Department of Informatics
School of Economics and Commercial Law
University of Gothenburg

# KM-system for Visualising Competence Patterns

Master Thesis 20 p
Spring 2000
IA7400

## Abstract

To support the management of Knowledge Intensive Organisations, different types of KM-systems have been developed. Recent research within the IS- and CSCW-communities has identified general problem areas concerning KM-systems particularly designed to support the management of competencies.

In this thesis we address two problem areas with KM-systems; knowledge evaluation and knowledge empowerment. Knowledge evaluation concerns the evaluation of the competence of teams and groups of various sizes. Knowledge empowerment is about the identification of employees' aims, directions and ambitions regarding competence development. We have addressed these problem areas by conducting a case study at Guide Konsult AB (now a part of Framfab). We have designed an add-on module for visualising status and development of competencies to Guide's existing KM-system Kompetenstorget and evaluated a *KM-system for visualising competence patterns*, i.e. the add-on module and Kompetenstorget.

The main results of our research are; (1) different fields of application for the KM-system for visualising competence patterns, such as the possibility to manage towards organisational goals and to staff assignments according to the competence interests of the employees, (2) design implications concerning the fields of application including consultants' availability and scope limitations regarding competence interests, (3) recommendations regarding the assurance of data quality including using the KM-system when staffing assignments and providing an incentive for the consultants to use the KM-system.

## Authors

Jesper Andersson
Peter Krickner
Roger Norrlén

## Instructors

Rikard Lindgren
Ph.D. Kalevi Pessi

## Examiner

Kjell Engberg

## *Preface*

This master thesis is written in co-operation with Guide Konsult AB and the Viktoria Institute. The research we have performed in this thesis has been a part of the KM-project "Managing competence", at the Viktoria Institute. Within the project a previous study was conducted, which included Guide's KM-system Kompetenstorget. We have used the empirical findings from this study as a starting point for our research.

Research within the area of how KM-systems should be designed to support the management of competence is limited. During our research, we also had the privilege to write a paper concerning parts of the subject together with Rikard Lindgren and Kalevi Pessi. This paper was accepted to the IRIS 23 conference and can be found in Appendix C.

During our research, Framfab became the largest stockholder of Guide and the two organisations merged into one. However, our case study has been focused on the former Guide, and the interviews performed have been with Guide employees. For this reason, we call the organisation *Guide*. The way we were accepted at Guide was very positive and we would like to thank them all for that.

Gothenburg 2000-06-02

Jesper Andersson          Peter Krickner          Roger Norrlén

## Table of Contents

# 1    Introduction

## 1.1    Background

Knowledge can be considered the most strategically important resource for business organisations (Zack, 1999). Therefore it is of great importance for organisations to manage the knowledge in order to create and keep competitive advantage in the business (Salvary, 1999). Within Knowledge Intensive Organisations (KIO:s), such as consultancies who trade in knowledge, Knowledge Management (KM) is especially important (Starbuck, 1992; Alvesson, 1993). Surely this is the reason why KM has undoubtedly boomed over the last two or three years (Swan, 2000).

There are two major strategies for managing knowledge; *Codification* and *Personalisation* (Hansen et al., 1999). KM-systems are tools designed to support the organisation's knowledge strategy. The different strategies make use of KM-systems in different way use of the KM-system. In the codification strategy the use of the KM-system is to store extracted knowledge into passive repositories, independently of the person that developed it, for reuse purposes. In a personalisation strategy the purpose of the KM-system is to support the sharing of knowledge through person-to-person contacts, by helping people to find and come in contact with other people. However, most of the literature within the research field of IS and CSCW up to date deals with KM-systems supporting the codification strategy.

## 1.2    Problem area

In order to investigate KM-systems supporting the personalisation strategy, Lindgren & Wallström (2000) conducted a multiple-case study of KM-systems for managing competence. The investigated KM-systems were implemented and used in organisations in the west of Sweden. The design of these KM-systems was focused on supporting organisations in their efforts to manage their employee's competencies in an efficient and structured way. A number of general problem areas regarding the investigated KM-systems were identified, and the need for additional research in order to develop and improve the design of such systems was stressed.

Two of the general problem areas were knowledge evaluation and knowledge empowerment.

- Knowledge evaluation concerns the functions for evaluating the competence of teams and groups of various sizes. This evaluation can be compared with the competence need of different projects etc.

- Knowledge empowerment regards the functions for supporting the identification of employees' aims, directions and ambitions regarding competence development.

In this thesis we address the two general problems above by presenting a case study concerning Guide's KM-system Kompetenstorget (KT). This presentation include the following:

- Empirical findings showing functions missing in KT related to knowledge evaluation and knowledge empowerment.

- Design implications concerning an add-on module to KT, which handles status and development regarding existing competencies and competence interests.

- An add-on module for visualising status and development concerning existing competencies and competence interests.

- An evaluation of the KM-system for visualising competence patterns, i.e. the original version of KT and the add-on module for visualising status and development regarding existing competencies and competence interests.

To further investigate the importance of the general problem areas, our aim was to evaluate the KM-system for visualising competence patterns by addressing the following three research questions:

- What fields of application within Guide could be supported by the KM-system for visualising competence patterns?

- How could this KM-system be improved in relation to the identified fields of application?

- What organisational aspects should be considered regarding the identified fields of application?

## 1.3  Purpose

The purpose of this master thesis is to design an add-on module, and evaluate this module together with the existing KM-system, i.e. evaluate a KM-system for visualising competence patterns. The reason for this is to improve the design of KM-systems for managing competence, and through that increase the existing body of research within the research fields of IS and CSCW.

## 1.4  Delimitations

The KM-system for visualising competence patterns wasn't implemented at Guide. The existing KM-system KT has been implemented and used in the organisation, but our add-on module, status and development, concerning existing competencies and competence interests has not. With this in mind, it is difficult to state what steps are demanded by the organisation to make the best possible use of the KM-system for visualising competence patterns. However, with the research we have conducted, we consider it possible to give recommendations concerning organisational aspects regarding the use of the KM-system for visualising competence patterns.

## 1.5  Disposition

This section describes the structure of the thesis.

- The first chapter of this thesis is an introduction to our research and what research questions we address.

- The second chapter describes the method we applied to get answers to our research questions.

- The third chapter is a referential framework to present theories and ideas, which we have used as a basis for our work.

- The fourth chapter shows our case regarding Guide and their original KM-system KT.

- The fifth chapter describes the module we developed.

- The sixth chapter shows the results from the evaluation interviews we conducted concerning the KM-system for visualising competence patterns.

- The seventh chapter is a discussion with conclusions regarding the results we obtained.

- The eighth chapter is an alphabetical list of references used in this thesis.

- The ninth chapter is an appendix including the interview questionnaires used in the design- and evaluation- interviews, the paper we sent to the IRIS 23 conference and a terms and abbreviations section which explains the terms and abbreviations we have used.

# 2    Method

In this chapter we will describe the method, case study, we applied in our research, what steps we took and why. We begin with describing our research process. Thereafter we describe our work from the philosophical perspective we believe to be appropriate for this kind of research. We continue with describing the forms of case study, literature studies, Interviews and focus group interviews. The last section in this chapter brings up criticism related to our research.

## 2.1    The research process

The research included the following steps and how the steps, except result, discussion and conclusion, was carried out are described below.
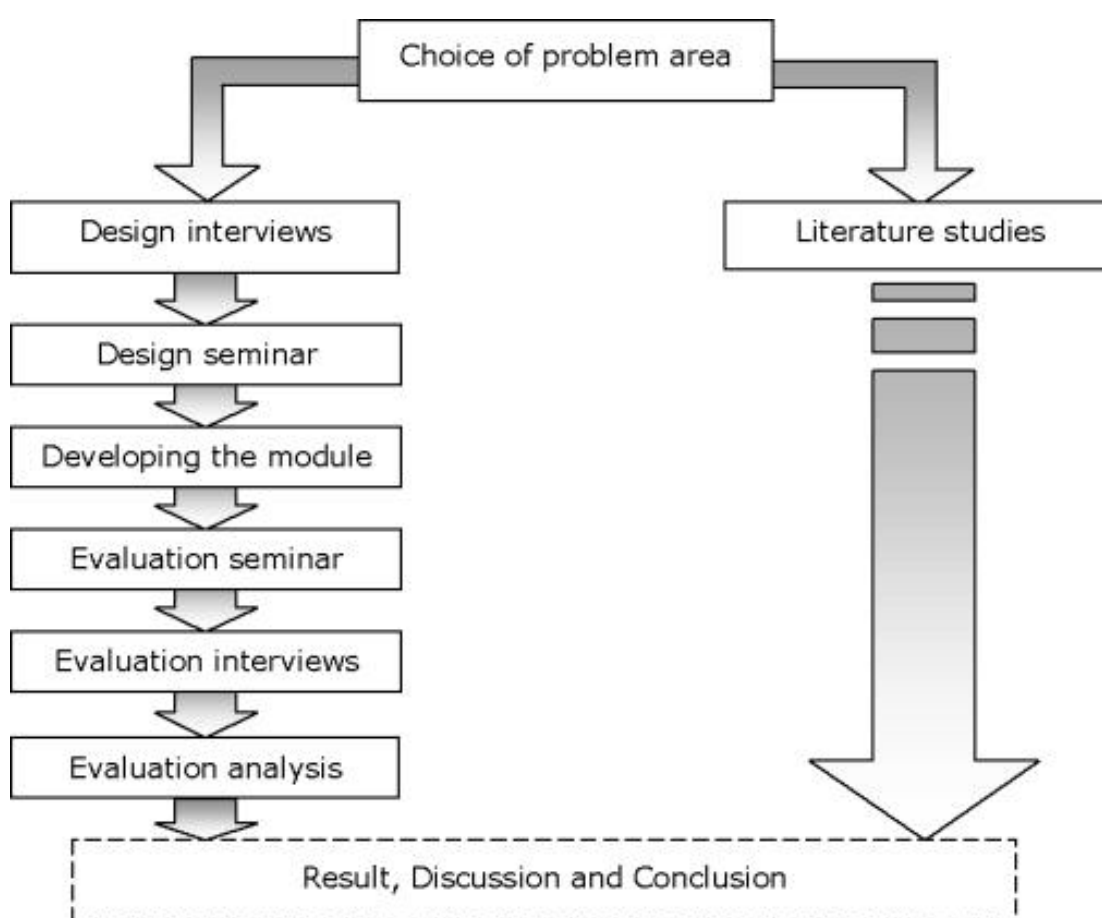


Figure 1: *Illustration of the steps in the research process.*

### 2.1.1    Choice of problem area

We started the work with our master thesis by choosing the problem area for this thesis. We wanted to do research within the area of KM. Therefor we contacted Kalevi Pessi, head of the KM-project at the Viktoria Institute. In the autumn of 1999 Lindgren and Wallström (2000) from the Viktoria Institute investigated five different KM-systems for managing competence. The resulting article and the empirical findings it was based on revealed the lack of functions in the KM-systems for enabling management of competencies.

The research they conducted included the KM-system KT at Guide and the empirical findings concerning KT also pointed at the necessity for this kind of functions. This gave us the idea to our research question for this thesis. We decided to address the two problem areas that are described in the introduction.

## 2.1.2 Literature studies

Throughout the research we have read literature in related subjects. We have done this in order to have a basis for our research; i.e. we wanted to gain an understanding for the context which KM-systems for managing competencies resides in. We also wanted to have a base for developing the add-on module to KT and for evaluating the KM-system for visualising competence patterns.

The subjects we have studied are Knowledge, Competence, Intellectual Capital, Knowledge Intensive Organisations, Knowledge Workers, Knowledge Management, and Knowledge Management Systems.

We have acquired the literature we have read in different ways. Some of the literature we had since earlier courses on the Informatics program, some has been accessed through the KM-project and we have also used Internet databases such as *ProQuest*[1] (Belle and Howell) and *Academic Search Elite*[2] (Ebesco).

## 2.1.3 Design interviews

In order to get a foundation for the design of the module we conducted interviews there we wanted to gain an understanding for the current use of KT and to how the information in the module should be presented. We started out by making different tables and charts that we used in the interviews to serve as a basis for discussions concerning design issues. We conducted five interviews with people in management positions at Guide in Gothenburg. We also conducted an interview with a Ph. D. in Statistics who works at Guide in Gothenburg.

The interviewees were asked questions on how different types of information should be presented and what fields of application the different results could support. Before the interviews took place we let our instructor review the questionnaire. The interviews were between 45 minutes and an hour long.

## 2.1.4 Design seminar at the Viktoria Institute

After the design interviews we presented our ideas of how the module could be designed in a seminar held by the KM project at the Viktoria Institute. At this event two researchers from the Viktoria Institute and four representatives from different IT companies participating in the project were present.

At this seminar the design proposal was discussed and we received more suggestions about what the module should include, how it should present the results and how to make sure that the module's data input holds high quality. Our subject was discussed for 45 minutes.

---

1. ProQuest Digital Dissertations (http://proquest.umi.com/)
2. Academic Search Elite (http://search.epnet.com/)

## 2.1.5 Developing the module

We used the impressions we had gained through the literature study, the design interviews and the design seminar and made the initial design of the module. This design was, with minor changes, followed during the development of the module. The development of the module took place at Guide's office in Gothenburg and was accomplished in four weeks.

The purpose with our module was to present how a KM-system for visualising the status and development of competencies and competence interests could be designed. With this module we also had a concrete design proposal to which the interviewees could easily relate and have opinions about.

## 2.1.6 Evaluation seminar at the Viktoria Institute

After the module was developed we once again participated in a seminar with the Viktoria Institute:s KM-project. At this seminar two researchers from Viktoria, three students at the Department of Informatics and five representatives from different IT companies participated. Our subject was discussed for one and a half-hour.

We presented the module and showed what functions it holds for presenting competence and competence interests. After the presentation a discussion followed with the participants concerning the functions and the layout of the module, how to obtain data quality, complexity versus flexibility etc. Our objective with this seminar was to get feedback on the design of the module and to get input to the questionnaire for the following evaluation of the total KM-system for visualising competence patterns.

## 2.1.7 Evaluation interviews

With the literature study, the design interviews and the evaluation seminar as a starting point we put together a questionnaire (Appendix B) for the evaluation. This questionnaire was also reviewed with our instructors and at a meeting we had with the ethnography group at the Viktoria Institute.

We conducted evaluation interviews with 15 persons. The interviewed persons were members of the management group, group leaders, consultants and a sales manager. Eight persons were interviewed in Gothenburg, five in Oslo and two in Stockholm. The interviews were between 45 minutes and an hour long.

The interviews started with a short introduction of what kind of research we were conducting. After the introduction the interviewee was shown the functions, and the results the module could provide.

The following discussion concerned fields of application, what information that should be presented, how it should be presented and the use of the original KM-system KT. We also discussed issues concerning aspects that are crucial for the use of the KM-system for visualising competence patterns, i.e. our module for visualising the status and development of competencies and interests together with the original KM-system KT.

## 2.1.8 Evaluation analysis

After the evaluation interviews were conducted we first analysed the interviews separately and in each case tried to determine what was important. When we had

had a fair understanding of the whole interview material we made a cross-analysis of the interviews. In this cross-analysis we categorised the material according to the three research questions we had stated for this thesis; i.e. fields of application, design implications for the KM-system and organisational aspects concerning the KM-system.

The objective of the analysis was to receive an understanding for what the interviewed had stated and decide how the material was related to the research questions. With the research questions as a framework we put together the findings which are presented in the result section of this thesis, chapter 6.

In this section, *the research process*, we have described how the research has been conducted and what the objective was with the different steps. In the section below we will describe the positivistic and phenomenological paradigms and try to determine our position regarding these paradigms.

## 2.2    Philosophical paradigm

There are two dominating paradigms within the social science of how to conduct research and what kind of research methods that should be used. In this part we will give a short summary of the two paradigms and describe where we stand in relation to them. The two paradigms are positivism and phenomenology. Below follows a discussion of the two paradigms with a starting point in Easterby-Smith, et al. (1991) definitons.

In the *positivistic paradigm* the basic beliefs are that the world is external and objective. The observer is independent and science is value-free, implying that what to study or how to study could be determined by objective criteria. In this type of research the researcher formulates hypotheses and then tries to either prove or falsify them. The research should focus on facts and look for causality and fundamental laws.

In this paradigm the preferred methods should include the operationalising of concepts, i.e. making theoretical concepts measurable (Wiedersheim-Paul & Eriksson, 1991). An example could be to make it possible to measure happiness by creating a scale where one can decide which value that best describes how happy one is for the moment. The meaning of this is to make facts measurable quantitatively. Samples that are gathered within this paradigm should be large enough to enable generalisations of the results.

In the *phenomenological paradigm* the world is socially constructed and subjective. The observer is a part of what is being observed and human interests drive science. Since the world is subjective and meaning is created by people, the researchers role is to appreciate different constructions and meanings that people place upon their experience. This is done by trying to understand what has happened, focusing on meanings instead of facts and develop ideas through processing data.

The preferred methods in this paradigm should focus on small samples and investigate them in depth or over time.

We argue that the research we have conducted belongs in the phenomenological paradigm. We have conducted our research in the form of a case study at the consultant company Guide. We have made qualitative interviews to be able to understand what fields of application this type of KM-system, a KM-system for

visualising competence patterns, could support and what implications this brings on the KM-system and the organisation.

In the sections below we will describe the characteristics of the method *Case study* and the qualitative methods we have used in the case study.

## 2.3    Case study

A case study is useful in research where you are focusing on one type of phenomenon. The phenomenon could be an organisation, a program, an activity etc. The aim is to investigate the case in depth and gain an understanding for the phenomenon (Wiedersheim-Paul & Eriksson, 1991; Patton, 1990).

Guide is geographically spread and the business directions at the different offices are not completely equal. Despite this we consider the activity of competence management, which we have investigated, to be equal at all three offices. We have investigated what fields of application the people at Guide could be supported in their work with competence management by a KM-system. In this investigation we have also considered the implications this brings on the KM-system and the organisation.

A case study is a qualitative research method and is a way to find out what people do, know, think and feel (Patton, 1990). The most fundamental of the qualitative methods is the in depth interview (Easterby-Smith et al., 1991) but it could also include other methods such as observation and analysing documents (Patton, 1990). In our case study we have used in depth interviews.

## 2.4    Interviews

The conducted interviews were made in two different phases and are described in section 2.1.3 and 2.1.7. The interviews in both phases were performed in a semi-structured (Easterby-Smith, et al., 1991) way. This implies that we asked open questions and followed up those questions with more questions to be certain that we had understood the answer correctly or if the answer could lead to another question. The quotation below expresses the general purpose of making an interview.

> *"The purpose of interviewing is to find out what is in and on someone else's mind."* (Patton, 1990, p. 278).

To really understand what the interviewee expresses are not easy and require skill from the person conducting the interview. The interviewer must be able to listen to the interviewee, be able to recognise what is relevant and be perceptive and sensitive enough to be able to change the line of inquiry during the interview. Last, but not least important, the interviewer must not project own opinions on the interviewee (Easterby-Smith et al., 1991). These are good pieces of advice for the interviewer, but to be a skilled interviewer is easier said than done.

In the design interviews we took notes of the interviewees' answers and wrote them to one document as soon as possible after the interview was finished. In the evaluation phase we taped the interviews and afterwards transcribed the tapes.

## 2.5    Focus group interviews

The seminars we participated in through The Viktoria Institute were held in the form of *focus group interviews*. Focus group interviews are held with a small group of people on a specific topic and the participators are a relatively homogenous group of people with similar backgrounds and experiences (Patton, 1990).

In focus groups the participants not only talk with the interviewer, they also talk with each other. The meaning of focus groups is to make it possible to access data and insights that otherwise wouldn't have emerged (Agar & MacDonald, 1995).

> *"The object is to get high-quality data in a social context where people can consider their own views in the context of the views of others"* (Patton, 1990, p. 335).

The form of focus groups is a loose structure interview where the participators can discuss the topic without having to reach a consensus (Patton, 1990). Although the structure is loose it is important that there is a guide that organises the interview. This "topic guide" contains the areas that should be discussed during the interview (Easterby-Smith et al., 1991).

The focus group interview form holds it's own difficulties. The person, who leads the interview, in focus groups called moderator, is the one that initiates and facilitates the discussion. This can be difficult when several people are simultaneously interviewed (Easterby-Smith et al., 1991). Two possible difficulties that could evolve are persons who try to dominate the discussions or persons who are not willing to air their views in public etc. (Patton, 1990; Easterby-Smith et al., 1991).

## 2.6    Literature study

In research it is important to take part of the documentation that already has been done within the chosen research area (Backman, 1985). The reasons for why a literature study should be made as a part of the research process are several. The purposes could be (Wiedersheim-Paul & Eriksson, 1991; Backman, 1985):

▪ To show the relevance of the research problem.
▪ How to formulate a meaningful scientific presentation of a problem.
▪ How the chosen area is perceived in the literature.
▪ To show how expressions within the area have been defined, specified and used.
▪ To see what kind of work practices that has been used.
▪ To see how data has been collected, processed and interpreted.
▪ To get data to the research.

To find out these things could be a necessary prerequisite for the research. The success of the research could be dependent of how well you have done your homework (Backman, 1985).

## 2.7    Analysis

In qualitative research it is important to make sense of the collected empirical material by trying to reduce the volume of information, identify significant patterns and to construct a framework for communicating the essence of what the empirical material reveals (Patton, 1990). The framework for our analysis has been the three research questions stated in this thesis.

In order to get a fair understanding of the empirical material, which we have obtained through the interviews, we have used an individual case analysis first and thereafter a cross-case analysis (Patton, 1990). An individual case analysis means that one examines the empirical material separately. A cross-case analysis means that one tries to group the material from different people according to common questions. The rational for doing both of these analysis is to get an understanding for the detailed- as well as for the comprehensive view (Patton, 1990).

## 2.8    Criticism related to our research

In this section we will discuss areas such as validity and reliability, we will also discuss the problems that could occur with the use of specific terms in our research.

### 2.8.1    Validity and Reliability

Validity is to determine how well a measuring instrument succeeds in measuring what it is supposed to measure (Wiedersheim-Paul & Eriksson, 1991). If we in our research were supposed to measure how much the earth weighs, we should deliver the weight of the earth not the size.

Reliability means that a measuring instrument should give a reliable result (Wiedersheim-Paul & Eriksson, 1991). What this means is that if someone else should perform the research we have conducted, with the same measuring instrument but with different people, the conclusion should be the same.

These ways of determining the validity and reliability of a research is closely related to the quantitative methods to conduct research (Easterby-Smith et al., 1991). We have conducted a qualitative research and do not consider these views apply to our research. Instead we have chosen to use Stolterman's (1991) view of validity and reliability to discuss the trustworthiness of our research.

Stolterman's view of validity is to determine how well the research conducted answers the questions stated in the research. Which implies that there is no way to objective measure the amount of truth in a statement. The worth of the statement could only be valued from the question it is an answer to. In this view we consider our answers to be of high validity concerning the way the answers emphasise and respond to the chosen problem areas.

Stolterman's view of reliability is that it is important to have high reliability in the traditional view if the purpose of the research is to prove something. If the purpose not is to prove something, but rather to emphasise and clarify a problem area the demands of reliability are not the same.

During the interviews we have tried to not ask leading questions and to be objective, but it is difficult not to be affected and committed to the work one has performed. What we are trying to say is that despite our efforts we might have

been both subjective and leading in certain moments. We have attempted to limit this effect as much as possible throughout the entire interview process. In an effort to correct some of the faults we have made during the interviews we have also tried not to put any weight in the answers given to leading questions.

Despite this, we believe that if the research had been conducted of others with the same KM-system, they would have gained similar result from the interviewees. But we totally agree with Stolterman (1991) when he claims that the interpretation of the gathered empirical material is depending on the researcher's theoretical background, and that the reliability of the research is depending on a common theoretical starting point.

## 2.8.2 The use of terms

In this research we have we come to an awareness of the difficulty in using specific terms. Although we have had a clear understanding concerning a specific term it has not always been obvious to the people we have been interviewing.

An example of this has been our use of the term *interest* in our research. We have used the term in the interviews, in the module as well as in this thesis. We have stressed the importance of visualising the consultants' interests to others, but we have not considered what the wide application of the term could implicate.

During one of the interviews a consultant asked us what we meant by the term interest. Considering the meaning we have placed on the term, maybe *aspirations* or *ambitions* would have been a better word to use. These two are more precise and would have been better when trying to explain what we meant and what we used the term for.

# 3 Referential framework

In this chapter we will present the theoretical framework, gained through literature studies (section 2.1.2 and section 2.4), that we use as a base to our thesis. We start by defining knowledge and competence. Thereafter we define Knowledge Intensive Organisations, the Intellectual Capital and Knowledge Worker. This chapter ends with Knowledge Management and finally Knowledge Management Systems.

The reason for this structure is that we aim to show the connection between these different areas. We argue that one needs to understand all of these concepts to understand the context that KM-systems exist in.

## 3.1 Knowledge

Knowledge is often used interchangeably with information although it differs from information in several ways. Information is a flow of messages, while knowledge on the other hand, is created by that flow of information, anchored on the commitment and beliefs of its holder (Nonaka, 1994).

Knowledge has been identified as a multifaceted concept with multilayered meanings (Nonaka, 1994). An attempt to define the meaning of knowledge was made by Polanyi (1966) by defining two different types of knowledge. He mentions tacit knowledge to explain that *"we can know more than we can tell"* (Polanyi, 1966, p. 4).

Knowledge is also a human act and is gained through thinking (McDermott, 1999). One can say that knowledge comes from experience (McDermott, 1999) and is better regarded as something that people do rather than something that they have (Blackler, 1995).

The explicit knowledge is a formal, "codified" knowledge, which can be conveyed from person to person in systematic ways such as documents, images and communication processes (Allee, 1997).

Tacit knowledge, on the other hand, is personal and context-specific. It relies on experiences, hunches and insights and a technical element that includes concrete skills and expertise (Allee, 1997). To share tacit knowledge is more complicated than explicit knowledge since it requires a lot of time spent on personal contact (Leonard & Sensiper, 1998). This can be compared with Allee (1997) who claims that knowledge is embodied in the heads of people possessing it and it can't be stored in documents, books or databases as information can.

But how do the individuals in an organisation receive knowledge? Well, Nonaka (1994) mentions autonomy as one basic factor for individuals to receive new knowledge. He means that autonomy gives the individuals the freedom to absorb knowledge. This is closely related to the autonomy Davenport (1999) talks about when he defines competence as the ability to be autonomous effectively. The term 'competence' will be discussed further in the next section.

## 3.2    Competence

Competence is not to be confused with knowledge, but it has been used so widely and so divergently in so many different contexts that it has stopped to have any precise meaning (Taylor, 1988). What we mean with the term is in a work-related context and coherent with Sadler's definition (1999, p. 12.):

> *"Competence can be defined as the ability to perform the work that advances an organisation toward its goals. In other words, its most important work."*

To be able to conceptualise work-related competencies as sub-individual units of analysis has several advantages (Nordhaug, 1999). Among these are the opportunity to aggregate single competencies across individuals and it makes far more sense to speak of the types of competencies that an organisation needs for its operations than to talk about the human resources required (Nordhaug, 1999).

Nordhaug proposed a competence typology, a classificatory framework, for work-related competencies carried by employees to classify different types of competencies (Figure 2).

| TASK SPECIFICITY | FIRM SPECIFICITY | | |
| --- | --- | --- | --- |
| | Low | | High |
| | INDUSTRY SPECIFICITY | | |
| | Low | High | |
| Low | I<br>Meta Competencies | II<br>General Industry Competencies | III<br>Intra-Organisational Competencies |
| High | IV<br>Standard Technical Competencies | V<br>Technical Trade Competencies | VI<br>Idiosyncratic, Technical Competencies |

Figure 2: *The competence typology* (Nordhaug, 1999, p. 18)

The figure above shows three major categories which competencies can be divided in. If a competence can be used in one firm only, and has no potential value for other employers, then that competence is of high firm specificity. Task specificity is the degree to which the competencies are linked to the execution of a narrow range of work tasks. When task specificity is high, competencies are tied to one single work task or very few tasks. Non firm specific competencies can be more or less industry specific, which means that they are tied exclusively to one particular industry.

The characteristics for the different competencies will now be briefly explained.

I.    Meta competencies represent basic knowledge and skills that are broadly applicable for work performance in general. Examples are learning ability, ability to tolerate change, co-operative abilities, communication skills and so forth.

II.    General industry competencies are tied to a specific industry in a higher degree than meta competencies. To be able to analyse the specific competitive conditions in the industry where the firm operates is an example of general industry competence.

III.     Intraorganisational competencies are closely linked to the organisational culture of the firm, and vice-versa. Examples of activities to reinforce the intraorganisational competencies are trainee programs, job rotation and so forth.

IV.     Standard technical competencies can be applied to across industries. They include a wide range of competencies such as typing, computer programming skills and knowledge of standard computer software to mention a few.

V.     Technical trade competencies come from experience gained through concrete and practical work within the industry. Examples are hairdressing and professional cooking.

VI.     Idiosyncratic competencies are confined to one employer and to a narrow range of work tasks. They make the employee very dependent of the present employer. Examples are skills in dealing with technical systems specific for one firm.

This section has concerned competence related to work and how specific the competence is in relation to the organisation. Another aspect of competence and organisations concerns the degree of competence, which is required within the organisation. Organisations, who are dependent on the competence of their employees, are sometimes called Knowledge Intensive Organisations. These organisations will be further described in the next section.

## 3.3     Knowledge Intensive Organisations

During the industrial era most of the workers had their work done at a machine. The work was done in the factory during the day and the workers did not have to think much about what they were doing. The work they performed did not require much thinking or intellectual effort (Dahlbom, 1997; Stewart, 1997). This industrial era belongs to the past and we have now entered information- and knowledge society (Dahlbom, 1997). In this new era of information, no company can afford to use human capital so inefficiently (Stewart, 1997).

The information era has introduced the term *Knowledge intensive organisations* (KIO:s). The KIO:s employs workers with other capabilities than the workers from the industrial era, and with different workers comes the need for different management (Drucker, 1999; Stewart, 1997). In the literature this phenomenon is, besides KIO, named Knowledge Intensive: Firms, Companies etc. In this thesis we will use the term KIO to cover all these expressions.

What is then the definition of a KIO? There are many definitions but most of them are united in the conclusion that knowledge is the most important asset in the organisation. Starbuck (1992) claims that:" *…labelling a firm as knowledge-intensive implies that knowledge has more importance than other inputs*". Another definition of KIO is stated by Blackler (1995): *"…'knowledge-intensive firms', that is, organisations staffed by a high proportion of highly qualified staff who trade in knowledge itself…"*.

Sveiby (1992) has used the term the knowhow company instead of KIO but the significance is the same. He claims that the knowhow company has the following characteristics;

- solves complex non-standard problems demanding creativity
- has a small, flat organisation
- has a high number of professional employees but few non-skilled employees
- treats its clients individually
- builds company strength through skilled individuals
- develops the organisation through developing the knowhow of the employees

Sveiby and Lloyd (1987) designate the modern management consultancy firm as the purest form of a knowhow company, but they, together with Alvesson (1993), also brings up law firms, accounting firms, advertising agencies, university's, hospitals etc as examples of KIO.

In KIO:s, it is not longer clear who owns the company, its tools or its products. In the KIO, the workers have their tools and the result of their work between their ears (Stewart, 1997). The most valuable parts in a KIO are not the machines and the factories of the industrial age. The most valuable part is the human capital (Drucker, 1999; Starbuck, 1992; Stewart, 1997). In the next section we will discuss the valuation of the human knowledge and competence, the *Intellectual Capital.*

## 3.4    Intellectual Capital

Many of the organisations today have already become knowledge intensive (Starbuck, 1992; Alvesson, 1993), which has made traditional management theory unfit (Edvinsson & Malone, 1997). Another result of this development is that there are assets in the organisations that are impossible to evaluate.

The fact above has been the attention of different companies and organisations, among them Skandia in Sweden. Skandia has been one of the pioneering companies when it comes to describe the intangible assets in today's organisations. Leif Edvinsson is the person who led the work with the intellectual capital within Skandia.

To exemplify the intangible assets that exist in today's companies he, and Michael Malone (Edvinsson & Malone, 1997), takes IBM's purchase of Lotus. When IBM purchased Lotus the worth of Lotus on the paper was $230 million; IBM paid $3.5 billion.

The conclusion Edvinsson and Malone made about why IBM paid that much is that there are assets that today's accounting methods can't show. One of those assets is the Intellectual capital.

According to Edvinsson and Malone, the Intellectual capital consists of two parts; the Human capital and the Structural capital. They define these parts as follows:

> *"Human capital. The combined knowledge, skill, innovativeness, and ability of the company's individual employees to meet the task at hand. It also includes the company's values, culture and philosophy. Human Capital cannot be owned by the company."* (Edvinsson & Malone, 1997, p. 11)

> *"Structural capital might best be described as the embodiment, empowerment, and supportive infrastructure of human capital. It is also the organizational capability, including the physical systems used to transmit and store intellectual material."* (Edvinsson & Malone, 1997, p. 35)

The relation between these two parts is described by Saint-Onge (quoted in Edvinsson & Malone, 1997, p. 35): *"Human capital is what builds structural capital, but the better your structural capital, the better your human capital is likely to be."*

In Skandia's work with the intellectual capital they have produced indicators to measure the intellectual capital within the organisation. These indicators measure five different areas the organisation focus it's attention on. The areas are human, finance, customer, process, renewal and development.

Together these indicators form the intellectual capital and with an equation Skandia have produced, one can sum up these indicators and actually calculate what the intellectual capital is worth in money.

During their work with the intellectual capital they had started out with the aim to make it possible to value the intellectual capital within the organisation. This, however, was not the only aim.

Their process for developing a method to measure the intellectual capital started as early as in the 1980s when the management at Skandia began to see how traditional management theory did not seem to fit anymore, especially when the business has become more knowledge intensive. Skandia recognised that the competitive strengths no longer reside in the traditional assets, but more in factors like individual talent, synergistic market relationships and the ability to manage the flow of competence.

Because of this recognition the work with the intellectual capital had two aims. It aimed both to value and to navigate the intellectual capital. This means that with the ability to measure the intellectual capital it is also possible to navigate for the future. It served as an aid for managing the intellectual capital, i.e. for managing the human and structural capital.

Miller and Wurzburg (quoted in Edvinsson & Malone, 1997, p. 125) conclude: *"absence of more sophisticated means for measuring and valuing human resources, particularly the qualifications acquired through experience and training, can heighten the risk of misallocation of resources"*. This quotations regards the need for measuring the intellectual capital, not just to please the stockholders but for making it possible to create an organisation that is fit for future success.

In this section we have discussed the intellectual capital. The human capital is one of the two major parts of the intellectual capital. This leads us on to the next section, in which we will discuss the *Knowledge worker*.

## 3.5   Knowledge Worker

There are several different definitions of the term "knowledge worker". Peter Drucker was the one who brought up the concept of the knowledge worker as early as 1973 (Kidd, 1994). According to him a knowledge worker is a person who puts to work what he has learned in systematic education, that is, concepts, ideas and theories, rather than a person who puts manual skills or muscles to work.

Many occupations fit this definition. However, it is knowledge that is used by the knowledge workers, not craftsmanship skills. Since 1973 the concept has become

more and more relevant. The definition of what makes a worker a knowledge worker has been analysed by several researchers and the more researchers, the more definitions.

One definition evolved from a study performed by Alison Kidd (1994). The knowledge workers that were interviewed saw their value to the organisation as understanding of a body of knowledge and generate new information from this understanding, which changed either the organisation or its customer in a direct way.

Another definition is stated by (Blackler et al., 1993), which concludes that the new generations of knowledge workers deal with options that their employing organisations are unable to address through their established disciplines.

Drucker (1999) argues that the knowledge worker and their productivity is the most valuable asset of a $21^{st}$ century institution, and that the productivity of the knowledge worker is the biggest challenge for management in the $21^{st}$ century. For the knowledge worker to be productive it requires a change in management, the knowledge worker must both be seen and treated as an asset rather than a cost. He also states that it is required by the organisations to make their organisation the most desired workplace for the knowledge worker.

> *"Employers need to find out what work their ablest people want to do and do best; place them where they can make the greatest contribution; pour responsibility on them rather than chores; encourage sabbaticals and rotation; and use knowledge employees as teachers"* (Drucker, 2000, p. 12).

This quotation illustrates that there is a need for a change in the management of the knowledge workers and introduces us to the next section, which will discuss the subject of *Knowledge management*.

## 3.6    Knowledge Management

Zack (1999, p. 128) claims that for business organisations *"knowledge can be considered the most strategically important resource"*. This statement by Zack illustrates the importance of managing the knowledge, i.e. KM. Although KM is nothing new, it became a popular subject for chief executives in the 1990s (Hansen et al., 1999). KM is a core business concern (Swan, 2000), and the importance of knowledge requires management strategies in the area. The span of approaches to KM extends from opinions that "*KM is nothing else but a technology that transforms information into knowledge*" (Salvary, 1999, p. 96), to *"Knowledge is the residue of thinking…"* (McDermott, 1999, p. 106), and therefore can not easily be stored.

The subject of KM has been discussed from a number of perspectives. Below we present three different assumptions to KM, recognised by Venzin et al. (1997):

▪ *Cognitivistic epistemology*
  Most cognitivist studies consider collection and central dissemination of information as the main knowledge development activity. The aim is to create a knowledge repository within the organisation.

▪ *Connectionistic epistemology*
  The connectionists belive that knowledge resides in the connections and hence focus on the self-organized despersed information flow. Knowledge transfer

can be facilitated by the identification of key experts in the network. Relationship and communication between people are in focus.

▪ *Autopoietic epistemology*
The autopoietic epistemologists stresses the interpretation and not the gathering of information as a major managerial responsibility. Knowledge can not be directly conveyed from one individual to another, because information has to be interpreted. Apprentice relations may facilitate the transfer of explicit knowledge.

Hansen et al. (1999) defines two different KM strategies applied by the consulting business; *Personalization* strategy and *Codification* strategy. The personalisation strategy focus on people-to-people contact and the communication of knowledge, whilst the codification strategy aims to codify and store knowledge in various databases, people-to-document.

One way to operationalise strategies into measurable goals is by using *Balanced Scorecards* (Kaplan & Norton, 1996). Balanced Scorecards can support the translation of a company's strategy into a coherent set of performance measures. This makes it possible to monitor the progress of building the capabilities and acquiring the intangible assets, such as the intellectual capital, they need for future growth.

The real power of the Balanced Scorecard, however, occurs when it is transformed from a measurement system to a management system. According to Kaplan & Norton (1996), Balanced Scorecard can support; the clarification about strategy; aligning department and personal goals to the strategy; linking strategic objectives to long-term targets; identify and align strategic initiatives; reviews to obtain feedback about strategy.

However, before making any choices of how to deal with KM questions, it is important to set the KM strategy. The KM strategy should reflect the firm's competitive strategy; a firm focusing on the codification strategy should provide high quality, reliable and fast solutions by reusing codified knowledge. A firm focusing on the personalisation strategy, on the other hand, should provide creative and unique solutions (Hansen et al., 1999).

The usual emphasis in KM is to codify and store knowledge (Swan, 2000). Tacit knowledge can not easily be stored (Swan & Scarbrough, 1999), and despite the value of tacit knowledge (Swan, 2000), the management of tacit knowledge is relatively unexplored (Leonard & Sensiper, 1999).

The problem regarding tacit knowledge has been addressed in several ways. One way to address the problem is locating experts with valuable tacit knowledge, and retain them within the firm (Swan & Scarbrough, 1999).

KM-systems are designed to support the organisations in their work with KM, which is the subject of the next section.

## 3.7    Knowledge Management Systems

Different types of KM-systems can be found in the literature. Frappaolo (1999) describes four functions that KM-systems can support:

- Intermediation, which refers to the connection of people to people. Bringing people who seek for a certain piece of knowledge together with those who are able to provide that piece of information.

- Externalisation, the connections of information source to information source. Focus is on the capturing, classifying and storing of explicit knowledge.

- Internalisation, the connection of explicit knowledge to people or knowledge seekers. Focus is on extraction and subsequent filtering of the stored knowledge.

- Cognition, which connects knowledge to process. This concerns the functions of systems that support decision-making process based on available knowledge.

The first point, intermediation, is positioned primarily within the realm of tacit knowledge which resides in the mind of people (McDermott, 1999), whilst the other points are oriented towards explicit knowledge that can be codified.

It is important that the KM strategy, and the KM-system that supports the KM strategy, is grounded in the firm's strategy and has solid relations to the creation of economic value and competitive advantage (Zack, 1999). There are several implementations of KM-systems related to different KM strategies described in the literature. Hansen et al. (1999) describes KM-systems that attempt to codify, store and reuse knowledge as well as KM-systems that are designed merely to support communication between people, i.e. help people find, contact, and talk to other people.

When designing KM-systems one must focus on the community that owns it and the people who use it and not the knowledge itself (McDermott, 1999). In the case of KM-system that support the codification strategy, the problem of making people write down what they know and share those documents in electronic repositories has been identified (Hansen et al., 1999).

IT-led KM that focuses on codification, typically encounter problems when it comes to sharing tacit knowledge, which is more suitable for the personalisation strategy (Swan, 2000). KM has been criticised, not least for the focus on KM-systems that aim to codify experts' tacit knowledge into explicit forms that can be shared (Swan & Scarbrough, 1999).

The IS- and CSCW-research about KM-system have been focused on KM-systems designed to store codified knowledge in passive repositories. As a consequence of this, there is a need for research regarding KM-system that are designed to support organisations in to have the right competence, at the right time and at the right place (Lindgren & Wallström, 2000).

With this section we end the chapter *Referential framework*. In this chapter we have discussed *Knowledge*, *Competence*, *Knowledge intensive organisations*, *Intellectual capital*, *Knowledge worker*, *Knowledge management* and *Knowledge management systems*, and how all of these subjects are connected together.

The aim with this chapter was to build a base for our research; i.e. we wanted to gain an understanding for the context which KM-systems for managing competencies resides in. With this referential framework as a base, we present the case study in the next chapter.

# 4    The Case

In this chapter we will present the case that we have based our research on. We worked at Guide's office in Gothenburg and our work is based on the KM-system KT. The evaluation interviews where performed at three offices within Guide; in Gothenburg, Oslo and Stockholm. Most of the information provided in the following two sections are a result of discussions with employees at Guide and our investigation of the KM-system KT.

## 4.1    Guide Konsult AB

Guide has three main business areas; Guide Management, Guide IT-consulting and Guide Infrastructure and Communication. The main business area is IT-consulting.

The employees are hired out to other organisations to fill a competence gap or to solve specific tasks. The business idea of Guide is to create competitive advantage for other organisations through peak performance, overall view and creativity within the subject of IT[3].

Guide is situated in Scandinavia and consists of 750 people. Geographically, Guide is made up of three organisations located in Stockholm that has approximately 350 employees, Gothenburg where the number of employees is 250 and Oslo that has approximately 50 employees. The turn over in 1998 was approximately 600 million SEK. Below the work process of Guide is illustrated.
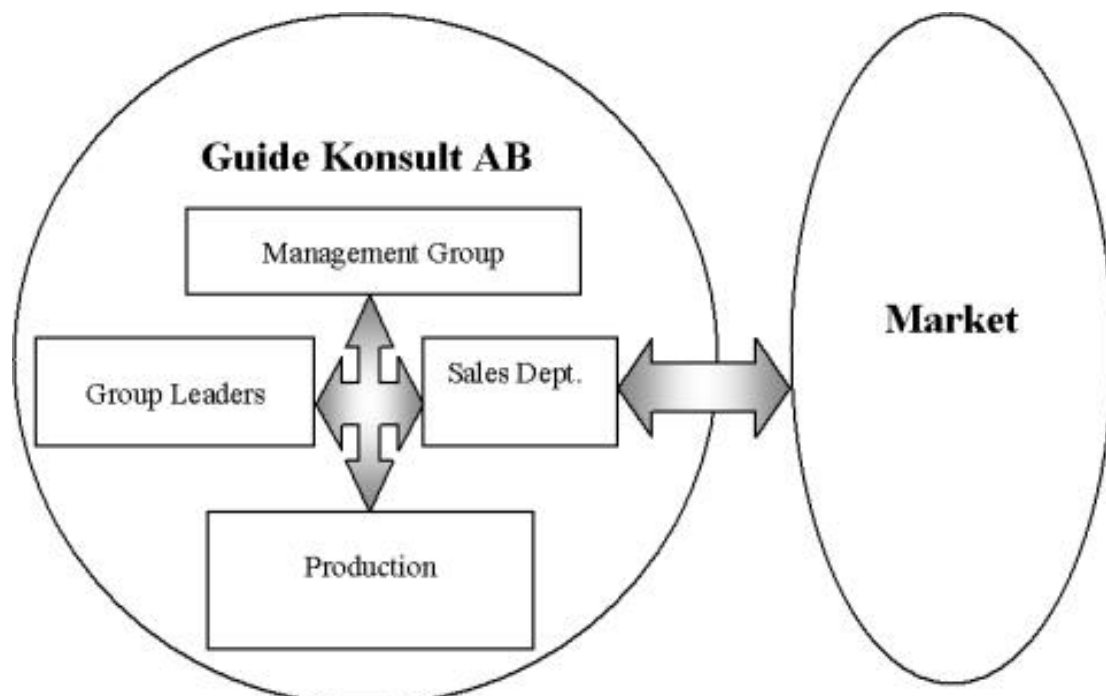


Figure 3: *The work process of Guide.*

The sales department keeps track of the market demands (Figure 3). On regular meetings the sales people and the group managers discuss what assignments that current the market. On these meetings the operative plan is defined,

---

3.   Guide's annual report 1998

including what assignments that are possible to take, and the group managers tries to man the assignments.

To be able to offer the best consultants on the market, the competence development is important[4].

In order to keep track of the consultants competencies Guide has developed a system called Kompetenstorget (KT).

## 4.2 The KM-system Kompetenstorget (KT)

The KM-system KT is developed at Guide in Oslo, Norway. KT is a database containing competence areas and competence levels concerning the consultants' competencies. The database is a SQL server and the information is presented through ASP on an IIS server. ASP generates the HTML-pages, which are viewable in a web browser.
Guide's idea regarding KT is to have a KM-system for:

- Mapping the consultants' competencies.

- Categorisation and visualisation of the competencies within the organisation.

- Forming teams of consultants.

- Finding expertise for their external projects.

In Oslo, Gothenburg and Stockholm KT is up and running. In the following sections we present platform and organisational issues, and technical features concerning KT. The data are derived from our empirical findings.

## 4.2.1 Platform and organisational issues

Below we present the fundamental concepts regarding KT's design, and how this KM-system is implemented within Guide's organisation.

### 4.2.1.1 Platform

KT is a KM-system with no subsystems. The application is http compatible, and is accessible internally on the Guide intranet. Further, there have been discussions about making KT accessible externally.

### 4.2.1.2 Knowledge formalisation

KT is developed with the consultants' competencies as a basis. There are no predefined roles in KT such as project manager, sales manager, HR manager etc. In KT a competence is a specific skill, e.g. C++, Java, Pascal etc.

### 4.2.1.3 Competence tree

The top level consists of four different groups and each of these has sub levels, which is constituted of the competencies, e.g. technology, tools and systems - programming- and script languages - C/ C++, Pascal, Java etc (Figure 4).

### 4.2.1.4 Competence grading

KT's competence tree consists of four levels concerning competence grading; *Beginner*, a person who has some theoretical background in the competence

---

4. Guide's annual report 1998

area, and has an interest of the area in question. *Some knowledge*, a person who has experience from at least one project, and also has some theoretical background in the subject. *Experienced*, a person who has participated in several projects within a certain competence area, and is able to teach others in the subject. *Expert*, a person who has a great deal of experience in the competence area, and has the ability to teach others on a higher level (Figure 4).
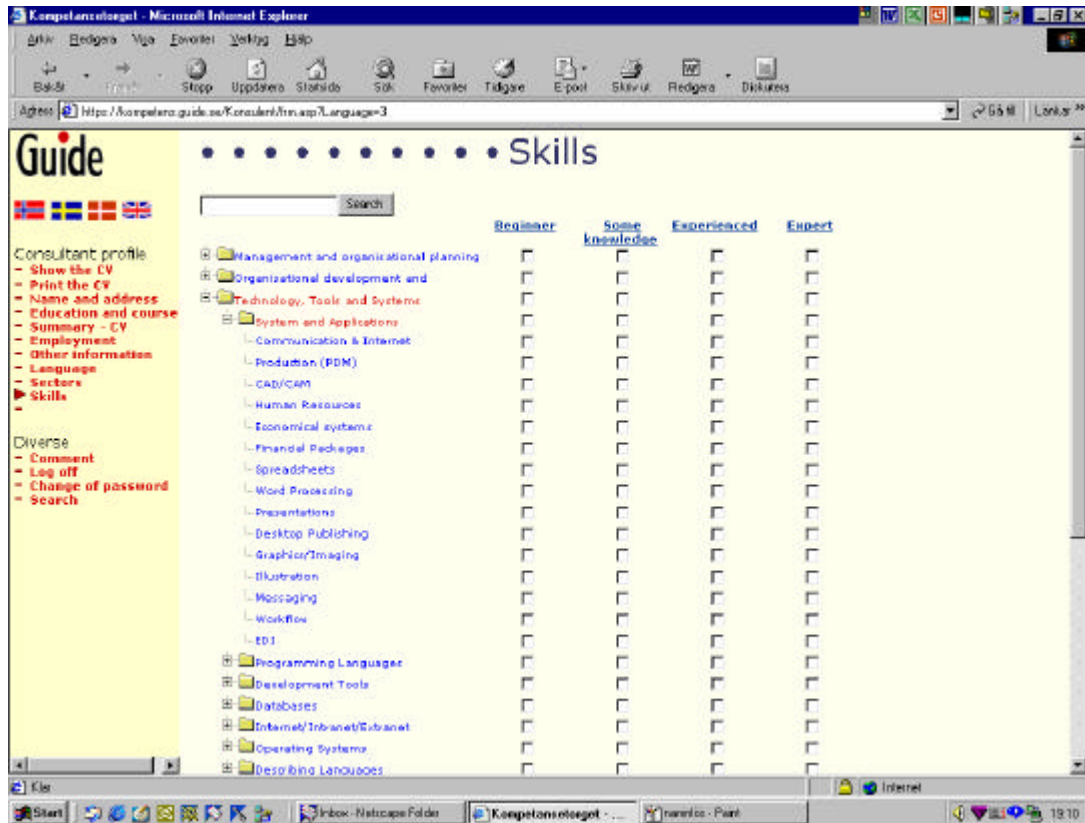


Figure 4: *KT's competence tree and competence grading.*

### 4.2.1.5   Implementation strategy

KT is implemented through a top-down strategy, which means that the management defines which competencies that should constitute KT.

### 4.2.1.6   Data input

The consultants are responsible for the input of their competence data.

### 4.2.1.7   Organisational structure

Guide's organisational structure is flat. This is reflected in KT where everyone can see everybody, i.e. the management is able to see their subordinates' competence profiles and vice versa.

## 4.2.2   Technical features

Here we present technical features of KT, i.e. how the KM-system can be used. The presented features are the most important, i.e. there are other features in KT, but they do not contribute to the content of this thesis.

## 4.2.2.1    Search

In KT it is possible to search for a specific competence or expertise in four different ways:

- *Search for person*, concerns the possibility to receive information regarding how to get in touch with a certain consultant.

- *Search in free text*, means that one can search for a defined phrase in the consultants' CV:s.

- *Simple search*, regards the possibility to search for a consultant that has accomplished assignments in a certain branch of industry, has competence within at least one of the four competence areas in KT, or has been involved in projects with a particular customer or in a certain kind of project.

- *Advanced search*, concerns the possibility to search in the three major areas; branch of industry, language and skills (Figure 5). Within each area it is possible to search for a certain competence or a specific mix of competencies. It is also possible to search for a particular competence on a certain competence level.
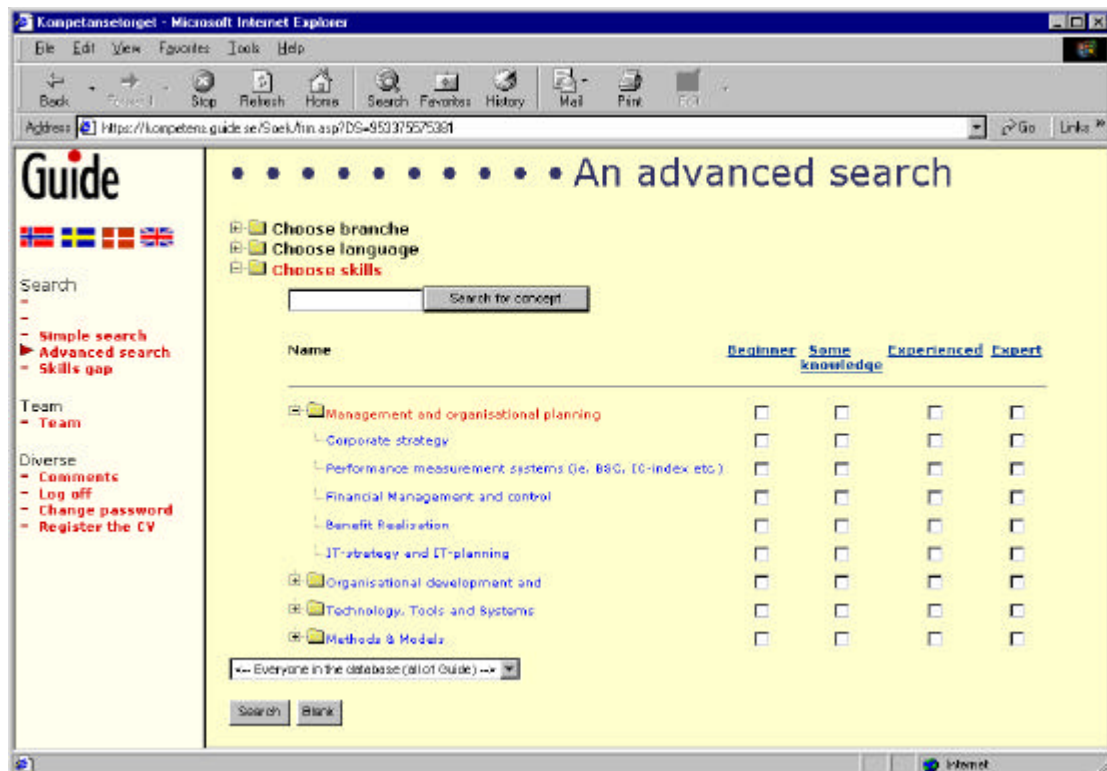


Figure 5: *KT's advanced search.*

Finally, in all these, above mentioned, search alternatives it is possible to choose which subsidiary within Guide to search in.

## 4.2.2.2    Competence gap

This type of search is used for investigating the number of consultants that hold a certain competence. Furthermore, through this search it is possible to monitor competence gaps, i.e. the difference between existing and wanted competencies. The search is very basic as it only enables looking at one competence at a time

and does not distinguish between which levels of competence the consultants' holds.

### 4.2.2.3    Free text

In KT it is possible for the consultants to enter comments and additional information into their CV's.

### 4.2.2.4    Individual plan

It is possible for consultants to express their interests concerning competence areas as well as competence levels. However, this is merely possible in free text, and the individual plan is not supported by the tree structure in KT.

### 4.2.2.5    Multilingual

KT exists in four different versions supporting the following languages; English, Danish, Norwegian and Swedish.

### 4.2.2.6    CV-pages

It is possible to print a CV in KT.

### 4.2.2.7    Grouping

Within Guide's organisation there are subsidiaries, which are predefined in KT and searchable. An additional possibility is to group the consultants in 'lists', which makes it feasible to enter wanted consultants irrespectively of which subsidiary they belong to. However, it is not possible to use lists when searching.

Above we have presented platform and organisational issues, and technical features concerning KT. The remainder of this thesis concerns the development and improvement of KT; *towards a KM-system for visualising competence patterns*.

# 5 Towards a KM-system for visualising competence patterns

The following two sections present; empirical findings regarding desired or missing features in KT and the module that was designed to address these functions.

## 5.1 Empirical findings

Below we present desired or missing features in KT. In order to illustrate these desired or missing features in KT, we use quotations from empirical findings[5]. The reason for this is to show the shortcomings of KT and at the same time present a base for the design of our module.

- One Project Manager at Guide in Oslo expressed the following:

  *"It is not sufficient to know the employees' competencies... actually, you must be able to manage those competencies in a strategic way, but it [the KM-system] does not contain a complete package...At present, we merely manage competencies on an individual level. However, our ambition is to manage competencies on a departmental level... and then we need it [the KM-system] as a management tool for the activity."*

  This quotation shows the need for functionality that supports analysing the competence of different groups of people in order to manage competencies. KT merely supports the management of competence at an individual level.

- A sales manager at Guide in Stockholm articulated this:

  *"As the way I see it... as we wish to use it [the KM-system]... first of all, these are the business areas we will concentrate on. Then you come to the conclusion that within this business area these particular competencies are demanded and so on... then we should use the system in order to make an inventory of the consultants. Identify the status of our competencies in comparison with our business areas and vice versa... with such information as a starting point we are able to handle future recruiting and competence development in a more professional way."*

  The statement illustrates is that there is a need for a features that supports the valuation of different competencies. This valuation should be performed at different groups, which makes it possible to compare the competence value with the demand of the market.

- The CEO for Guide in Stockholm articulated the following:

  *"What is the market's direction... what are our competencies in those business areas. Our track record concerning related projects... present status of our employees' competencies. Furthermore, references to employees' aims and directions would be great to have [in the KM-system]."*

---

5. Empirical findings from previous research regarding KT within the KM-project at the Viktoria institute.

This quotation shows the need for functions that support the comparison of the competence with the market demand. There is also a need to compare the development of competence as well as the interests of the employees within the firm, to the development of the market.

- Guide's CEO in Stockholm stated:

  *"The system should also handle interests, aims and ambitions concerning competencies... otherwise you will only see competencies that employees' have today... the existing competencies that they have documented. A complementary approach is to identify interests, aims and ambitions of the employees."*

  The quotation illustrates the need for the KM-system to handle the existing competencies as well as the competencies the employees are interested in developing in the future.

With these empirical findings regarding the shortcomings of KT, we have created a base for the design of our module. The design implications are summarised and presented in the next section.

## 5.2    Design implications

The following design implications, summarised from the previous section (5.1), are critical for the development of a module to KT for visualising competence patterns; (1), Functions that in a clear way present information regarding the competence status of different groups. (2), Functions that generate competence patterns concerning the development of existing competencies. (3), Functions that present competence patterns regarding the competencies that the organisation's employees wish to build up, i.e. interests, aims and ambitions regarding the development of competencies.

## 5.3    Module for visualising competence patterns

With the design implications, presented in the previous section, as a starting point, our objective was to develop a module that complements KT by:

- Making it possible to survey competence status of different consultant groups at a specific moment.

- Handling information concerning consultants' existing competencies and competence interests.

- Enabling the user to view both snapshots at a particular point of time and development over a certain period regarding existing competencies as well as competence interests.

In the following sections we present the developed KM-system, which is based on the system structure and data of the original version of KT. However, since the original version of KT does not handle data concerning competence interests, we have simulated data for this purpose.

## 5.3.1    Technical data

This KM-system for visualising competence patterns is, like the original version of KT, based on ASP-scripts, an IIS server and a SQL server. ASP generates the HTML-pages, and these are viewable through a web browser.

## 5.3.2    The server

On a regular basis, the server creates copies of Guide's competence table that contains information regarding competence areas and competence levels of every single consultant within the organisation. With these copies, related to the original version of KT, the module is able to generate competence patterns concerning existing competencies of specific groups. Competence patterns regarding the simulated competence interests are handled by the competence interest module, which is based on the same competence tree and competence grading as the original version of KT (Figure 6).



**Update your competence interests**

| | Beginner | Some knowledge | Experienced | Expert |
|---|---|---|---|---|
| Management and organisational planning | ☐ | ☐ | ☐ | ☐ |
| Organisational development and | ☐ | ☐ | ☐ | ☐ |
| Technology, Tools and Systems | ☐ | ☐ | ☐ | ☐ |
| Methods & Models | ☐ | ☐ | ☐ | ☐ |

Figure 6: *Data input regarding competence interests.*

These competence patterns (Figure 8; 9), mentioned above, can be constituted of either KT's competence grading or an aggregated competence value. A competence value is calculated on a weighting of KT's competence grading. The weighting of the competence grading is developed in cooperation with Guide's management, and is presented below:

- Beginner is valued 0,25.
- Some knowledge is valued 0,5.
- Experienced is valued 1,0.
- Expert is valued 1,25.

This weighting is based on the assumption that an experienced Guide consultant is able to do independent work, and handle project assignments without the need for assistance. A consultant with some knowledge has basic competencies within the area, but needs support in order to complete assignments.

## 5.3.3    User interaction interface

Here we present the user interaction interface of the developed KM-system for visualising competence patterns (Figure 7).

Figure 7: *The user interaction interface of the module.*

The following sections describe the KM-system's user interaction interface.

- **Choose chart type.** Regarding existing competencies as well as competence interests the user has the possibility to choose between two different chart types; snapshot of competence status at a particular point of time or development over a certain period.

- **Choose scope.** The user can choose between the following scopes; the whole organisation, a subsidiary or a user created list.

- **Choose competence area.** The user has the possibility to choose between the four competence areas represented in the competence tree.

## 5.3.4    Output

The output is displayed in either a chart of vertical bars representing a snapshot of the competence status at a certain point of time (Figure 8) or a linear chart regarding development (Figure 9). The developed KM-system is limited to

handling competence patterns regarding different kinds of groups, and does not provide information about development of specific a consultant. The competence patterns can be based on existing competencies as well as competence interests.
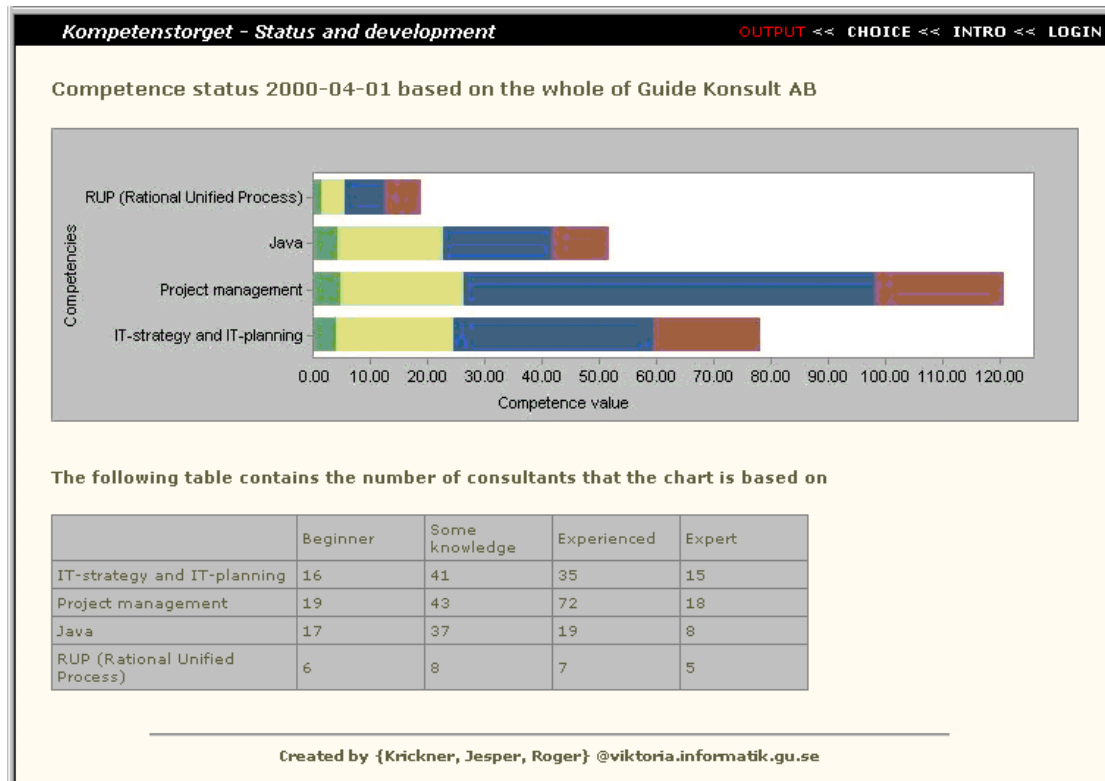


Figure 8: *Bar chart of competence status at a certain point of time.*

Each vertical bar can be constituted of up to four parts, which represent the different competence levels; beginner, some knowledge, experienced and expert. If there are no consultants within a particular competence level, for instance experts, the vertical bars will be presented with three parts and so on. Below the chart, a table is presented containing the number of consultants that the vertical bars are based on.
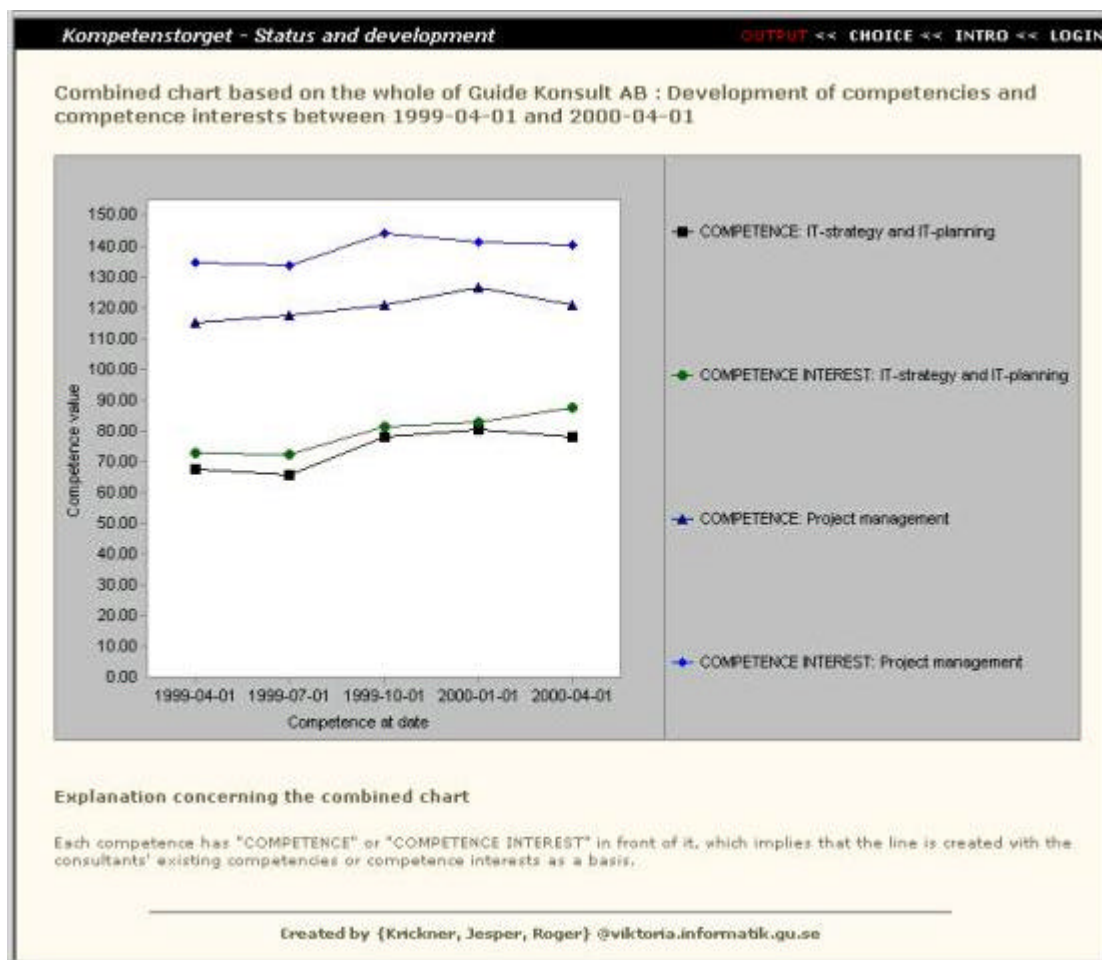
Figure 9: *Combined development chart based on the whole of Guide Konsult AB.*

This combined linear chart is based on the existing competencies and the competence interests. The lines are representing the existing competence or competence interests in a specific competence area. Each dot on the lines represents the aggregated competence value at a specific moment.

In section 4.2 we described the KM-system KT. In this section, 5.3, we have presented the module that complements the shortcomings of KT, described in section 5.1. In the next chapter, 6, we will present the evaluation of our module together with KT. The module and KT are evaluated as one KM-system, the KM-system for *visualising competence patterns*.

# 6    Results

The fields of application, design implications and organisational aspects presented in this chapter are the results derived from the empirical findings.

During our evaluation interviews we evaluated the KM-system for visualising competence patterns, i.e. KT and the add-on module. This chapter is divided in three major sections:

- *Fields of application*
    - 6.1 presents the present fields of application supported by the KM-system.
    - 6.3 presents the wanted fields of application for the KM-system.

- *Design implications*
    - 6.2 consists of design implications that could enhance the support of the KM-system within the present fields of application.
    - 6.4 presents design implications that are needed in order to support the wanted fields of application.

- *Organisational aspects*
    - 6.5 consists of the organisational aspects, mainly to assure data quality, regarding the use of the KM-system.

## 6.1    Present fields of application

This section presents the fields of application supported by the KM-system in the present state. The next section, 6.2, consists of design implications suggested to improve the KM-systems' support regarding the fields of application mentioned in this section.

### 6.1.1    Management towards organisational goals

This concerns three activities, which are closely connected to each other:

- *Defining competence goals based on the competence status*
  With a clear picture of the competence status at a certain time, it is possible to define organisational goals, i.e. the desired competence status.

- *Gap analysis*
  When both the current and the desired competence status is presented, it was possible to monitor the gap between the two situations and determine what kind of actions to take, e.g. educate or recruit, in order to reduce the gap in the best possible way.

- *Evaluation of competence actions*
  With the possibility to monitor the development of competence it is possible to evaluate the actions taken to reduce the gap between the organisational goal and the competence status.

The first two activities presented above were illustrated by a member of the management group at Guide in Gothenburg:

*"This is for managing the development, to be able to set targets, so to speak. Today were a hundred, in six months we shall be 150. We'll make these*

*efforts, projects, and programmes."*

A consultant at Guide in Oslo described the area of evaluation of competence actions:

*"It could be interesting to see how our recent investment within an area has paid off. If a major investment this year has been correct. Maybe one should have recruited instead..."*

Another type of *evaluation*, than the one mentioned above, is to use aggregated information of the employees' competence goals, i.e. competence interests, and see how well the organisation fulfils these goals. The information should be useful for managers with personnel responsibilities. It could give an indication if the organisation succeeds in satisfying the employees' interests or if there is a need to make further efforts.

## 6.1.2     Development discussions and group information

With the information that the KM-system can provide, it could be easier to have discussions with the employees regarding the competence status within the organisation. The discussions could be both on a group level and an individual level.

On a group level it could be useful to review the situation with the employees and also to show for the employees that a certain competence investment has paid off. For this purpose the graphical presentation of competence development is suitable. A member of the management group at Guide, Oslo, articulated this:

*"It is useful to talk about the situation with the employees and it is easier to understand charts, and easier to understand what we mean!"*

On an individual level the KM-system could be useful, because it could provide information about the individual and the organisational competence profile and serve as a basis for discussing the employee's future competence development.

In the personal development discussions one could go through the consultants' competencies and set targets for how and within what competence areas the employee would like to develop in the future. These targets are set in the interest module and could be followed up and analysed later on.

## 6.1.3     Estimating capacity

In order to decide whether the organisation can undertake an assignment or not, they need to know if they have the competence resources required. A member of the management group at Guide, Gothenburg, expressed this:

*"We have an example: A large project at [a company] that we are going to offer on. I was thinking about this yesterday, is it even possible for us to deliver? If we immediately could see that we can not do that, we could put a whole month of work with this offering aside at once! "*

This is especially important when it comes to unusually large assignments. Within an organisation that expands rapidly it is not an easy task to maintain awareness of the current competence status. In those situations the KM-system could be useful.

## 6.1.4 External marketing

On an organisational level it could be a way to present the organisational competence for customers in order to show them that the organisation can match their needs. A group leader at Guide, Stockholm, stated this:

*"A customer would probably choose our organisations first if he can see that we have many employees with a certain competence…"*

This is especially useful when it comes to building relationships with new customers who do not know what Guide stands for.

External marketing also consists of an individual level. On the individual level it is possible to present a consultant to a customer through his/her CV.

## 6.1.5 Valuing competence

Another form of external marketing is the presentation of the organisational competence for stockholders and other stakeholders who want to invest in the organisation. It could be important to be able to present competence development in order to get assignments or to earn the stakeholders trust.

The information could be presented in the annual report to point out the intellectual capital in the organisation, and what competence areas the organisation has invested in. A member of the management group at Guide in Gothenburg put it like this:

*" We sell competence, so to speak, and that's the most important thing we possess. But we do not have the tool to present that competence. And it's a thing for the future! The stock exchange market value us from how much brain power we have and what we know."*

Another member of the management group stressed that showing this kind of information not merely is of a positive nature. If the organisation shows an exceptionally good development within a certain competence area one year, they are expected to do this the next year as well.

## 6.1.6 Consultants' competence interests as a market indicator

During our research a question has evolved concerning the use of consultant's competence interests as an indication of future market directions. The interviewees had many different opinions about this field of application. Below some of them are listed.

- Market demands could be seen in the competence interests of the consultants but it is not sure that every consultant's interests could be used as an indicator.

- If interests coincide with market demands it is dependent of the business cycle. When demands are low the consultants wish to develop within areas where they can get assignments, but when demands are high interests tend to become more personal.

- It is important for the consultants to be one step ahead and to meet the markets' demands. One should be careful though from trying to estimate the

markets' demands through the interests of the consultants, since the interests easily increases much but the demand for that competence is more stable.

▪ The interest of the consultants is related to the development on the market.

*"It is in each and every ones interest to maintain his value on the market!"*

This group leader articulates that the employees keep their value by developing competence that the market demands. This implies that there is some kind of relationship between the competence interest and the development of the market. How they are related was not known by any of the interviewees.

## 6.1.7    Summary of Present fields of application

In the previous sections we have presented the suggested fields of application with the KM-system for visualising competence patterns, which consists of KT and the add-on module. In this section, we summarise these suggestions.

The suggested fields of application were:

▪ *Managing towards organisational goals*, which included the identification of competence status, definition of organisational goals and evaluating the actions taken to narrow the gap between the goals and the status. Measuring the gap between the employees' competence interests, i.e. aspirations, and the competence status could give an indication of how well the organisation are fulfilling the consultants' aspirations.

▪ *Development discussions and group information* is about how the charts could be used as a basis for discussing organisational goals and development with the employees.

▪ *Estimating capacity* concerns the problem of knowing what kind of assignments that the organisation can manage.

▪ *External marketing* regards the possibility to show the customers the competence status of different areas within the organisation.

▪ *Valuing competence* concerns the presentation of Intellectual Capital to stockholders.

▪ *Consultants' competence interests as a market indicator* regards the possibility that the aggregated competence interest, i.e. aspiration, of the employees could be used to predict the development of the market.

This section includes the summary of the suggested fields of application. In the next section we will present design implications that could enhance the support within the *present fields of application.*

## 6.2    Design implications concerning Present fields of application

In this section we will present technical changes to the KM-system that could further improve the present fields of application we have brought up above. The suggestions below have evolved during the evaluation interviews.

## 6.2.1 Scope limitations regarding interest

In the present version of this KM-system for visualising competence patterns, interests for a specific competence is visualised based on everyone who is included in the scope and then summed. This means that the people who are competent in the specific area do not have to be the same ones who are interested in the same area. To make the information easier to analyse, limitations in the scope for separating existing competence and competence interest should be made.

In other words, there should be a way to delimit the scope further in the function that generates the charts (Figure 9). The delimitation should consist of four alternatives to choose between:

▪ Competent and interested consultants

▪ Competent and not interested consultants

▪ Not competent but interested consultants

▪ Total competence and total interest of all consultants within a scope

With the improvements above it is possible to get a more specified result than before. The information will be easier to analyse and the quality of the information can be trusted in another way than before because one knows which group of consultants that constitutes the basis of the result.

## 6.2.2 Competence levels in development charts

To see the development over time divided into the different competence levels was desired in order to see how the relation between the different competence levels are changing over time. An illustration of this is presented below (Figure 10).
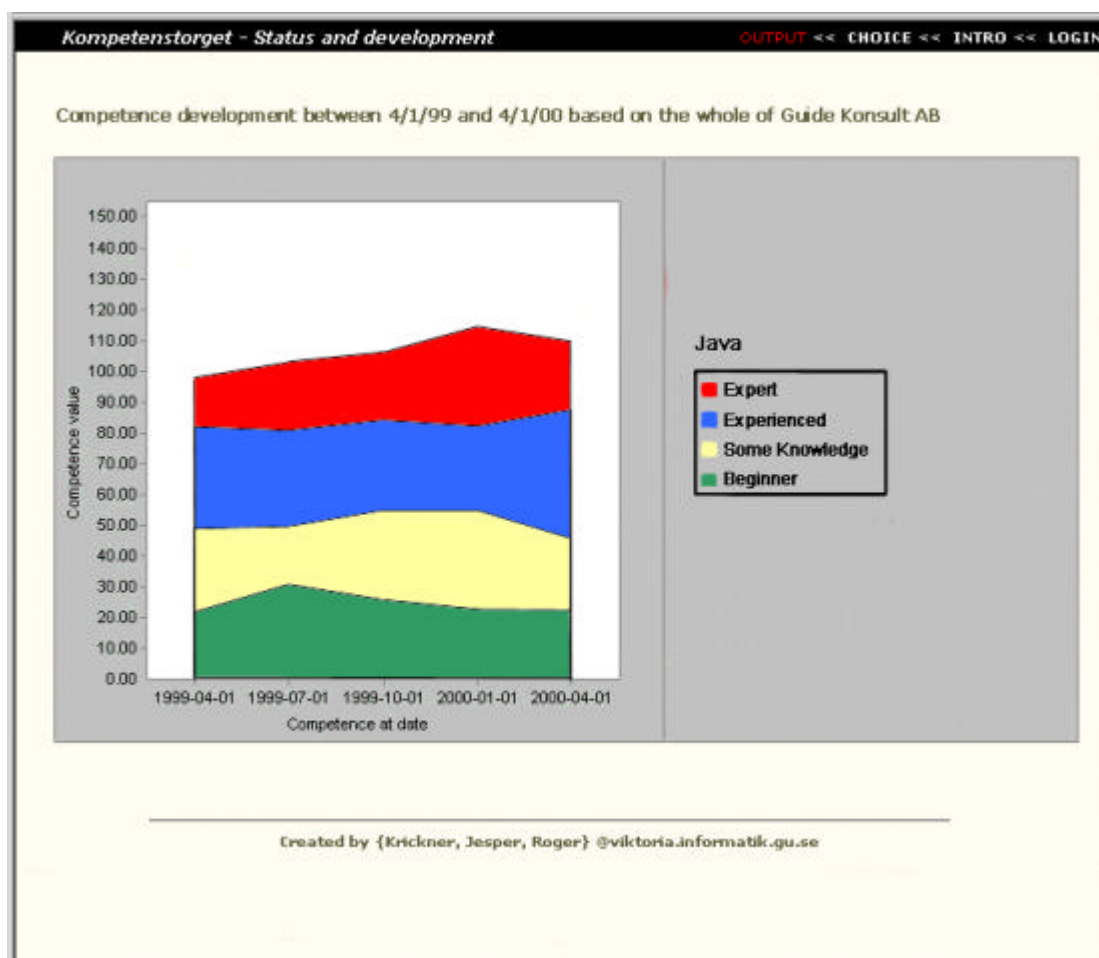
Figure 10: *An illustration of how competence levels can be visualised in development charts.*

## 6.2.3    CV functionality

To present date Guide has used consultant CV:s, made in MS Word, when offering a consultant to a customer. The KM-system includes a function to create a CV based on the consultants' competence profile. According to the interviewees, the lack of flexibility in this function makes it impossible to replace their current CV documents.

It was not possible to e-mail the CV of a consultant from the KM-system, which could be useful when offering a consultant to a customer. Opinions about the design of the CV's were that completed assignments must be described more stringent and that competencies at the beginner's level should not be displayed. The latest assignments should also be emphasised and older assignments should be summarised. Another wish was to be able to manually choose which parts of the CV the customer should receive. It should emphasise competencies and experiences the consultant has which are relevant to the customer.

## 6.2.4    Data export

There is a wish for a possibility to export the competence data from the KM-system into another system such as MS Excel for further analysis and alternative visualisation possibilities.

## 6.2.5    The sum of consultants

The table (Figure 8) under the chart showing the competence values for certain competencies shows the number of consultants who holds a certain level in the chosen competence. These numbers should be summarised. The sum of the consultants should be placed at the end of the table.

Another opinion is that the total number of consultants included in the scope when the result was generated also should be displayed in the table.

## 6.2.6    Summary of Design implications concerning Present fields of application

The improvements presented for the KM-system in the section above makes that the tasks the presented fields of application holds easier to perform. It is not the fields of application that has been altered, but merely the functions to perform these fields. In this section, we have summarised these suggestions.

The suggested design implications were:

▪ *Scope limitations regarding interest* concerns the wish to view employees with competence and interests-; competence but *not* interests-; not competence but interests- within a certain area (Figure 9).

▪ *Competence levels in development charts* regards the desire to view the relation between the different competence levels that are aggregated to one value in the development charts (Figure 10).

▪ *CV functionality* is about the lack of functionality regarding the CV function. There was, for instance, a desire to adjust the layout of the CV.

▪ *Data export* regards the need to export the data from the KM-system in order to analyse it in other programs, such as MS Excel.

▪ *The sum of consultants* concerns the wish to see the total number of consultants who holds a certain competence as well as the number of consultants included in the scope.

The next section presents *wanted fields of application* that came to light during the evaluation interviews.

# 6.3    Wanted fields of application

This section covers fields of application that the interviewees wished the KM-system to support. The new functionality that these fields require are presented in the section *Design implications for wanted fields of application*.

## 6.3.1    Staffing assignments and projects

At sales meetings the group managers and the people from the sales department staff the assignments that Guide have been offered. The sales department presents what the market wants and the group managers decide which consultant who can take on the assignment and if the assignment fits the consultant's interest profile. In this process it is important to know if the consultants are available or not. A sales manager at Guide in Gothenburg expressed it like this:

*"It doesn't matter if they are competent, if they are not available."*

Another situation is when the desired competence doesn't exist in house, it could be essential to find those who are motivated to develop that competence. A member of the management group at Guide in Gothenburg illustrates this with the following quote:

*"...it takes three month to recruit a consultant with the desired competence...to develop competence through education is faster, - one to two weeks!"*

A group leader at Guide in Gothenburg expressed a wish to be able to use the KM-system when staffing projects. In those situations it's important to find the right competence for the job. The group leader expressed it like this:

*"Another thing could be when you should staff a project, to get the best team for the project you maybe should need to view the whole region or the whole of Sweden. But surely you must have the possibility to group people in some way."*

The group leader stresses the possibility to group consultants and to use it not only to find the right man for the job, but also to find the right team for the job.

## 6.3.2    Work satisfaction

Group leaders considered it to be important that the employees were offered assignments in projects that concerned competence areas they were interested in. The problem with getting assignments they weren't interested in was emphasised. The risk was that they would start looking for employment elsewhere.

This is a concern that is of high significance since the labour market of today is favourable for the IT consultants. The quote from a branch director at Guide in Stockholm illustrates this situation very well:

*"At least 80% of the employees probably has a standing offer for another job!"*

The same branch director also pointed out that it is much easier to let the employees get assignments within those competence areas they are interested in when things are going well for the organisation. When the business cycle is positive, Guide can take on the assignments they want. When times are not as prosperous Guide have to take on virtually every assignment offered.

## 6.3.3    Comparing organisational competence with market demands

A member of the management group at Guide in Gothenburg wanted to be able to compare market demands for certain competencies with the competence status of the organisation. He wanted this kind of functionality in order to see if they needed to take actions to be able to meet market demands. He expressed the wanted functionality with the following quote:

*"To compare with the market demands. If we are not in contact with our market, that we are totally isolated and in-house all the time, this might look great. – But we're dead! How do we map this [organisational competence] against the trends on the market, now that's interesting."*

This quotation concerns the importance of keeping good control of what the market demands. The need to represent the market in the KM-system was stressed.

Guide had different ways to estimate what the market demands but they have no system that supports this type of activity.

### 6.3.4 Mixes of competencies

To be able to take on large projects a certain competence mix within the organisation was needed. A member of the management group at Guide in Gothenburg stated the following quote:

*"These large projects demand a mix of competencies. They often demand a project leader, an architect etc. depending on how large they are. If you look at separate competencies it might look good because of our rapid growth, but if we only have one percentage point project leaders we can't take a project, it is destined to fail "*

This means that he wanted to see the percentage of the consultants that holds a certain competence in relationship to the total of consultants that are included in the scope. This mix of competencies is another way to manage towards goals.

### 6.3.5 Mentorship

Mentors are experienced people who can answer specific questions within an area and support less experienced consultants in their assignments even if the mentor doesn't work within that area anymore. A consultant at Guide in Gothenburg had the following suggestion:

*"Even if one could be very tired of something one could work as a mentor, that could be preferable in order not to wear someone down completely. The person's knowledge could instead be passed on to others in the organisation"*

The mentor role gives the opportunity for the organisation to keep the competence value for a person who doesn't wish to work within the area anymore. The competence profile could remain within the system so that other persons could find and contact the experienced person. In this way the competence could be maintained within the organisation.

### 6.3.6 Summary of Wanted fields of application

In the previous section we have described the interviewees' wanted fields of application concerning the KM-system. They came up with several fields of application where the KM-system could be supportive if it was further developed. In this section we have summarised those fields.

The new fields were:

- *Staffing assignments* which means that they wished to be able to use the KM-system to find the right man for the assignments they had received.

- *Work satisfaction*, i.e. to see in the KM-system how well the interests of the consultants coincided with the assignments they had.

- *Comparing organisational competence with market demands.* This means that if there was a way to get the market's competence demands into the system, they could compare those demands with the organisational competence and act thereafter.

- *Mixes of competencies*, which means that there was a wish to see the percentage of how many consultants who holds a certain competence in relation to the whole scope of consultants.

- *Mentorship* dealt with the problem of experienced consultants of did not wish to work within a certain competence area any longer. Instead of removing his/her competence value from the system there should be a way to mark that they are not interested and can from then on be used as mentors for others within the area.

The wanted fields of application mentioned above demands new functionality to be implemented into the KM-system. Below we will discuss these functionalities and describe what implications they bring to the design of the KM-system.

## 6.4    Design implications concerning Wanted fields of application

The wanted fields of application bring further design implications that have to be addressed. These implications are listed below.

### 6.4.1    Identification of the people behind the numbers

Having generated a chart and viewing the table the chart was based on, a majority of the group leaders would like to see who the persons behind the numbers were. This could help them when staffing an assignment.

### 6.4.2    Availability

The KM-system lacks functionality staffing assignments and projects. One missing key feature was the availability among the consultants. In order to use the KM-system when staffing a project it seemed essential to be able to view the consultant's availability status within the system. The availability should be possible to view in the KM-system, but the data should remain in another system, the staffing system, as it is today.

### 6.4.3    Not interested

To man an assignment it is important to make sure that the consultants who are candidates for the assignment want to work with the competencies that are required.  To make it possible to view which consultants that do not wish to work with certain competence areas, the interest module should be complemented with a checkbox. With this checkbox it is possible to express that you do not want to work with a certain competence.

The ability to express this is not only a concern for staffing the assignments but also serves a purpose in order to make the consultants more satisfied with their work situation.

## 6.4.4　　The mix of competencies

A certain mix of competencies is needed to be able to take on assignments, e.g. 25% project leaders. The relation between a certain competence and the number of employees should be added to the table. In other words a percentage showing the competence in relation to the mass.

## 6.4.5　　Market information in the KM-system

The wish for an ability to view market information in the KM-system complies with the logical conclusion that it must be included somehow. This, however, is easier said than done. We received several suggestions on how to solve this problem. Three suggestions are described below.

- The prospects, i.e. possible assignments mentioned by customers, could be handled and presented in the same way as the competencies. That could be a way to confront resources with demands.

- Another suggestion was to include the company strategy in the system, maybe in the shape of target values for certain key competencies.

- The last suggestion was to categorise the history of orders in the same way as the competencies and insert them in to the KM-system.

The list above highlights three different suggestions to solve the problem. Which one of these serves as the best solution we do not know. The area has to be investigated further to reach a conclusion.

## 6.4.6　　Summary of Design implications concerning wanted fields of application

The design applications that we have brought up above concern what is needed to change in the KM-system in order to make the wanted fields of application possible. This section presents a summary of those design implications.

The design implications regarding desired fields of application:

- *Identification of the people behind the numbers* concerns the desire to easily identify the persons that a chart is based to support the staffing of assignments.

- *Availability* regards the lack of functions in the KM-system to display the availability of the consultants.

- *Not interested* concerns that there was no functionality to exclude consultants that not have interest in a certain competence area.

- *The mix of competencies* is about the desire to see the relation between consultants that holds a certain competence and the total number of employees, the percentage of competence in relation to the mass.

- *Market information in the KM-system* regards the need to have information about the market represented in the KM-system.

In the next section we will concentrate on the organisational factors, organisational suggestions, that have to be considered if the system is to be successful.

# 6.5 Organisational aspects

The fields of application we have presented above, regarding both the present and the wanted KM-system, imply certain organisational aspects to be considered. These steps mainly concern the subject of data quality. In this section, we will present the recommendations regarding organisational aspects we perceived through the interviews.

## 6.5.1 Responsibilities

During the interviews, different areas of responsibility evolved.

- Unambiguous definitions: It is important that there are clear definitions of what each competence level requires and that all users should know these definitions. An expert within each competence area could define competence level definitions.

- Guarantee of data input: The group leader should be responsible for checking that the consultants' competence resides at the correct level in the KM-system. This is illustrated with an expression used by a member of the management group at Guide in Gothenburg:

  *"It's only ...the group leaders who can tell how high 2 metres is... You might jump 1,6 metres and think it's a world record, but in reality the record is 2,4 metres..."*

  The reason for this is to make the data more reliable and trustworthy.

- Aggregation of competence: When conducting a search for a certain competence level within a category, which contains subcategories, in the original KM-system KT, the result shows persons holding that competence level in any of the subcategories. In other words, the competence levels are aggregated from the most detailed categories to the higher, more general categories. This means, for instance, that when searching for an expert in the total area of technology, an expert in the sole area of JavaScript would appear.

  *"It is not properly thought through and I'm not sure that there should be any aggregation. It's merely a logical grouping to find competence areas, that's all it is."*

  The issue of aggregating competence is complicated and should rather be done manually than automatically by the system.

- Competence tree: The KM-system has to reflect the dynamic world it represents, the competence tree must be added with new competencies as well as old competencies have to be removed. If the system is to be used throughout the organisation, the updating should be done within a function common to the whole organisation to avoid confusion of terms.

  *"It can become total anarchy if too many people are allowed to update the tree..."*

This quotation of a group leader at Guide in Gothenburg shows the importance of not letting everyone and anyone update the competence tree categories.

## 6.5.2    Incentive for the consultants

In order to keep the data in the KM-system updated there has to be an incentive for the consultants to update their competence profiles. A sales manager at Guide in Gothenburg illustrated this by saying:

*"The person entering information into the system should get something out of it. Otherwise the information won't be up to date. There must be an incentive for the consultants."*

This quotation shows that if the consultants do not get anything in return for updating the system will be of no use for the management group either, since the data won't be updated.

A consultant, who works with competence development issues, expressed the notion that competence development should take place within the assignments. She considered it to be the most important way to develop a consultant's competence. This is why the complexity of problems with selling and staffing projects are so important. She concluded that the way to keep competent people within the company is to make sure that they get assignments in the competence areas they want to work with.

A sales manager claimed that the competence development of the consultants was not a responsibility for the sales department though. He thought the group leader should take care of the competence interests of the consultants in his/her group and choose assignments for the consultants in the group according to their interests. This way the group leader could handle situations where the consultant and the group leader had agreed upon what kind of assignments the consultant should have.

When offering a consultant to a customer, the CV function in the KM-system should be used. This could also be a good incentive for the consultants to keep their competence profile, which the CV function in the KM-system is based upon, up to date. Today, another system based on text documents is used.

## 6.5.3    Routines for updating

Routines for the consultants to update their competence profile in the KM-system were required. It was proposed that the updating should take place when an assignment or a course was finished, and when it was time for the annual personal development discussions. A group leader at Guide in Gothenburg illustrates this:

*"Every time any change [of competence] has occurred either in the shape of education, assignments - entered a new one or finished an old one, or taken a course, one should enter the system."*

This quotation shows that the KM-system should to be updated every time a change in competence has occurred.

## 6.5.4       Management responsibility

It was stated in an interview with a consultant at Guide in Oslo that the management group has the greatest responsibility for motivating the consultants to use the KM-system:

*"The management group has the greatest responsibility for motivating use [of the KM-system]."*

It was also suggested that there should be a person responsible for the organisational competence development, i.e. a Chief Knowledge Officer. He/she should hold a position in the management group.

## 6.5.5       System access

Guide have the policy to keep all aspects of the KM-system open to everyone within Guide, and according to a group leader it felt natural to keep it that way, even after an addition like our module had been implemented. Even though the information presented in the module is mainly for use of the people in a management position, the group leader thought that it could be interesting for the individuals to look at the information as well.

Furthermore another group leader did not think keeping secrets from the consultants in the organisation was a good idea. The only restriction should be that a person should not be able to change the profile of another person, but the possibility to watch the other consultants' competence values could help the consultants to set the right competence level.

## 6.5.6       Interest tree structure

The interest module should be structured and weighted in the same way as the competencies, according to the interviewees. The reason for this is to be able to compare the competencies with the competence interests. The exception is that it should be possible to select 'not interested' for specific competence interests. Otherwise everything else should be equal.

## 6.5.7       Weight of the competence levels

When displaying competence charts in the KM-system the competence levels are not equally valued. The idea is that from a competence perspective an expert is higher valued than a beginner, for example. For each competence level a weight factor has been set and determining these factors proved to be rather difficult. One opinion regarding these weight factors was that the weighting should not be linear. A member of the management group at Guide in Oslo exemplifies this:

*"In the beginning you can not even say that they [the consultants] are worth 0.25...I can not sell them to a customer...but then the curve climbs rapidly... It's a fast increase in value and then the increase slows down again".*

Others held other opinions and it became evident that there was a need to test the weighting of competence levels for a longer period of time in order to find the right factors for the organisation. To make the testing easier one should be able to change the factors within the system.

## 6.5.8    Summary of Organisational aspects

The organisational aspects described above regards suggestions that should be considered. These aspects are suggestions that address the problem of data quality in the KM-system. This section presents a summary of those organisational aspects.

The organisational aspects found are:

- *Responsibilities* concerns the need for people responsible for; defining the different competence levels, guaranteeing  that the input in the KM-system is correct, that aggregation of competence is correct, keeping the competence tree up to date

- *Incentive for the consultants* regards that the consultants must have something in return for updating their competence profiles.

- *Routines for updating* regards the need for routines for the consultants to update their competence profile.

- *Management responsibility* concerns that the management has the greatest responsibility for motivating the use of the KM-system.

- *System access* regards that the interviewees thought that all the functions KM-system should be accessible for everyone in the organisation.

- *Interest tree structure* regards that the structure of the competence interest tree and the weighting of the competence interest should be identical to the competence tree.

- *Weight of the competence levels* regards that the weighting of the different competence levels was a rather difficult question. The need for further testing was found.

With this section, regarding organisational aspects, we end the result chapter. In the next chapter (7) we will discuss these results.

# 7 Discussion and conclusion

In the previous study by Lindgren and Wallström (2000) regarding KM-systems for managing competence a number of general problems were identified. We have in this thesis focused on two of the problem areas that were brought up, Knowledge evaluation and Knowledge empowerment. We have addressed these problem areas with a case study where we have evaluated the original KT and the module for visualising competence status and competence development as one system, i.e. a KM-system for visualising competence patterns.

In the previous chapter (6) we presented the results from the case study performed, which included *fields of application* for the KM-system, improvements to be made with the KM-system, i.e. *design implications*, and organisational aspects, described as *assuring data quality*, concerning the use of the KM-system.

## 7.1 Fields of application

The fields of application that the current KM-system can support includes:

- Management towards organisational goals
- Development discussions and group information
- Estimating capacity
- External marketing
- Valuing competence
- Consultants' competence interests as a market indicator.

The fields of application the interviewees wanted the KM-system to support are as follows:

- Staffing assignments
- Work satisfaction
- Comparing organisational competence with market demands
- Mixes of competencies
- Mentorship

This section presented the fields of application that were mentioned during the evaluation. In the next section, we will discuss the design implications regarding these fields of applications.

## 7.2 Design implications

Common to practically every field of application is that they bring forth design implications. Design implications regarding wanted fields of application are required, whilst the design implications concerning supported fields of application are wanted but not required.

A wanted field of application concerned the process of staffing assignments through the KM-system. This requires the availability of the consultants to be implemented in the KM-system. However, it is not enough to only include data regarding when the consultants are not occupied with assignments. It is important that it is possible to exclude consultants who has marked that they are not available for certain assignments, which concerns competence areas that they are not interested in. Otherwise, the consultants would remove competencies that

they do not wish to work with from their profile in the KM-system, i. e. the actual competence would be used in the way that the competence interests should. This would, of course, result in incorrect competence values in the KM-system. It would also be more difficult for other employees to find experts who do not wish to work within a certain area. The latter problem is related to the field of application that we have called *Mentorship*.

*CV functionality* regards the lack of functions concerning modification of the CV layout. The CV is used when offering a consultant to a customer and in this situation it is important that the offered consultant's CV emphasise the competencies the customer wants. The CV functionality in the original KM-system KT doesn't support this feature. It was also thought that it should be possible to send the CV via e-mail. This shows the importance of having certain functionality in the KM-system if it is to be used. The group leaders and sales managers do not use the CV in the KM-system because of the lack of functionality and instead use a MSWord document. The result of this is that the incentive for the consultants to update their CVs in the KM-system does not exist.

*Mix of competencies* concerns the need to monitor the mix of competencies. The organisation might for example have a goal of 25 percent of the employees with competence in project management. The competence charts and tables did not display any relation between the competence value and the number of employees that the organisation has. This could lead to that even though the total value of competence regarding project management has increased, due to recruiting or education for instance, the percentage of the employees that holds competence within project management has decreased in relation to the number of employees in the organisation.

During the interviews we noticed that the interviewees tended to analyse the gap between the value of actual competence and competence interest. This is related to the design implication *Scope limitations regarding interest*, and regards the comparison of the total competence interest and the total competence of different groups. In this scope there could be a possible source of error. An experienced consultant probably has more competencies than competence interests. For example a consultant might have gathered 30 different competencies, she might have only a few competence areas of interest that she would like to emphasise for the moment. If the consultant expressed these competencies and competence interests in the KM-system, it would contribute much to the competence value of the organisation but not much to the competence interest value of the organisation. On an aggregated level consisting of several consultants this would result in a chart showing a huge gap between the actual competence and the competence interest.

On the other hand, if the competence interest would be set to the same value as the competence value by default this problem could be addressed. In that way, any difference between the competence value and the competence interest would be the result of that a consultant has expressed that she, in relation to the competence level she holds, is either more or less interested in developing her competence in the certain competence area. This way, competence interest could be measured in relation to competence.

The design implications mentioned in this section are recommendations that we have based on the results (Chapter 6). However, if the fields of application mentioned above are going to be satisfactory supported, there are a number of aspects that has to be considered. These are presented in the next section *Assuring data quality*.

## 7.3    Assuring data quality

The issue of assuring data quality in this section concerns the organisational aspects presented in section 6.5.

In order to get reliable output from the KM-system, the quality of the data is essential. The consultants do the data input, which implies that without their motivation for using the system, data quality will not be attained. The best way to motivate the consultants to use the KM-system would be to offer them interesting assignments according to their competence and interests profile.

There are different ways for the consultants to develop their competencies. Although much money may be invested in competence development each year, most of the time the consultants are occupied in different assignments. That's why it is preferable from both an educational and an economical view to make it possible for them to develop their competencies through the assignments rather than solely from costly, traditional education.

If the consultant's competence interests are not considered when staffing assignments we think that there is a risk for that the competencies will be regarded as interests, i.e. the consultants will only emphasise the competencies they want to work with. Firstly this would lead to that it would be impossible for other consultants to find these consultants using the KM-system and ask them for their expertise. Secondly it would not give a representative competence value for the organisation. To avoid that consultants remove their competence values regarding undesired competence areas there should be a way to express that they are not interested within that area.

All this means that the KM-system must be used in the staffing process, which in turn require features such as availability. With availability we mean available as not occupied with assignments and available as according to the consultant's competence interest profile.

However, it is not enough to motivate the consultants to update the data in the KM-system on a regular basis. It is of great importance that everyone within the organisation has the same understanding of what the different competence levels means. The problem of getting and maintaining data quality also requires a person responsible for the data in the KM-system. It was also clear that there should be one central function that maintains the competence tree or else searches all over the organisation would not be possible. The competence tree must also continuously be updated with new competencies, as well as outdated competencies have to be removed, in order to reflect the organisational competence in the best possible way. In addition, it is the responsibility of the management to lead the way if the KM-system is to be successfully used.

## 7.4    Future research

In this section we will discuss two areas we consider needs further research. The first area is about the usage of the KM-system for visualising competence patterns and the implications this will bring forth. The second area regards the input of market information into the KM-system.

For the KM-system to work we believe it is essential that the KM-system is used by the people in management, the people who staff assignments and by the consultants who put their competence profiles into the KM-system. For this to happen we believe that each user group needs to get something in return for

using the KM-system. However, this is only an assumption from our part. We do not have more than indications on this, i.e. what the people we have interviewed thought was needed. To be able to define what is really needed to make the KM-system work in an organisation like Guide, research on how the implemented KM-system for visualising competence patterns is used for a longer period of time has to be conducted.

How the weighting of the four competence levels should be set is another thing we believe should be evaluated after the KM-system has been used. The answers we received from the interviewees regarding the weighting was of different character and we believe that it is not possible to receive a clear understanding of this before the KM-system has been used for a period of time.

Another field that needs further research is how the market should be represented in the KM-system. During our interviews almost every interviewee wished for the possibility to view the competencies that the market demanded in relation to the competencies that the organisation hold. We have been given suggestions on indicators that could represent what the market demands. However, we believe that this area has to be further investigated in order to find out how this should be done.

## 7.5    Summary

In this section, we present the conclusions of our work. The conclusions are structured after the three research questions.

- By visualising competence patterns it is possible to take actions regarding competencies. Possible fields of application included; management towards organisational goals, estimating capacity, external marketing, valuing competence and consultants' competence interests as a market indicator. Fields of application that the KM-system could support with technical improvements included; staffing assignments, evaluating the work satisfaction of the employees and monitoring the wanted mixes of competencies.

- A number of design implications regarding the KM-system was found; improved CV functionality, presentation of the competence value in relation to the number of employees and show availability of the consultants. Availability in this case means to be both available in time as well as that the employee wants to work with the assignment. The last point, regarding the availability, is important as it is related to the question of data quality presented below.

- Assure data quality by; staffing assignments according to the consultants' competence and competence interest profiles in the KM-system, develop routines for updating and have a person responsible for the correctness of the consultants' competence values. To establish clear definitions of what the competence levels require and to have a central function for maintaining the competence structure is also important to assure data quality.

The conclusions presented above are the result of our case study at Guide. Since the research method we used was qualitative, it is not possible to generalise the results. However, we argue that KIO:s similar to Guide, which have a need to evaluate and manage the competence development, could have use for a KM-system like the one we evaluated in this thesis, i.e. a KM-system for visualising competence patterns.

# 8    References

Agar, M., MacDonald, J. (1995), *Focus Groups and Etnography*, Human Organizaton, Vol 54, No. 1.

Allee, V. (1997), *The Knowledge Evolution*, Butterworth-Heinemann, USA.

Alvesson, M. (1993), *Organizations as rhetoric: Knowledge-Intensive firms and the struggle with ambiguity*. Journal of Management Studies: 30:6 November.

Backman, J. (1985), *Att skriva och läsa vetenskapliga rapporter*, Studentlitteratur, Lund, Sweden.

Blackler, F. (1995), *Knowledge, Knowledge Work and Organizations: an overview and interpretation*, Organization studies, vol. 16.

Blackler, F., Reed. M., Whitaker. A. (1993), *Editorial introduction: Knowledge workers and contemporary organisations*. Journal of Management Studies: 30:6 November.

Dahlbom, B. (1997), *Välkommen till pratsamhället*, Tidsskrift för dokumentation, vol 52, no 1-2.

Davenport, T.O. (1999), *Human Capital*, Management Review, Vol. 88, No. 11.

Drucker, P. F. (1988), *The Coming of the New Organization*, Harvard Business Review, Jan/Feb, Boston.

Drucker, P. F. (1999), *Knowledge-worker productivity: The biggest challenge*. California Management Review, Winter; Berkley.

Drucker, P. F. (2000), *Knowledge work*, Executive Excellence, Vol. 17, No. 4.

Edvinsson, L., Malone, M. S. (1997), *Intellectual Capital*, Harper Business, New York.

Easterby-Smith, M., Thorpe, R., Lowe, A. (1991), *Management Research - An Introduction*. Sage Publications. London. Great Britain.

Frappaolo, C., Capshaw, S., (1999), *Knowledge management software: Capturing the essence of know-how and innovation*, Information Management Journal, Prairie Village.

Hansen, M., Nohria, N., Tierney, T. (1999), *What's your strategy for managing knowledge?*, Harward Business Review, March-April.

Kaplan, R. S, Norton, D. P. (1996), *The balanced scorecard is more than just a new measurement system*, Harvard Business Review, May-Jun.

Kidd, A. (1994), *The Marks are on the Knowledge Worker*, Published at CHI '94.

Leonard, D., Sensiper, S. (1998), *The Role of Tacit Knowledge in Group Innovation*, California Management Review, Vol. 40, No. 3.

Lindgren, R., Wallström, C. (2000), *Features Missing in Action: Knowledge Management Systems in Practice*. Accepted for ECIS-8, Vienna, Austria.

McDermott, R. (1999), *Why Information Technology Inspired But Cannot Deliver Knowledge Management*, California Management Review, Vol. 41, No. 4.

Nonaka, I. (1994), *A Dynamic Theory of Organizational Knowledge Creation*, Organization Science, Vol. 5, No. 1.

Nordhaug, O. (1998), *Competence specificities in organisations*, International Studies of Management & Organization, Vol. 28, No. 1.

Patton, M. Q. (1990), *Qualitative evaluation and research methods*. Second edition. Sage Publications. USA.

Polanyi, M. (1966), *The Tacit Dimension*, Routledge & Kegan Paul, London.

Sadler A. (1999), *Why pay to train when you really need competence*, Boston Business Journal, 9/13.

Salvary, M. (1999), *Knowledge management and competition in the consulting industry*, California management review, vol 41, no 2.

Starbuck, W. H. (1992), *Learning by Knowledge-Intensive firms*. Journal of Management Studies: 29:6 November.

Stewart, T. A. (1997), *Brain power: Who owns it…How they profit from it*, Fortune. New York. March.

Stolterman, E. (1991), *Designarbetets dolda rationalitet*, Solfjädern Offset AB, Umeå.

Sveiby, K., Lloyd, T. (1987), *Managing knowhow: add value - by valuing creativity*, London Bloomsbury.

Sveiby, K. (1992), *The knowhow company: Strategy formulation in knowledge-intensive industries*, International Review of Strategic Management; Chichester.

Swan, J., Newell, S., Robertson, M. (2000), *Limits of IT-driven Approaches: Towards a Community-Based Model of Knowledge Management for Innovation*, Proceedings of HICSS-33.

Swan, J.A., Scarbrough, H. (1999), *Knowledge Management: the next fad to forget people?*, Proceeding of 7th European Conference on Information Systems, Copenhagen Business School, Copenhagen.

Taylor, D.S. (1988), *The meaning and use of the term 'competence' in linguistics and applied linguistics*, Applied Linguistics 9.

Venzin M., et al. (1997), *Future research into knowledge management"* In von Krogh, G., et al. (1998) *Knowing in firms; Understanding, managing and measuring knowledge*, Sage Publications, London.

Wiedersheim-Paul, F., Eriksson, L. T. (1991), *Att utreda, forska och rapportera*. Almqvist & Wiksell. Malmö. Sweden.

Zack, M. (1999), *Developing a knowledge strategy*, California management review, vol. 41, no 3.

# 9    Appendix

## A.    Design interview questionnaire

### 1. Bakgrund – varför vi gör denna studie

Det har påvisats en brist i KM-system (inkl. KT) vad det gäller att visa hur kompetensutvecklingen inom företaget sker. Vissa personer i ledningsbefattning har efterfrågat stöd för att se hur utvecklingen sker för att kunna fatta strategiska beslut ang. framtida inriktning och uppdrag.

Vi är intresserade av att påvisa utveckling för olika kompetensområden för att få en mer översiktlig bild av vart Guide är på väg kompetensmässigt.

1.1     Vad kan vi idag?
1.2     Vad är konsulternas önskemål?

### 2. Informationsbas

2.1     Varför har ni Kompetenstorget?
2.2     Vilken information i Kompetenstorget tycker du är viktig och varför?
2.3     Hur bestämmer ni vilka områden som ni skall satsa på?

### 3. Evaluation och Empowerment

3.1     Hur vet du hur företagets konsulter utvecklas?
3.2     Hur vet du vad företagets konsulter är intresserade av?
3.3     Vet du om konsulterna utvecklas inom de områden de är intresserade av?
3.4     Är det intressant att veta detta?

### 4. Visualisering

4.1     Hur skulle du vilja få detta visat för dig?
4.2     Hur skall det visualiseras för dig? Visa bilder!!!!
4.3     Vilka olika dimensioner är du intresserad av att se?
         - experter, nybörjare, grupper, geografiska områden, kompetensområden

### 5. Användning

.1      Vad skulle du kunna tänka dig att använda det till?

# B.  Evaluation interview questionnaire

## 1. Kan systemet stödja ledningen och i så fall på vilka sätt ?

1.1 Vad skall systemet användas till?

- Utvecklingssamtal: skulle det vara möjligt att diskutera runt konsultens kompetenser och sätta upp mål för framtida kompetensmål utifrån konsultens kompetensbild.

- Säljmöten: Kan man använda kompetensstatus och kompetensutveckling samt motsvarande för kompetensintresse när det gäller hur man kan sälja uppdrag till kunder.

- Cellplanering: Kan det vara användbart att kunna flytta folk till en lista och med denna lista kolla av en framtida cells kompetensbild.

- Inriktningsplanering: Kan kompetens och kompetensintresse-kurvorna användas för att planera framtida kompetenssatsningar.

- Bokslut: Skulle man kunna använda denna typ av information i årsredovisningar och på så vis redovisa kompetensstatus och utveckling för aktieägare.

- Utgångspunkt mot marknaden: Kan man använda informationen som diskussion om vad marknaden förväntas önska i framtiden

## 2. Vilken information är väsentlig för ledningen?

2.1 Vilken information är viktig för ledningen när det gäller att styra kunskap/kompetens?

2.2 Finns det annan information än den uppvisade som borde varit med?

2.3 Är någon av den uppvisade informationen överflödig?

## 3. Hur bör KM-systemet vara utformat?

3.1 Går det att tolka ett resultat ur bilderna?

3.2 Finns det risk att bilderna kan bli missvisande – kan man förstå skillnad mellan kompetens och intresse i den kombinerade bilden?

3.3 Anser Du att man får en god överblick av Guides kompetensstatus med hjälp av stapeldiagrammen?

3.4 Skall intresset grundas på hela organisationen eller endast för de som har kompetens inom området eller skall båda varianterna vara möjliga?

3.5 Tror du att en konsult har lika många kompetensintressen som kompetenser?

3.6 Skall intressena jämföras med kompetenserna och i så fall hur?

**Viktning**

3.7 Skall det vara olika viktning mellan intresse och kompetens?

3.8 Skulle du vilja vikta annorlunda?

3.9 Vad anser du Guide är bäst på? ( stämmer detta med tio-i-topp?)

## 4. Bakomliggande system (KT) och dess data

4.1 Tror ni på användandet av KT?

4.2 Vad krävs för att KT skall användas?

4.3 Hur skall man främja användandet av KT:
Projektavslut-avprogrammering?
I samband med utvecklingssamtal?
I samband med bemanning, förutsatt att 'ledig från' finns med?
Gör om hela KT?

4.4 Hur ofta bör " snapshots" tas?

4.5 Finns rätt kategorier i kompetensträdet?

4.6 Hur skall trädet hållas uppdaterat?

4.7 I det ursprungliga KT blir man expert inom ett huvudområde genom att endast vara expert på något längst ned i en gren. I vår prototyp är detta borttaget, vi visar alltså endast upp de kompetenser där det uttryckligen är markerat. Frågan är hur skall detta vara- skall man markera allt eller skall det förekomma någon typ av aggregering?

4.8 Om en person inte arbetat inom en viss kompetens på ett tag, skall kompetensvärdet i KT minskas då?

## 5. Befogenhet och begränsning

5.1 Ska systemet vara öppet för alla? (vår prototyp?!)

5.2 Får man ändra sin egen profil med avseende på kompetenserna?(gamla KT?!) itén på kompetenserna?(gamla KT?!)

# C. Article for conference proceeding

# Knowledge Management System for Visualizing Competence Patterns

Jesper Andersson, Peter Krickner, Rikard Lindgren, Roger Norrlén, Kalevi Pessi
{jesper, krickner, rikard, roger, pessi}
@viktoria.informatik.gu.se
The Viktoria Institute
Göteborg
Sweden

## Abstract

*This paper presents the results from a multiple-case study at the Swedish IT-consultant Guide, including empirical findings and a developed KM-system for visualizing competence patterns. The reason for this is to improve the design of KM-systems for managing competence, and thereby increase the existing body of research within the fields of IS and CSCW.*

**Keywords**: knowledge management system, competence, competence patterns

## Introduction

In recent years, knowledge management systems (KM-systems) have gained more and more attention within the IS- and CSCW communities (Ruggles, 1997; Ackerman & McDonald, 1996).

There are a number of perspectives on KM-systems, and different typologies concerning such systems have been developed (Ruggles, 1997; Wiig et al, 1997; O´Dell & Grayson, 1998; Hansen et al, 1999). Despite extensive debates regarding the nature of knowledge "as situated, distributed, provisional, pragmatic and mediated by artifacts" (Gherardi, 1999:118), there appears to be a persistent tendency to treat knowledge as a discrete, stable and unambiguous entity. However, the controversial idea regarding codified and disembodied knowledge stored into passive repositories has been criticized (Bannon & Kuutti, 1996; Swan et al, 1999). Accordingly, different types of KM-systems have been developed within the research fields of IS and CSCW (e.g. Milton et al, 1999; McDonald & Ackerman, 1998).

In Lindgren & Wallström (2000) a multiple-case of KM-systems for managing competence is presented; KM-systems that a considerable part of the IS- and CSCW research until now has ignored. These KM-systems are 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. Lindgren & Wallström (2000) highlight general problem areas concerning the investigated KM-systems, and point out the need for additional research in order to develop and improve the design of such systems.

In this paper we focus on two of the problem areas presented by Lindgren & Wallström (2000); knowledge evolution and knowledge empowerment.

Knowledge evolution concerns the lack of functions, in the KM-systems, that handle information concerning the change of employees' knowledge and interest profiles over time. Knowledge empowerment is about the absence of functions, in the KM-systems, which support the identification of employees' aims and directions regarding competence development. We address these problem areas by reporting the results from a multiple-case study at the Swedish IT-consultant Guide, including empirical findings and a developed KM-system for visualizing competence patterns. The reason for this is to improve the design of KM-systems for managing competence, and thereby increase the existing body of research within the fields of IS and CSCW.

This paper is structured as follows: Section two outlines the related work. The following section presents the research method. Section four introduces the research sites; Guide's offices in Göteborg, Oslo and Stockholm. The next section describes Guide's KM-system Kompetenstorget (KT). Section six presents empirical findings highlighting functions missing in KT, and design implications towards a KM-system for visualizing competence patterns. After that the developed KM-system is described. Section eight contains a discussion and future research.

# Related work

The IS-research concerning 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 (Cole-Gomolski, 1997).

Organizational memory (OM) and KM have much in common, and several OM-systems have been described in the CSCW-literature. The aim of gIBIS (Conklin & Begeman, 1988) is to make decision processes explicit by capturing the argumentation. Another OM-system is Teambuilder (Karduck, 1994), which objective is to support team members to identify expertise and through that collaborate more effectively. The purpose of Answer Garden (Ackerman, 1994) is to support organizations and their employees to capture and enable retrieval of experiences. In Answer Garden 2 functions for finding and interacting directly with experts were added (Ackerman & McDonald, 1996).

# Research method

This research was undertaken through a multiple-case study (Yin, 1988; Yin, 1993) during the autumn of 1999. The multiple-case study include twelve semi-structured interviews with people in the following organizational roles; consultant managers, project managers, sales managers and CEOs. The empirical material was transcribed and analyzed according to the principles of grounded theory (Glaser & Strauss, 1967). Finally, our developed KM-system for visualizing competence patterns is a result of cooperation and active participation within Guide's KM-projects.

# Research sites

Guide is a Swedish IT-consultant organization consisting of three main business areas; Guide IT-consulting, Guide Infrastructure and Communication and Guide Management. Guide has approx. 750 employees at six offices located in three countries. The turn over in 1998 was approx. 600 million SEK. Totally twelve interviews have been conducted at Guide; six at the office in Göteborg where the

number of employees is 250, six at the office in Oslo that has approx. 50 employees, and six at the office in Stockholm that consists of approx. 350 employees.

# The KM-system Kompetenstorget

The KM-system Kompetenstorget (KT) is developed at Guide in Oslo, Norway. KT is a database containing competence areas and competence levels concerning the consultants' competencies. The database is a SQL server and the information is presented through ASP on an IIS server. ASP generates the HTML-pages, which are viewable in a web browser.
Guide's idea regarding KT is to have a KM-system for:

- Mapping the consultants' competencies.
- Categorization and visualization of the competencies within the organization.
- Forming teams of consultants.
- Finding expertise for their external projects.
- Marketing of the consultants' competencies internally.

In Oslo KT is up and running, in Stockholm an implementation project is coming up and in Göteborg a first pilot has been initiated.
In the following sections we present platform and organizational issues, and technical features concerning KT. The data are derived from our empirical findings.

## Platform and organizational issues

Below we present the fundamental concepts regarding KT's design, and how this KM-system is implemented within Guide's organization.

### Platform

KT is a KM-system with no subsystems. The application is http compatible, and is accessible internally on the Guide intranet. Further, there have been discussions about making KT accessible externally.

### Knowledge formalization

KT is developed with the consultants' competencies as a basis. There are no predefined roles in KT such as project manager, sales manager, HR manager etc. In KT a competence is a specific skill, e.g. C++, Java, Pascal etc.

### Competence tree

The top level consists of four different groups and each of these has sub levels, which is constituted of the competencies, e.g. technology, tools and systems - programming- and script languages - C/ C++, Pascal, Java etc (see figure 1).

### Competence grading

KT's competence tree consists of four levels concerning competence grading; *Beginner*, a person who has some theoretical background in the competence area, and has an interest of the area in question. *Some knowledge*, a person who has experience from at least one project, and also has some theoretical background in the subject. Experienced, a person who has participated in several projects within a certain competence area, and is able to teach others in the

subject. Expert, a person who has a great deal of experience in the competence area, and has the ability to teach others on a higher level (see figure 1).
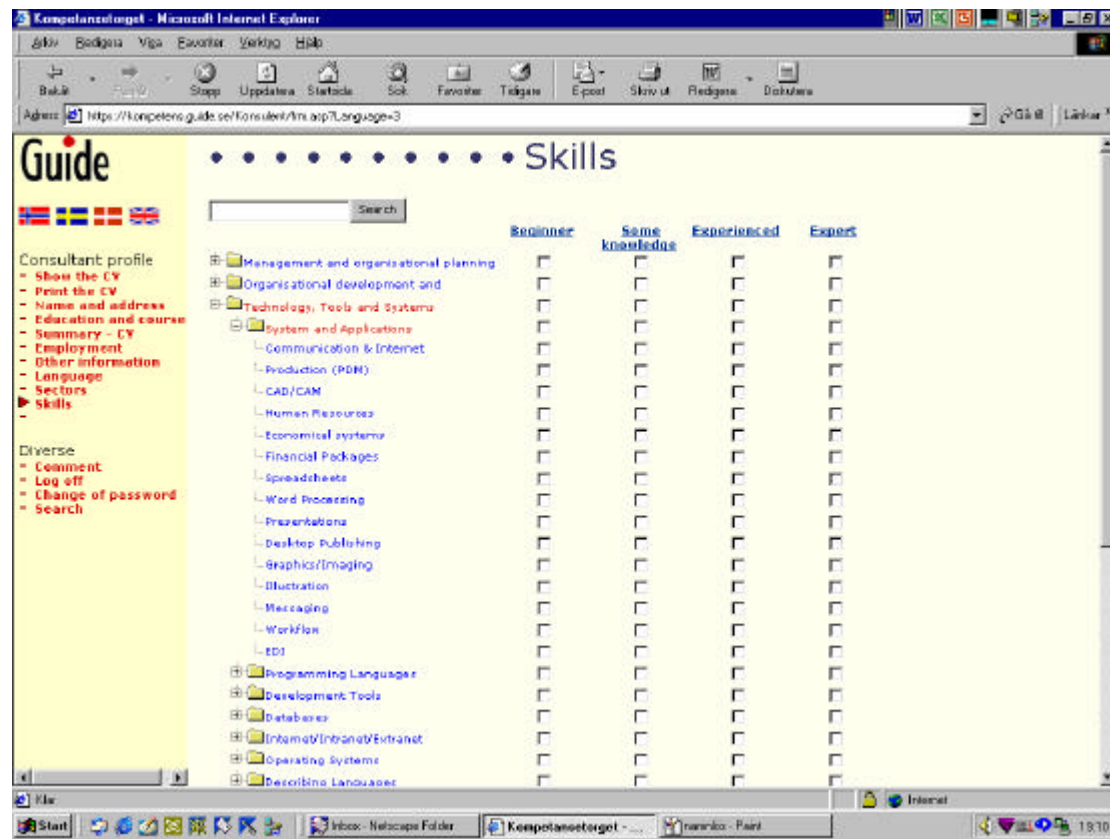


*Figure 1: KT's competence tree and competence grading.*

**Implementation strategy**

KT is implemented through a top-down strategy, which means that the management defines which competencies that should constitute KT.

**Data input**

The consultants are responsible for the input of their competence data.

**Organizational structure**

Guide's organizational structure is flat. This is reflected in KT where everyone can see everybody, i.e. the management is able to see their subordinates' competence profiles and vice versa.

# Technical features

Here we present technical features of KT, i.e. how the KM-system can be used. The presented features are the most important, i.e. there are other features in KT, but they do not contribute to the content of this paper.

**Search**

In KT it is possible to search for a specific competence or expertise in five different ways; *Search for person*, by using this search it is possible to receive information regarding how to get in touch with a certain consultant. *Search in free text*, search for a defined phrase in the consultants' CV´s. *Simple search*,

search for a consultant that has accomplished assignments in a certain branch of industry, has competence within at least one of the four competence areas in KT, or has been involved in projects with a particular customer or in a certain kind of project. *Advanced search*, search in the three major areas; branch of industry, language and skills (see figure 2). Within each area it is possible to search for a certain competence or a specific mix of competencies. It is also possible to search for a particular competence on a certain competence level.
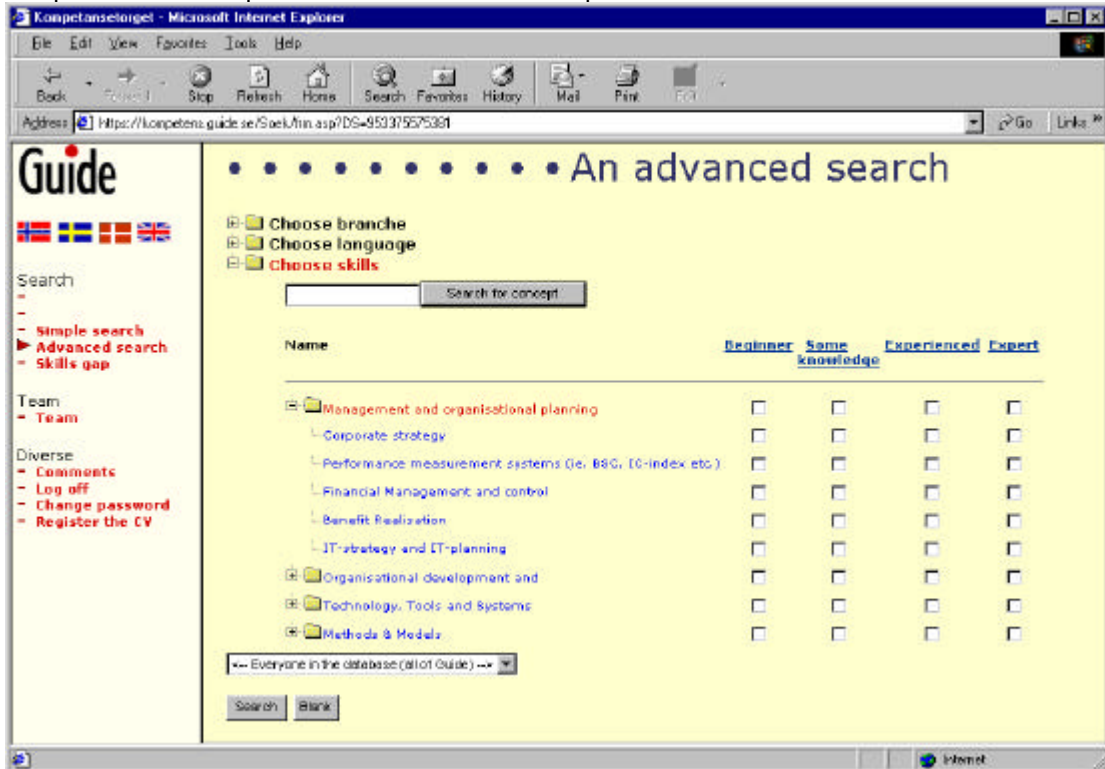


*Figure 2: KT's advanced search.*

Finally, in all these, above mentioned, search alternatives it is possible to choose which subsidiary within Guide to search in.

**Competence gap**

This type of search is used for investigating the number of consultants that hold a certain competence. Furthermore, through this search it is possible to monitor competence gaps, i.e. the difference between existing and wanted competencies.

**Free text**

In KT it is possible for the consultants to enter comments and additional information into their CV's.

**Individual plan**

It is possible for consultants to express their interests concerning competence areas as well as competence levels. However, this is merely possible in free text, and the individual plan is not supported by the tree structure in KT.

**Multilingual**

KT exists in four different versions supporting the following languages; danish, english, norwegian and swedish.

**CV-pages**

It is possible to compose a CV-page from the KT's database.

**Grouping**

Within Guide's organization there are subsidiaries, which are predefined in KT and searchable. An additional possibility is to group the consultants in 'lists', which makes it feasible to enter wanted consultants irrespectively of which subsidiary they belong to. However, it is not possible to use lists when searching.
Above we have presented platform and organizational issues, and technical features concerning KT. The remainder of this paper concerns the development and improvement of KT; towards a KM-system for visualizing competence patterns.

# Towards a KM-system for visualizing competence patterns

The following two sections present; empirical findings regarding desired or missing functions in KT, and design implications concerning a KM-system for visualizing competence patterns.

## Empirical findings

Below we present desired or missing features in KT. In order to illustrate these desired or missing features in KT, we use quotations from the empirical findings.

▪ One Project Manager at Guide in Oslo expressed the following:

*"It is not sufficient to know the employees´ competencies... actually, you must be able to manage those competencies in a strategic way, but it [the KM-system] does not contain a complete package. Our intention is to categorize the activity with regard to strategic goals and critical competencies. At present, we merely manage competencies on an individual level. However, our ambition is to manage competencies on a departmental level... and then we need it [the KM-system] as a management tool for the activity."*

▪ A Sales Manager at Guide in Stockholm articulated this:

*"As the way I see it... as we wish to use it [the KM-system]... first of all, these are the business areas we will concentrate on. Then you come to the conclusion that within this business area these particular competencies are demanded and so on... then we should use the system in order to make an inventory of the consultants. Identify the status of our competencies in comparison with our business areas and vice versa... with such information as a starting point we are able to handle future recruiting and competence development in a more professional way."*

▪ The CEO for Guide in Oslo stated:

*"On a CV we have tried to store categories of competencies [in the KM-system], which correspond to the competencies we wish to build up... and the competencies we have to have now and in the future within our organization... information concerning which those should be is missing."*

- Guide's CEO in Stockholm expressed this:

  *"It is possible to do gap analyses by using the system... however, these gap analyses only deal with existing competencies... in a way a historical description concerning the organization's competence status. What is needed are functions [in the KM-system] that can present pictures regarding what competencies the employees wish to develop in the future."*

- The CEO for Guide in Stockholm articulated the following:

  *"What is the market's direction... what are our competencies in those business areas. Our track record concerning related projects... present status of our employees' competencies. Furthermore, references to employees' aims and directions would be great to have [in the KM-system]."*

- Guide's CEO in Stockholm stated:

  *"The system should also handle interests, aims and ambitions concerning competencies... otherwise you will only see competencies that employees' have today... the existing competencies that they have documented. A complementary approach is to identify interests, aims and ambitions of the employees."*

With these empirical findings as a starting point, the next section outlines design implications.

## Design implications

The following design implications are critical for the development of a KM-system for visualizing competence patterns; (1), Functions that in a clear way present information regarding the competence status of different groups. (2), Functions that generate competence patterns concerning the development of existing competencies. (3), Functions that present competence patterns regarding the competencies that the organization's employees wish to build up, i.e. interests, aims and ambitions regarding the development of competencies.

# KM-system for visualizing competence patterns

With the design implications, presented in the previous section, as a starting point, our objective is to develop a KM-system that:

- Makes it possible to survey competence status of different consultant groups at a specific moment.
- Handles information concerning consultants' existing competencies and competence interests.
- Enables the user to view both snapshots at a particular point of time and development over a certain period regarding existing competencies as well as competence interests.

In the following sections we present the developed KM-system, which is based on the system structure and data of the original version of KT. However, since the original version of KT does not handle data concerning competence interests, we have simulated data for this purpose.

# Technical data

This KM-system for visualizing competence patterns is, like the original version of KT, based on ASP-scripts, an IIS server and a SQL server. ASP generates the HTML-pages, and these are viewable through a web browser.

# The server

On a regular basis, the server creates copies of Guide's competence table that contains information regarding competence areas and competence levels of every single consultant within the organization. With these copies, related to the original version of KT, as a starting point the KM-system is able to generate competence patterns concerning existing competencies of specific groups, i.e. cells of consultants or the whole organization. Competence patterns regarding the simulated competence interests are handled by the competence interest module, which is based on the same competence tree and competence grading as the original version of KT (see figure 3).



*Figure 3: Data input regarding competence interests.*

These competence patterns, mentioned above, can be constituted of either KT's competence grading or an aggregated competence value. A competence value is calculated on a weighting of KT's competence grading. The weighting of the competence grading is developed in cooperation with Guide's management, and is presented below:

- Beginner is valued 0,25.
- Some knowledge is valued 0,5.
- Experienced is valued 1,0.
- Expert is valued 1,25.

This weighting is based on the assumption that an experienced Guide consultant is able to do independent work, and handle project assignments without the need for assistance. A consultant with some knowledge has basic competencies within the area, but needs support in order to complete assignments.

# User interface

Here we present the user interface of the developed KM-system for visualizing competence patterns (see figure 4).

*Figure 4: The user interface of the KM-system.*

The following sections describe the KM-system's user interface.

**Choose chart type**

Regarding existing competencies as well as competence interests the user has the possibility to choose between two different chart types; snapshot of competence status at a particular point of time or development over a certain period.

**Choose scope**

The user can choose between the following scopes; the whole organization, a subsidiary or a user created list.

**Choose competence area**

The user has the possibility to choose between the four competence areas represented in the competence tree.

# Output

The output is displayed in either a chart of vertical bars representing a snapshot of the competence status at a certain point of time (see figure 5) or a linear chart regarding development (see figure 6). The developed KM-system is limited to handling competence patterns regarding different kinds of groups, and does not provide information about development of specific a consultant. The competence patterns can be based on existing competencies as well as competence interests.
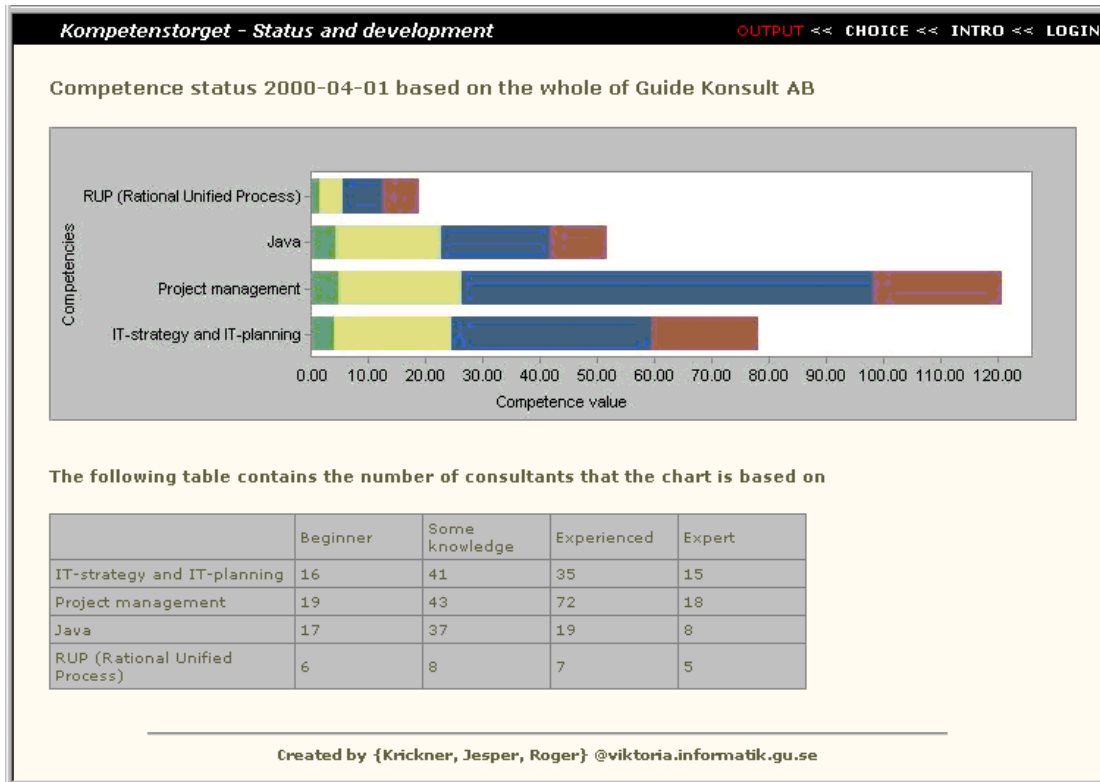


*Figure 5: Snapshot of competence status at a certain point of time.*

Each vertical bar can be constituted of up to four parts, which represent the different competence levels; beginner, some knowledge, experienced and expert. If there are no consultants within a particular competence level, for instance experts, the vertical bars will be presented with three parts and so on. Below the chart, a table is presented containing the number of consultants that the vertical bars are based on.
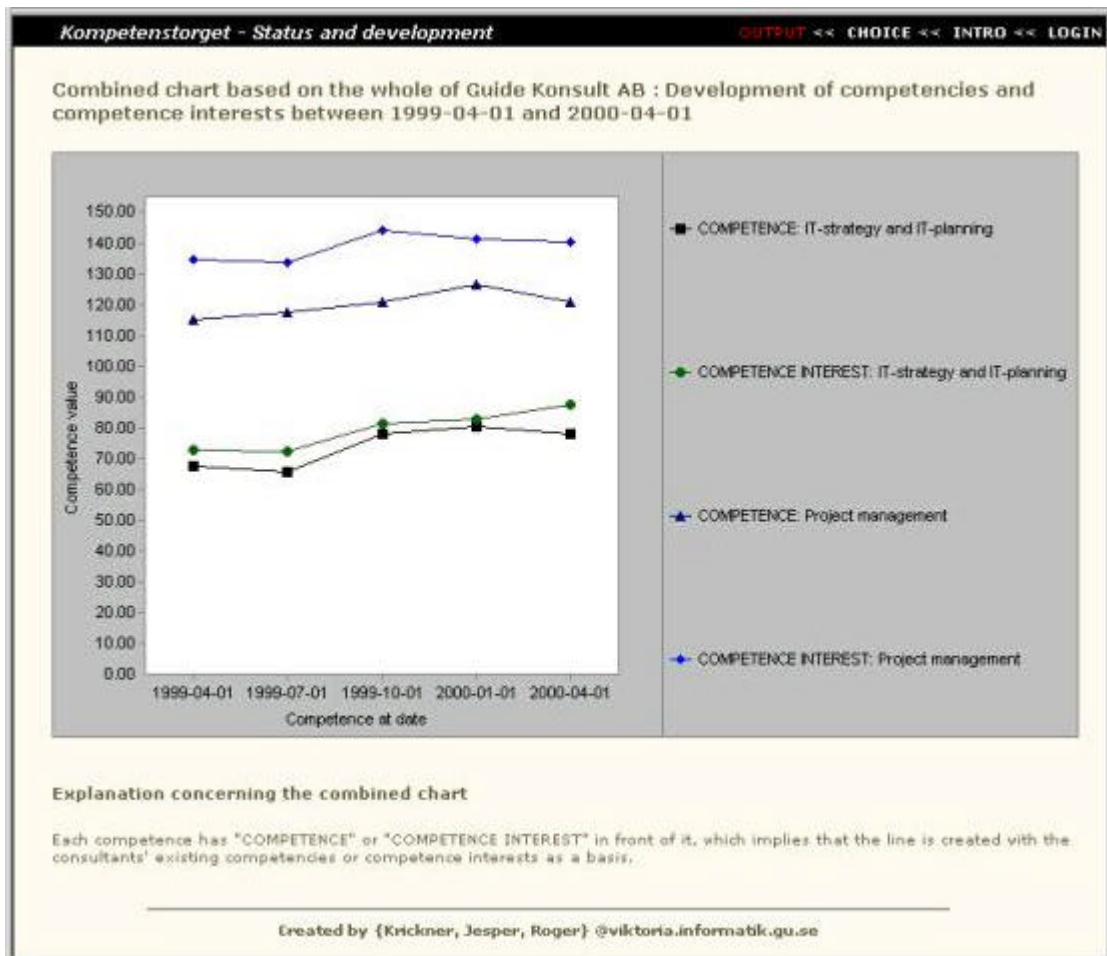
*Figure 6: Combined chart based on the whole of Guide Konsult AB.*

This combined linear chart is based on existing competencies and competence interests. The lines are representing the existing competence or competence interests in a specific competence area. Each dot on the lines represents the aggregated competence value at a specific moment.

With the above presented KM-system for visualizing competence patterns as a point of departure, the next section discusses the developed KM-system and outlines the future research.

# Discussion and future research

Management of organizations in the industrial era, was based on the assumption that it is possible to figure out everything ahead of time, divide the work-tasks up among various functions, and then monitor and control what is done so it meets the expected outcome. This industrial-era command and control thinking is, however, not adequate when managing knowledge resources. In the modern business new management approaches are needed, which focus on human capabilities, competencies and knowledge (Drucker, 1988).

Furthermore, when organizing people and their knowledge and competence, management has to go beyond fundamental industrial concepts like "satisfaction", "needs" and "wants", and instead concentrate more on people's "aspirations" and "interests" (Savage, 1996).

The empirical findings, derived from our multiple-case study at Guide, are in line with Savage (1996), and indicate at the same time the need for KM-systems that handle employees' interests, aims and ambitions concerning competencies. Our

KM-system for visualizing competence patterns has functions for the handling of information regarding employees' competence interests. In order to improve and develop our KM-system further, we are going to evaluate the KM-system together with our industrial partner Guide. The evaluation will be conducted during the spring of 2000 at Guide's offices in Göteborg, Oslo and Stockholm. Our plan is to evaluate the following; (1), In what way can the KM-system support Guide's management? (2), How should the KM-system be designed? Finally, we are also planning to conduct field experiments with consultants in order to receive additional information concerning the KM-system's design.

# Acknowledgement

# References

A. Karduck. TeamBuilder - A CSCW Tool for Augmenting Expertise and Team Formation, in Computer Communications, Butterworth-Heinnemann Publ., 17(11), Nov 1994, pp. 777-787, 1994.

B. Cole-Gomolski. Users Loathe to Share Their Know-How, Computerworld, 31(46), 6, 1997.

B. Glaser and A. Strauss. The Discovery of Grounded Theory, Chicago: Aldine, 1967.

C.M. Savage. 5$^{th}$ Generation Management, Butterworth-Heiniemann, 1996.

D.W. McDonald and M.S Ackerman. Just Talk to me: a field study of expertise location. In Proceedings of ACM 1998 Conference on Computer Supported Cooperative Work. pp. 39-48. Seattle, WA: ACM Press, 1998.

J. Conklin and M.L. Begeman. gIBIS: a hypertext tool for exploratory policy discussion. In Proceedings of ACM 1988 Conference on Computer Supported Cooperative Work, pp. 140-152, Portland, OR: ACM Press, 1988.

J. Swan, H. Scarbrough and J. Preston. Knowledge Management - The Next Fad To Forget People? In Proceedings of the 7th European Conference on Information Systems - ECIS 99, pp. 668-678, 1999.

K.M. Wiig, R. De Hoog and R. Van Der Spek. Supporting Knowledge Management: A Selection of Methods and Techniques. Expert Systems With Applications, 13, pp. 15-27, 1997.

L. J. Bannon and K. Kuutti. Shifting Perspectives on Organizational Memory: From Storage to Active Remembering, Proceedings of the 29th Hawaii Conference on System Sciences (HICSS-29.), Vol. IV, pp. 156-167, IEEE Computer Society Press, Los Alamitos, 1996.

M.S. Ackerman. Augmenting the organizational memory: a field study of answer garden. In Proceedings of ACM 1994 Conference on Computer Supported Cooperative Work, pp. 243-252, Chapell Hill, NC: ACM Press, 1994.

M.S. Ackerman & D. McDonald. Answer Garden 2: Merging organizational memory with collaborative help. In Proceedings of ACM 1996 Conference on Computer Supported Cooperative Work. pp. 97-105, New York, ACM: Press, 1996.

M.T. Hansen, N. Nohira and T. Tierney. What's the strategy for managing knowledge, Harvard

Business Review, pp. 106-116, 1999.

N. Milton, N. Shadbolt, H. Cottam and M. Hammersley. Towards a knowledge technology for knowledge management. Int. J. Human-Computer Studies 51: 615-641, 1999.

O'Dell & Grayson. If Only We Knew What We Know: The Transfer of Internal Knowledge and Best Practice, New York: The Free Press, 1998.

P.F. Drucker. The Coming of the New Organization. Harward Business Review, pp. 45-53, 1988.

R. Lindgren and C. Wallström. Features Missing in Action: Knowledge Management Systems in Practice. Accepted for the 8th European Conference on Information Systems, Vienna, Austria, 2000.

R. Yin, Case study research: Design and methods (Rev. ed.), Beverly Hills, CA: Sage Publishing, 1988.

R. Yin. Applications of case study research, Beverly Hills, CA: Sage Publishing, 1993.

R.L. Ruggles. Knowledge Management Tools, Butterworth-Heiniemann, 1997.

S. Gherardi. Learning as Problem-driven or Learning in the Face of Mystery? Organization Studies 20(1): 101-124, 1999.

# D.    Terms and Abbreviations

In this appendix we explain what the terms and abbreviations used in this thesis means.

ASP:            Active Server Pages
CEO:            Chief Executive Officer
CV:             Curriculum vitae, the resume of your life
HTML:           Hyper Text Markup Language
IC:             Intellectual Capital
IIS:            Internet Information Server
IS:             Information Systems
KIO:            Knowledge Intensive Organisations
KM:             Knowledge Management
KM-system:      Knowledge Management System
KT:             Kompetenstorget
MS Excel:       Spreadsheet from Microsoft
MS Word:        Word processor from Microsoft
SQL:            Standard Query Language