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# Features Missing in Action: Knowledge Management Systems in Practice

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**Abstract-** This paper presents the results from a multiple-case study of knowledge management systems (KM-systems) in practical use. A set of general problem areas concerning the investigated KM-systems has been identified. These problem areas constitute the starting point of the discussion regarding design implications of KM-systems. One conclusion is that significant functions are missing in the KM-systems. Most of them can be described as traditional personnel administration systems, complemented with features that file competencies. A final conclusion is that the KM-systems' functions have to be developed and improved, if the organizations' KM-efforts shall 'survive'.

## I. INTRODUCTION

The notion of knowledge management (KM) is far from clear, and it has inspired interesting research within the IS- and CSCW communities [cf. 1, 2]. This paper contributes to the existing research body by reporting from a multiple-case study of KM-systems in practical use.

The growing literature on KM provides a number of alternative perspectives on KM-systems, and various typologies on such systems have been developed. Examples of these: Codification and personalization [3]; generation, codification and transfer [4]; conceptualisation, reflect, act and review [5]; create, identify, collect, organize, share, adapt and apply [6].

KM-systems have been criticized, and a substantial part of the critique concerns the controversial idea regarding de-contextualized knowledge stored into passive repositories [cf. 7, 8, 9, 10], i.e. knowledge is socially constructed [11], and is problematic to repackage [12]. In accordance, this paper is not concentrated on KM-systems that store knowledge in passive repositories. The focus is on KM-systems particularly designed to support organizations, in their efforts to manage their employees' competencies in an efficient and structured way, i.e. to have the right competence, at the right time and at the right place. Consequently, this paper deals with KM-systems that a considerable part of the IS- and CSCW-research, until now, has ignored.

The multiple-case study of KM-systems in practical use, was conducted at several large organizations in Sweden. EHPT (former Ericsson/ Hewlett-Packard Telecom), Volvo Car Corporation (VCC) and Volvo Truck Corporation (VTC) are global organizations. Volvo Information Technology (VIT) is a support organization for the Volvo Group. The others are Swedish IT-consultant organizations Frontec and Guide.

EHPT, Frontec, VCC, VTC and VIT have bought existing KM-systems; ProHunt Competence, Tieto Persona HR and SAP R/3 HR Competence Module. Frontec has also developed their own KM-system Kompassen, and Guide uses their in-house developed KM-system Kompetenstorget.

We have investigated these KM-systems, mentioned above, by looking at their features and objectives. We do so in order to identify and highlight general problem areas concerning such systems in practical use. Desired or missing features, i.e. *features missing in action*, illustrates these problem areas. Accordingly, this paper is not focused on an evaluation of specific KM-systems. The objective is rather to highlight general deficiencies in function applicable to all or most of the investigated KM-system. The reason for this is to improve the design of such systems, and thereby increase the existing body of research within the fields of IS and CSCW.

The structure of this paper is as follows: Section two outlines the related work. In section three the research method is introduced. Section four presents the research sites and the investigated KM-systems. The following section describes the KM-systems in practical use. Section six discusses features missing in action, and after that design implications are outlined. Section seven concludes the paper.

## II. RELATED WORK

The notion that knowledge and competence, and their development is becoming of increased importance to the process of wealth creation has been proposed by a range of researchers [13, 14, 15, 16].

The concepts of knowledge and competence have been discussed in terms of: Distinctive or firm-specific resources [17]; core competencies [18]; core capabilities [19, 20]; strategic assets [21]. Accordingly, it does not require a close reading to see that the terms of knowledge and competence are being treated in a variety of ways.

Nevertheless, the notion of core competencies [18] has had an influential impact on the KM-literature. The core competencies of an organization incorporate tacit - as well as explicit knowledge, and should be conceived as a mix of skills and technologies [cf. 1]. Thus, the concepts of knowledge and competence are closely related. This could be one of the underlying reasons for the lack of unambiguous definitions. Until now, however, research on KM within the fields of IS and CSCW has been concentrated on the term knowledge.

The IS-research has focused on technologies as well as organizational aspects [1, 4, 22, 10]. Technologies for KM include repositories of knowledge, e.g. knowledge bases of best practices, and search tools that make it possible to retrieve stored knowledge objects [20, 23]. Furthermore, new organizational forms have inspired important debates concerning KM within the IS-community, e.g. Nonaka's hypertext organization [24]. In these debates, according to the IS-literature, organizational culture is recognized as important [cf. 25].

The concept of KM has recently been introduced into the CSCW community [cf. 26]. Organizational memory (OM) is an established theme within CSCW, and it appears to have

much in common with KM. OM as well as KM have inspired significant discussions regarding information repositories, information retrieval and AI -techniques [cf. 27].

One of the first OM -systems described was gIBIS [28]. Additional OM-systems are Teambuilder [29], Answer Garden [30] and Answer Garden 2 [31]. The purpose of these systems is to support organizations and their employees to capture and enable retrieval of experiences, finding and interacting directly with experts, and through that collaborate more effectively. Systems that link employees with similar interests are usually referred to as 'recommender systems' [cf. 32].

Finally, empirical studies on KM have been conducted in order to elicit implications for design, e.g. by analyzing work conducted in a telephone hotline group [2], and expertise location in a software development company [33].

### III. RESEARCH METHOD

This research was undertaken through a multiple -case study at EHPT, Frontec, Guide, VCC, VTC, and VIT.

The case study approach is an empirical inquiry, which purpose is to gather comprehensive, systematic and in -depth information about each case of interest. Case data consist of; interview data, observational data, documentary data etc [34]. Case study research can be based on single - or multiple-case studies. Our multiple -case study includes six cases within the same study, because we predict that similar results will be found. If such results are indeed found for several cases, we can have more confidence in the overall results. Consequently, the development of consistent findings, over multiple -cases, can be considered as very robust findings [35 , 36].

Our fieldwork was conducted over approximately a ten -week period during the summer of 1999. The multiple -case study include 24 semi-structured interviews, each lasted between 45 minutes and one hour, and observation through active participation within the organizations' KM projects. The semi-structured interviews were conducted with people in the following organizational roles; consultants, consultant managers, sellers, HR-people, HR-managers, project-leaders and CEOs. The empirical material was transcribed, and analyzed according to the principles of grounded theory' s coding strategies; breaking down, conceptualizing and reconstructing data [37].

In addition to the semi-structured interviews and observation, written documentation in form of KM -system manuals and organization specific competence plans etc are the most important sources of data.

### IV. RESEARCH SITES AND KM-SYSTEMS

In this section we present a brief description of the research sites, and an overview of the investigated KM -systems.

#### A. Research sites

EHPT is a leading software developer in the telecom industry sector. EHPT focuses on four main areas of telecom convergence; communication services, operations and business support processes, telecommunications and computer competencies and IP -technology. EHPT has approx. 1250 employees located worldwide in 12 different locations, and the turnover in 1998 was 198 million USD. We

have conducted three interviews at EHPT's office in Göteborg, which consists of approx. 400 employees.

Frontec is a Swedish IT-consultant organization. Frontec work with a wide range of business areas, e.g. process innovation, product development, IT -support etc. The Frontec group has approx. 1200 employees at 26 offices located in 12 countries. The turnover in 1998 was 109 million USD. We did three interviews at Frontec's office in Göteborg that has approx. 500 employees.

Guide is a Swedish IT -consultant organization. Guide has three main business areas; Guide Management, Guide IT -consulting and Guide Infrastructure and Communication. Guide has approx. 750 employees at 6 offices located in 3 countries. Guide had in 1998 a turnover of 66 million USD. Totally nine interviews have been conducted at Guide; three at the office in Göteborg that has approx. 250 employees, three in Oslo where the number of employees is approx. 50, and three at the office in Stockholm that consists of approx. 350 employees.

Volvo Car Corporation (VCC) is a car manufacturing company recently purchased by Ford Motor Company. Focus is on producing safe middle-class cars, and Volvo Car Corporation has approx. 27000 employees all over the world. In 1998 the turnover was 12,8 billion USD. We have conducted three interviews at the office in Olofström, which has approx. 3300 employees.

Volvo Truck Corporation (VTC) has its focus on the development, production and marketing of medium and heavy-duty trucks for all types of transport. Volvo Truck Corporation has approx. 23000 employees and sales in more than 120 markets. In 1998 the turnover was 7,8 billion USD. We did three interviews at VTC's office in Göteborg that consists of approx. 4500 employees.

Volvo Information Technology (VIT) is the Volvo Groups resource- and expertise centre for IT -systems. Volvo Information Technology has approx. 2500 employees all over the world. The turnover in 1998 was 386 million USD. Three interviews have been conducted at VIT's office in Göteborg, where the number of employees is approx. 1350.

#### B. Overview of the KM -systems

Kompassen, Kompetenstorget, ProHunt Competence, Tieto Persona HR and SAP R/3 HR Competence Module the main component that they have in common are that they store individuals' competencies. Furthermore these KM -systems are empty from the beginning, i.e. there are no preinstalled competencies, categories or roles. Administrators in each of the organizations handle the implementation of these parameters. However, the KM -systems support this process by offering a framework concerning how competencies, categories and roles can be entered. Below we describe the investigated KM -systems further.

*Kompassen* is an in-house developed KM -system at Frontec. The main idea of *Kompassen* is to manage projects and reuse models and existing knowledge. Further, a feature that has been added is the ability to find expertise in order to configure different project teams. This is at present a free -text searchable CV -database.

*Kompetenstorget* is developed at Guide in Norway. The KM-system is focused on employees' competencies. It is possible to form teams of several individuals and make statistic analysis on them. The idea of *Kompetenstorget* is to improve as well as map the competencies of the employees, and to find expertise for their external projects. In Oslo the KM-system is up and running, in Stockholm an implementation project is coming up and in Göteborg a pilot has been initiated.

*ProHunt Competence* is a commercial product from Palmér System AB in Sweden. ProHunt is based on competencies, but the focus of the system is on roles, e.g. one role can be database implementer. A role is consisting of several competencies at different levels. This KM -system has been implemented as a pilot at EHPT. Recently EHPT has started this project, and has analyzed the competencies of their employees through internal workshops. Frontec has also initiated a pilot using ProHunt.

*Tieto Persona HR* is a commercial product developed by Tieto Datema AB in Sweden. Tieto Persona HR is based on 'competence windows'. These 'windows' are customizable to contain a special type of competencies. The special competencies can be background education, courses and certificates etc. Furthermore it is possible to specify a local 'window' if a competence is only vital to employees at a certain location within the organization. VCC in Olofström started to use this system a couple of years ago, and are now using it to support their change toward a process-oriented organization. Through a cross company project within the Volvo Group, both VTC and VIT started to use Tieto Persona HR for their competence efforts. VTC has been working for about two years analyzing their working processes and tasks, and are now running a large-scale pilot. VIT are still analyzing their work processes, and has recently initiated a pilot.

*SAP R/3 HR Competence Module* is a module to the widely spread SAP R/3 product from the German company SAP. SAP R/3 HR Competence Module is based on competencies and has many statistical features, mainly focusing on individual facts. VCC in Olofström has evaluated and rejected this system. The main reason for this was that it is impossible to run the HR (Human Resources) module separate from the main SAP R/3 application.

## V. KM-SYSTEMS IN PRACTICAL USE

Here we present *platforms and organizational issues*, and *technical features* in practical use of the investigated KM -systems. Data regarding the following presentation are derived from the empirical findings.

### A. *Platforms and organizational issues*

The table below (see table I) illustrates platforms and organizational issues, i.e. which platforms the KM -systems support, and how the KM-systems support the implementation process within the different organizations.

#### *Platforms*

**dedicated client** States if the KM-systems uses a special client to access the data or not.

**http compatible** If the data is accessible through the use of a web-browser internally or externally.

**subsystems** This states whether the KM -systems have more components available than those described here, e.g. recruiting- and course booking systems.

#### *Purpose*

**marketing** The employees are able to market their competencies internally. In one of the organizations there has been discussion about making this searchable externally.

**managing** This concerns using the KM -systems as a management tool, e.g. strategic planners should be able to see the current status of competencies and also what competencies the organization will have to acquire in the future.

**mapping** The organization is concerned with the categorization and visualization of competencies in order to make expertise management possible.

#### *Knowledge Formalization*

**roles/competence** This aspect of the KM -systems represent differences regarding strategies for knowledge categorization. Usually a role is the task a certain person has been assigned to, but not always. A competence is a certain skill, e.g. in *Kompetenstorget* a competence can be a project leader, C++ programmer, implementer etc. However, we only point out if the KM-system (see table I) distinguishes between those concepts. Further, we will not try to define these two concepts.

#### *Implementation Strategy*

**top-down/bottom-up** This illustrates which way the organization has chosen to adopt the KM -systems' formalization of knowledge. In other words if the management defines which competencies that should be available to choose from, or as in the case of the EHPT pilot where a employee workshop discussion constitutes the basis for which categories that were to be applied.

#### *Data input*

**user/manager** This is simply who is responsible for the input of competence data. In some of the organizations both categories are filled in, which means that a manager together with an employee decide which competencies he or she has.

#### *Organizational Structure*

**hierarchical/flat** Displays the relation between search functions and the organizational structure, e.g. if any non - manager within EHPT searches for a special competence the result is the manager of the person possessing this competence, not the person himself. Managers on a higher level in the hierarchy can find the competencies below, but not above. In a flat organizational structure any one can find everybody.

TABLE I  
PLATFORMS AND ORGANIZATIONAL ISSUES

Platforms and organizational issues		KM-systems and organizations				
		Kompassen (Frontec)	Kompetenstøret (Guide)	ProHunt (EHPT, Frontec)	SAP R/3 (VCC)	Tieto Persona HR (VCC, VIT, VTC)
Platforms	dedicated client	○	○	●	●	●
	http compatible	●	●	●	○	○
	subsystems	○	○	●	●	●
Purpose	marketing	●	●	○	○	○
	managing	○	○	●	●	●
	mapping	○	●	●	○	●
Knowledge Formalization	roles	○	○	●	●	○
	competencies	●	●	●	●	●
Implementation Strategy	top-down	○	○	●	●	●
	bottom-up	●	○	●	○	○
Data Input	user	●	●	●	○	○
	manager	○	○	○	●	●
Organizational Structure	hierarchical	○	○	●	●	●
	flat	●	●	○	○	○

● feature present ○ feature not present

### B. Technical features

The table below (see table II) presents technical features of the investigated KM-systems, i.e. how the KM-systems can be used in practice. The presented features are the most important, i.e. that the feature is present in each of the KM-systems, or that the feature is essential to one of these. There are several additional features in these KM-systems, but they do not contribute to the content of this paper.

#### Technical Features

**search** The ability to search for a specific competence or expertise.

**measurement** A feature that makes it possible to overview the status of competencies.

**competence gap** The difference between existing and wanted competencies. This is related to the competence category of the knowledge formalization mentioned above.

**resource gap** The difference between existing and wanted resources. This is related to the role category of the knowledge formalization mentioned above.

**survey** The possibility to monitor the changes in competence status over time.

**competence tree** If the KM-systems support a hierarchical competence structure. Kompetenstøret has a three level structure. The top level consists of three different groups and each of these groups has sub levels, which is constituted of the competencies, e.g. technology, tools and systems – programming- and script languages – C/C++, Pascal, Java etc.

**competence grading** The KM-systems have a grading scale to indicate the level of skill for a certain competence.

**free text** If it is possible to enter comments and additional information into the KM-systems.

**individual plan** Whether the employee is able to express their wanted skill level and/or new areas of interest.

**competence course** This is related to the individual plan and these features enable the connection to a course planning system.

**multilingual** If the KM-systems supports the use of several languages.

**cv-page** If it is possible to compose a CV-page from the KM-systems database, which contains the competencies of the employees.

TABLE II  
TECHNICAL FEATURES

Features in the KM-systems		KM-systems and organizations				
		Kompassen (Frontec)	Kompetenstøret (Guide)	ProHunt (EHPT, Frontec)	SAP R/3 (VCC)	Tieto Persona HR (VCC, VIT, VTC)
search	●	●	●	●	●	
measurement	○	●	●	●	●	
competence gap	○	●	●	●	●	
resource gap	○	○	●	○	○	
survey	○	○	●	○	○	
competence tree	○	●	●	●	●	
competence grading	○	●	●	●	●	
free text	●	●	○	○	●	
individual plan	○	●	○	●	●	
competence course	○	○	○	●	●	
multilingual	●	●	○	●	●	
cv-page	●	●	●	○	●	

● feature present ○ feature not present

### C. Reflections on KM-systems in practical use

The more traditional organizations have bought KM-systems, which have a hierarchical structure. The IT-consultant organizations, Frontec and Guide, have chosen to develop KM-systems supporting a flat organizational structure. This involves that within the traditional organizations, only the management is able to see their subordinates and they can solely see themselves. Within the IT-consultant organizations, on the other hand, everyone can see everybody. This more 'open' attitude among the IT-consultant organizations is also reflected in that the employees are responsible for the data input, as opposed to the traditional organizations where the management enters the data.

It is not easy to say whether a top-down or bottom-up approach when classifying competencies is preferable. EHPT has used both. Guide, VCC, VIT and VTC have used top-down, while Frontec uses bottom-up. However, if the KM-

system should be used by thousands of people in many countries we suspect that a top-down method is the only reasonable solution.

In some of the KM-systems there are confused views of the relationship between roles and competencies. The explanation for this may be that all of the KM-systems depend on hierarchical classification procedures with its limitations [cf. 38]. A more sophisticated free text classification could most likely be used here [cf. 39].

Three of the organizations have chosen HTTP enabled solutions, while the organizations using Tieto Persona HR are forced to utilize dedicated clients. The trend of networking on the Internet may have affected the design decision of the other organizations [cf. 40].

All KM-systems, except Kompassen, have in common that the categorization of competencies is hierarchical, there is a possibility to grade competencies and accordingly make them searchable. Furthermore, it is possible to make an inventory of existing competencies and make gap analyses concerning specific goals or plans.

Within SAP R/3 and Tieto Persona HR there is a connection between an individual plan and courses, i.e. a course can directly be booked in the KM-systems. Though it is controversial to say that there is any correspondence between competence development and courses this is in some case relevant, e.g. some certificates are attainable through the completion of a course.

Finally, SAP R/3 is the only KM-system that does not offer the possibility to compose a CV-page. However, there is an important difference between the other KM-systems, since Kompassen exclusively stores the CV-page while within the other KM-systems the CV-page is complemented with a combination of competencies.

## VI. FEATURES MISSING IN ACTION

Below we present problem areas concerning KM-systems in use, by pointing at desired or missing features in action. In order to illustrate these desired or missing features in action, we use quotations from the empirical findings.

### A. Knowledge Mapping

This is about the description, categorization and formalization of knowledge [cf. 41]. One of the organizations' HR-manager expressed the following:

"The different offices make use of the concept of competence in varying ways, they do not mean the same thing when writing in free text... as they should have meant if there was an unambiguous definition concerning the actual meaning within the organization... and then make it eligible in some form of formalized declaration of competencies."

The quotation shows the problem with expressing competencies in free text, as well implying that the solution could be an unequivocal and well defined declaration of competencies. However, our study displays difficulties concerning the approach to create a specified structure of competencies. On the one hand it is problematic to describe

an organization's activity with such a structure as a basis, and on the other hand it is hard to reach consensus regarding a 'given' competence structure. Consequently, there are two fundamentally varying approaches, both of them afflicted with their respective difficulties. Further, the investigated KM-systems support one of the two or both, but not a combination. The KM-systems have no function that handles the connection between free text and competence structure, e.g. a search for a German speaking employee in the specified competence declaration, do not result in information regarding an employee that has expressed "I have worked in Germany for five years" in free text.

### B. Knowledge Evolution

This concerns the change of employees' knowledge and interest profiles over time. A seller of consultant services in one of the organizations puts it as follows:

"Several times I have searched for a particular programming language... then some names are presented, but when I get in contact with these people the answer often have been... I am not doing any of that any longer, I can but I am not interested."

The problem that this quotation illustrates, originates from that the investigated KM-systems do not distinguish between the ability of an employee, and the wanted work tasks of that person. Furthermore, our study shows that sometimes employees 'hide' competencies to avoid unwanted consultant assignments. This in combination with the, above mentioned, lack of function in the KM-systems, impede the organizations' efforts to map their knowledge depots [cf. 6].

### C. Knowledge Isolation

This is about isolation of employees and their knowledge in the KM-systems. One of the organizations HR-managers expressed the following:

"The structure of the system is hierarchical... as an individual you see nobody except yourself. If I am in want of a particular knowledge, the system should support me in identifying the appropriate person... such a function is missing. I have to talk to someone else... someone who is familiar with the employees' competencies... I can not do it myself by using the system."

The quotation highlights an obstacle in the KM-systems, which counteract activities such as expert finding, internal networking and knowledge sharing within the organizations [cf. 33]. However, some of the organizations consider the hierarchical and closed system structure as a mean in order to obstruct internal recruiting.

### D. Knowledge Interaction

This concerns interaction between employees for the purpose of exchanging knowledge and experiences. A project-leader in one of the organizations puts it as follows:

“Maybe it should be possible to connect this group of people with similar interests profiles in some way... or mark here [in the KM -system], I am a member of this network... then I find... I have more search paths... at present there is no interactive forum for exchange of opinions, and such... primarily, make it easier to initiate a dialogue.”

The quotation indicates the lack of function, in the KM -systems, which support direct communication between employees. Such a feature that supports the creation of virtual forums [cf. 40] is, according to our study, demanded among the organizations.

#### *E. Knowledge Evaluation*

This is about the evaluation of the employees’ knowledge levels through statistical analysis. One of the organization’s HR-managers expressed the following:

“The major disadvantage of the system is that is not possible to make competence analysis concerning teams and groups... the system handles analysis of individuals in an excellent way. However, we also want to form a project team, and make analysis regarding its total competences level compared with the need. The system could not handle evaluation of groups...”

The quotation illustrates that the investigated KM -systems have no functions that manage competence analysis of teams and groups in varying sizes. Most of the KM -systems deal with this type of analysis exclusively at predefined levels. Consequently, with regard to competence analysis of teams and groups the flexibility is limited. However, there are many researchers that consider such measurements as controversial [cf. 42].

#### *F. Knowledge Empowerment*

This concerns the development and improvement of the employees’ knowledge. A CEO for one of the organization’s subsidiaries puts it as follows:

“There [in the KM-system] you also should have aim and direction as well as ambition regarding competencies... otherwise you will choose competencies that people have today... the competencies that they have documented... a better approach is to try to identify the aims and directions of the employees.”

The quotation shows the importance of that the management is aware of the employees’ aims, directions and ambitions concerning future knowledge empowerment [cf. 43]. Functions, in the KM-system, that support the identification of the employees’ aims and directions are requested by the organizations.

#### *G. Operative Knowledge Management*

This is about the management and handling of knowledge in the day-to-day work. A seller of consultant services in one of the organizations expressed the following:

“Perhaps that is the most significant problem due to my point of view... in advance you can almost anticipate that... this person is not available... you have to check the list... we have an Excel sheet... the so-called “free list”, which indicates who is available and not... and then you can make a choice.”

The quotation highlights that the KM-system have imperfect functions regarding the operative management of the employees’, and their competencies. Since, the seller in question does not have information concerning the accessibility and activities of the employees [cf. 44], the latter’s work task is obstructed.

#### *H. Strategic Knowledge Management*

This concerns the planning and management of the employees’ knowledge in relation to the organizations’ strategic business goals [cf. 41]. A CEO for one of the organization’s subsidiaries puts it as follows:

“Market research... market analysis, what the market demands... we have to take notice of the world around. What is the market’s direction, and what are our abilities in those areas. Our track record regarding such projects and what is the status of our employees...”

The quotation indicates the importance that the KM -systems have functions, which handle information concerning the surrounding world, i.e. market analysis, prospects, suspects etc. The possibility to match this kind of information with the existing competencies of the employees’ would, according to the organizations, be of great value.

#### *I. Design implications*

Concerning the problem areas Knowledge Evolution, Knowledge Isolation, Knowledge Evaluation and Operative Knowledge Management design ideas can be found among the organizations. Thus the, above mentioned, problem areas do not indicate design issues that is difficult to handle, but rather organizational choices concerning whether the features shall be implemented or not.

The situation is, however, different when it comes to the problem areas Knowledge Mapping, Knowledge Interaction, Knowledge Empowerment and Strategic Knowledge Management. Indeed, our empirical material indicates the awareness of these deficiencies in the KM -systems functions. Nevertheless, this awareness is not firmly established within the organizations, and design ideas that address the, above mentioned, problem areas are missing. Consequently, we focus on these, and below some design ideas on a conceptual level are outlined.

The design idea regarding Knowledge Mapping concerns the design of features that connect free-text and the competence structure, and through that increase the flexibility in the KM-systems. The idea is that increased flexibility facilitates the activity of creating acceptance as well as consensus concerning a chosen structure of competencies within the organization.

The problem area Knowledge Interaction can be addressed by integrating the KM-systems with other types of systems, which support direct communication, i.e. e-mail, telephone, chat etc. The motive for this is to support the creation of interactive forums, where both experiences and knowledge can be exchanged.

The design idea concerning Knowledge Empowerment is about the development of functions in the KM-systems that handles information regarding the employees' aims, directions and ambitions related to future work tasks. Further, it is important that such information can be aggregated to the organizations management, in order to support them in identifying strategic and important interests directions among the employees.

The problem area Strategic Knowledge Management concerns the design of functions, in the KM-systems, which provide management with information regarding market analyses, prospects and suspects, i.e. the organizations strategic business goals. Features in the KM-systems that support the handling of such information form an important resource when it comes to planning and management of the employees' competencies.

Finally, a new and exciting design challenge is to develop the KM-systems' functions, so that information concerning the employees' aims, directions and ambitions, and the organizations strategic business goals can be combined. A CEO for one of the organization's subsidiaries puts it as follows:

"References to employees' aims and directions would be great... then you could match such information with information regarding market research... market analyses."

Accordingly, functions in the KM-systems that handle these types of matches, constitute an important support for organizations in their strategic work with the employees' competencies.

## VII. CONCLUSIONS

The KM-systems included in our study, are particularly designed to support the organizations in their efforts to manage the employees' competencies in an efficient and structured way, i.e. to have the right competence, at the right time at the right place. This is, however, not the case. Our study highlights general problem areas concerning the investigated KM-systems. All of these have impact on the way in which the KM-systems support the organizations' handling of competencies. In rare cases the KM-systems contribute to the organizations in their efforts to have the right competence, at the right time and at the right place. These KM-systems are rather tools for creating inventories of competencies. Consequently, significant functions in the KM-systems are missing. The investigated KM-systems can be described as traditional personnel administration systems complemented with features that file competencies. However, the organizations demand that the KM-systems activate competencies, and therefore additional efforts regarding the design of such systems are required.

Furthermore, deficient functions can result in negative consequences for the organizations. Several KM-projects

begin with the implementation of a KM-system. After this the organization and the culture are to be changed in accordance with the philosophy of the implemented KM-system, i.e. work forms that build upon cooperation across boundaries, self-governing project groups, knowledge sharing and tight networks. Through this the organizational effects can be achieved. With the identified problem areas as a point of departure, one can reflect on the outcome of such KM-efforts. The KM-systems' functions have to be developed as well as improved, as soon as possible, if the organizations' efforts shall 'survive'. This conclusion contrasts the research results that criticize the KM-research's altogether one-sided technique orientation, and meagre focus upon the meaning of organizational- and cultural issues [cf. 10]. Since the KM-systems seem to constitute a driving force in the organizations' KM-efforts, there is a need for further research in order to develop functions, which not counteract important organizational- and cultural aspects regarding KM.

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