeler provides a reasonable data basis for tracking the needed information for skill catalogues. If one does not only limit the process modeling to some reference processes but models every single job and employee, the K-Modeler provides in fact all the data needed by the competency management system. Skills and employee master data can be directly transferred to the competency management system.

## PERSPECTIVES FOR THE K-MODELER IN RELATION WITH COMPETENCY MANAGEMENT

Competency management systems often use proprietary standards only providing data exchange possibilities with products from the same producer. Data exchange with other parties products or open standards that can be implemented by the company itself are mostly not supported [Us103]. The recently upcoming standard HR-XML is by far the best solution to solve this problem.

The HR-XML Consortium is an independent, non-profit organization dedicated to the development and promotion of a standard suite of XML specifications to enable e-business and the automation of human resources-related data exchanges. They provide a large number of DTDs and XML schemas, for the purpose of competency management, the most important and interesting are:

- Competencies, Version 1.1
- Resume, Version 2.0
- Staffing Exchange Protocol, Version 1.2

Those three specifications define in detail a XML-based exchange format that meets all the requirements by a competency management system. A sample describing the ability of speaking a foreign language with a certain degree is shown in the next paragraph:

```
<?xml version="1.0" encoding="UTF-8"?>
<Competency name="Foreign language skill: German" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns="http://ns.hr-xml.org" xsi:schemaLocation="http://ns.hr-xml.org/Competencies.xsd">
<NumericValue minValue="1" maxValue="5" description="DSH certificate">5</NumericValue>
</Competency>
```

The format provides the eventuality to describe all skills and competencies of each employee in a similar manner. All needed attributes are defined by HR-XML.

There are few known competency management systems yet that implement this standard. A very simple and fast enhancement of the K-Modeler can provide this functionality of data exchange and not only give some surplus but provide an experimental interface to use the K-Modeler more directly with competency management and to give a stimulus für using more HR-XML based programs [Gr03b].

## SUMMARY AND GENERAL PERSPECTIVES

The K-Modeler at the certain stage is good for creating skill catalogues for competency management systems, yet it can be improved by implementing the HR-XML standards. Those standards contribute a lot to the skill and competency management basic approach. But even without this purpose the enhancement is needed in order to provide portability for the processes without having to copy a database and making it possible to provide a self-speaking data format containing job demands and skills of each employee.

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