

THE EVOLUTION OF KNOWLEDGE MANAGEMENT SYSTEMS NEEDS TO BE MANAGED

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ABSTRACT

Today many organizations are reliant on the knowledge and competence of individual organizational members. Information systems to support knowledge management (KM) are therefore considered to be vital tools in order to achieve competitive advantage. In this paper, we report the results from a field research study of such systems in a knowledge-intensive, fast-growing and dynamic organization. The case illustrates that evolution, which refers to the process by which organizations and their information systems change over time, needs to be managed since it can result in KM-systems failures. We characterize the mainstream KM research literature in relation to managing the risk of KM-systems failures, and outline that management of KM-systems' evolution is a dimension that has not been addressed so far. With these empirical and theoretical results as a basis, we argue that more attention must be given to managing the evolution of KM-systems.

1. INTRODUCTION

Large investments are being made in information systems to support KM, and these are expected to improve business performance and competitive advantage [Wiig, 1997; Milton et al, 1999]. However, there is a risk that the investments do not lead to the expected benefits. Recent contributions to the KM research show that KM-systems often fail [Fahey and Prusak, 1998; Newell et al, 1999; Lindgren and Wallström, 2000; Storey and Barnett, 2000], and it is apparent that KM-systems suffer from development and implementation difficulties that have previously been discussed in the broader literature on information systems failures [e.g. Lyytinen and Hirschheim, 1987; Lyytinen and Robey, 1999]. Given the risk that KM-systems fail to deliver the expected benefits, an important task for the KM research is to contribute with knowledge that will support researchers and practioneers in their efforts to successfully develop and implement KM-systems.

In the broader literature on information systems failures, evolution, although often discussed in different terms such as adaptation and drift, has been identified as an important dimension that can result in failures [see e.g. Ciborra, 1996, 2000; Orlikowski, 1992, 1996; Henfridsson, 1999]. In this paper, evolution refers to the process by which organizations and their information systems change over time. Since the world changes, business changes, strategy changes and context changes, the information systems need to adapt to such changes in order to deliver benefits [Parker, 1996]. Further, changes in information systems also affect other systems and the organization. Therefore, changes are often interrelated and affect their surroundings in sometimes unpredictable ways. The change process is continuous, multi-dimensional and difficult to manage. An implication of this perspective is that information systems cannot be viewed as stand-alone systems, but as interrelated systems that need continuous management rather than one-time planning [e.g. Hanseth and Monteiro, 1997; Magoulas and Pessi, 1998].

In this particular study, we are interested in what support the KM research has provided so far for the management of KM-systems' evolution, and what additional support the KM research needs to provide. We first characterize the mainstream KM research literature in relation to managing the risk of KM-systems failures, and point out that evolution is one dimension that has not been addressed so far. We then illustrate, by presenting findings from a field research study, that evolution is an important dimension, which can lead to unnecessary complexity and ultimately KM-systems failures. In the final part of the paper we discuss the implications of this study in relation to the KM research, and argue that more attention must be given to managing the evolution of KM-systems.

2. KM RESEARCH

In this section, we characterize the mainstream KM research literature in relation to managing the risk of KM-systems failures, and outline that evolution is a dimension that has not been addressed so far. The KM research literature that we have studied is found mainly in the three overlapping research areas Computer Supported Cooperative Work (CSCW), Information Systems (IS) and Organization Theory (OT). Most of the contributions that explicitly focus on KM have been published since 1995, i.e. within the last 5 years. Conferences that we have concentrated on are the Conference on Computer Supported Cooperative Work (CSCW), the European Conference on Computer Supported Cooperative Work (ECSCW), the Hawaii International Conference on System Sciences (HICSS), the International Conference on Information Systems (ICIS) and the European Conference on Information Systems (ECIS). Journals that we have studied are Journal of Knowledge Management, Organization Science, and special issues on KM in Harvard Business Review, Journal of Management Studies, Strategic Management Journal and Strategic Management Review. Moreover, we have less comprehensively studied and used other conferences and journals. Below we characterize the mainstream KM research within CSCW, IS and OT.

Contributions within the research area CSCW inform the design of KM-systems. The focus is on computer systems and functions supporting groups, and the emphasis is on developing and evaluating new types of functions and uses for KM-systems. This is supported by empirical and theoretical studies that inform design of new KM-systems. Typical contributions propose a KM-system and evaluate it [e.g. Terveen et al. 1993; Ackerman, 1994; Karduck, 1994; Ackerman and McDonald, 1996; Kovalainen et al. 1998], inform design through empirical studies of work-practice [e.g. Ackerman and Halverson, 1998; McDonald and Ackerman, 1998; Fagrell et al. 1999], and inform design through theoretical discussions [e.g. Bannon and Kuuti, 1996; Randall et al. 1996]. Overall, in relation to managing the risk of KM-systems failures, the KM research within the CSCW area offers researchers and practitioners support and guidelines for how to design and implement a KM-system to fit work-practice in a specific use context.

Contributions within the research area IS inform the design of organizational KM initiatives and KM-systems. Through both empirical and theoretical studies, the emphasis is on finding a match between a certain type of KM-system and an organization. Typical contributions propose strategies for organizational use of a KM-system [e.g. Davenport and Prusak, 1998; Hansen et al. 1999; Zack, 1999; Swan et al. 2000], improvement of functions for KM-systems from an organizational perspective [e.g. Abecker et al. 1999; Hauck and Chen, 1999; Lindgren and Wallström, 2000], and investigations of the nature of knowledge and KM in order to create an understanding of the phenomena to support [e.g. Schultze, 1999; Tuomi, 1999; Hedesstrom and Whitley, 2000]. Overall, in relation to managing the risk of KM-systems failures, the KM research within the IS area offers researchers and practitioners support and guidelines for how to design and implement a KM-system to fit organizational characteristics and strategies.

Contributions within the area OT inform the design of organizational KM initiatives. The emphasis is on organizing, and IT is treated peripherally. With both empirical and theoretical studies as a basis, typical contributions deal with proposals for organizational designs [e.g. Nonaka, 1994; Brown, 1998; Nonaka and Konno, 1998], discussions about the nature of organizations and work [e.g. Brown and

Duguid, 1991; Grant, 1996; Spender, 1996; Tsoukas, 1996; Scarbrough, 1998], and discussions concerning the nature of knowledge [e.g. Blackler, 1995; Cook and Brown, 1999]. Overall, in relation to managing the risk of KM-systems failures, the KM research within the OT area offers researchers and practitioners support and guidelines for how to design and implement a KM-oriented organization. KM-systems are not discussed in detail, but instead seen as unproblematic supportive technology for the organizational designs.

Summing up, the mainstream KM research can be described as having a perspective that focuses on the development and implementation of one KM-system in a relatively stable organization during a limited time-period. This perspective does not encompass the evolution of KM-systems, i.e. the process by which organizations and their information systems change over time. Knowledge from a perspective of a single systems development project does not offer support and guidelines for managing the evolution of KM-systems. In the rest of this paper we illustrate, by presenting findings from a field research study, that evolution is an important dimension, which can result in unnecessary complexity and ultimately KM-systems failures. With these theoretical and empirical findings as point of departure, we argue that more KM research focusing on this problematic phenomenon is needed.

3. THE GUIDE CASE: RESEARCH SITE AND METHODOLOGY

The research site is the Swedish IT consultant organization Guide, which can be characterized as a knowledge-intensive, fast-growing and dynamic organization. Guide has approximately 800 employees at ten offices located in three countries. Since he start in 1988 Guide's business concept has been to offer top expertise. In order to realize this ambition, Guide has annually invested 15 percent of the turnover in competence development, and can be described as an ambitious organization with regard to KM.

From a practical standpoint we had good access to the organization. One of the authors was employed by Guide 1994 to 1999, and during the period 1996 to 1998 he was the chief knowledge officer (CKO). This means that on the one hand he has unique insights and knowledge regarding the case, yet on the other hand he can be considered biased towards the case. The problems with bias are likely to have been counter-balanced by the fact that the fieldwork at Guide has been conducted by the rest of the authors, who have not been affiliated with the organization. Moreover, other studies at Guide have contributed to the understanding of the case [e.g. Lindgren and Wallström, 2000].

The fieldwork was carried out during March to May 2000, and employed ethnographic techniques [Van Maanen, 1979, 1988]. We have conducted 25 semi-structured interviews, each lasting approximately one hour, with sales managers, project managers, system architects, management consultants, personnel managers, competence area managers and business area managers. 15 of the interviews were with people, from Guide's office in Göteborg, who had knowledge of local issues as well as local development and use of KM-systems. However, most of these people also had assignments on a top-management level and therefore had knowledge of the organization as a whole. Moreover, we interviewed 5 people from Guide's office in Stockholm and 5 people from Guide's office in Oslo. The reason for this was to gain knowledge concerning the locally developed KM systems at these offices, i.e. the Competencemarketplace system and the Developers-guild. The interviews focused on issues regarding what has worked and not with KM-systems at Guide during the period 1995 to early 2000. Large parts of the interviews were conversations where the respondents were given freedom to express the issues that were most relevant from their perspective. However, in order to test the stability in these expressions, we tempted the respondent to counterargue. Furthermore, all the interviews were recorded and later transcribed. Besides the interviews, we collected empirical data through studying documents such as system manuals, strategy plans, competence plans and annual reports. We have maintained a critical perspective towards the empirical data, and iteratively analyzed the case in order to get past first-impressions and surface explanations of the situation. Thus, our research approach can be broadly classified as an interpretive case study

[Walsham, 1995], and the results presented in this paper is one possible interpretation of the Guide case.

4. RESULTS

In this section we present the results from our field research study at Guide. The presentations are structured using categories generated from the analysis of the empirical data. Firstly, we describe the overall organizational development of Guide during the period 1988 to 2000. Secondly, we present an overview of the KM-systems that are relevant for this study. Thirdly, we describe the complex situation early 2000 at Guide's office in Göteborg with regard to the KM-systems use. Finally, we outline ad hoc management of the KM-systems' evolution as a cause to the unnecessarily complex situation. The first and second sections serve as a background to the third and fourth, which are of a more problematizing character.

4.1. The organizational development of Guide

Guide was founded in 1988 when two IT consultant firms merged, and a number of consultants at one of the firms decided to leave the organization and start a new company. The objective was to offer top expertise, and therefore developing as well as managing knowledge were recognized as key issues.

In 1989, Consultant profiles containing brief descriptions of individuals' competencies were introduced in order attract customers. Further, consultants with an average experience of 15 year were recruited to offer a mentoring base for less experienced employees. Recruiting experienced consultants from other organizations was, however, relatively easy due to the competence focus that Guide had. Furthermore, the ambition at this time was to have a growth rate equal to the growth of the industry branch, yet not to become too big. The organization was geographically concentrated to Göteborg and Stockholm where the major customers were located, and the business focus was systems development.

In times of recession, in 1993, Guide suffered its worst result ever. This was met by intensified investments in competence development. A test-laboratory was built in order to show their high competence for customers, and this laboratory gained much positive attention.

In 1994, Guide implemented routines to enable customers to value specific consultants' competencies and performance in assignments.

In 1996, Competence development ratings were implemented as a measurement of the consultants' perceived competence development in assignments. This enabled management based on other parameters than traditional economical ratios. The same year the business strategy changed from selling individual consultants to selling teams, concepts and complete solutions in order to increase profit margins. Further, the organization was ISO-certified, and this demanded routines for managing knowledge and competence. A KM strategy was formulated, and an IT strategy was developed. Moreover, the two new subsidiaries IT management and Integration were created, which resulted in that the business became diversified. Previously, the offices in Stockholm and Göteborg were organizationally separated, i.e. they had their own customers, consultants and assignments. With the two new subsidiaries this was changed since the different offices were part of the same organization. Also in 1996 some smaller corporations were bought, and the new employees were integrated into the existing organization.

The year after, in 1997, the extent of corporate takeovers increased. Guide bought the corporation Communicator, and established offices in Uppsala, Malmö and Oslo.

In 1999, Guide established an office in Köpenhamn.

In February 2000, the Internet consultant corporation Framfab bought Guide.

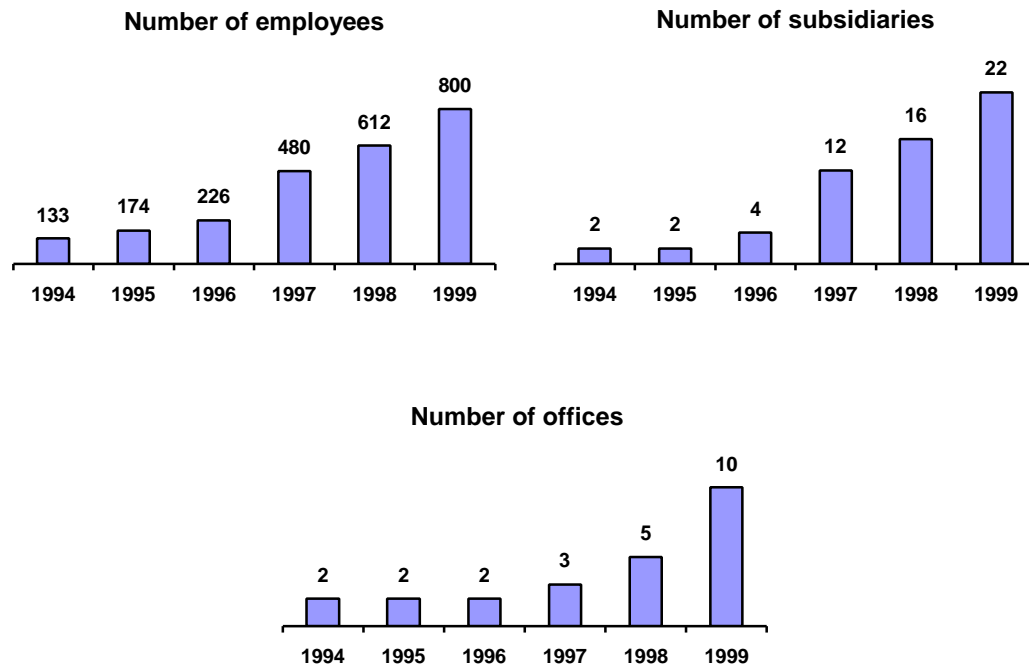


Figure 1: The growth of Guide during the period 1994 to 1999.

4.2. KM-systems at Guide

As part of the ISO-certification process, *Competence descriptions* were developed and implemented 1996. The *Competence descriptions* are word documents containing detailed descriptions of the consultants' competencies, and these documents were mainly used for manning assignments. However, they were also used to show the customers the competencies that were available for a prospect. The *Competence descriptions* could be edited and used by everyone, i.e. both management and consultants. Until 1996 the business strategy focused on selling individual consultants, and the operational focus within Guide was to find the appropriate consultant for an assignment. Eventually, the organization became too large for managing assignments without system support, so the *Available-consultants system* was developed and implemented in early 1996. The system was a spreadsheet document, stored on a server, containing competence profiles, availability status, competence areas and prospects. Merely the management could access this system. The *first Intranet version* was launched in 1996. This Intranet version contained HTML based competence descriptions, which were automatically generated from the above described word documents, and prospects, project information, competence-areas etc.

In 1998, the *second Intranet version* was implemented as a replacement for the *first Intranet version*. This version of the Intranet contained information concerning consultant profiles, but less attention was given to projects and competence-areas. Instead the focus was on personal information about the consultants. The same year the *Job-assignment system* was developed and implemented at Guide's office in Göteborg. This system was based on Lotus Notes and replaced the *Available-consultants system*. The *Job-assignment system* contained competence information and prospects, and was used to match incoming prospects with the consultants' competencies and wishes. Only the management could access the system.

In 1999, the *Competence-marketplace system* was developed at Guide in Oslo, and since August 1999 the system is up and running at Guide's offices in Göteborg, Oslo and Stockholm. The system is a

database containing competence areas and competence levels concerning the consultants' competencies. Guide's idea regarding the *Competence-marketplace* system is to have a KM-system for mapping the consultants' competencies, categorization and visualization of the competencies within the organization, forming teams of consultants, and finding expertise for their projects. Further, the consultants are responsible for the input of their competence data. At the time of the implementation of the *Competence-marketplace system*, the *Developers-guild system* was developed at Guide's office in Stockholm. The system was made available for the whole organization in late 1999. The *Developers-guild system* is a community website functioning as a meeting space for system developers. The idea was to have an alternative forum for cooperation, knowledge sharing and information retrieval. The *Developers-guild system* includes online articles, discussion lists, collaborative writing tools and news.

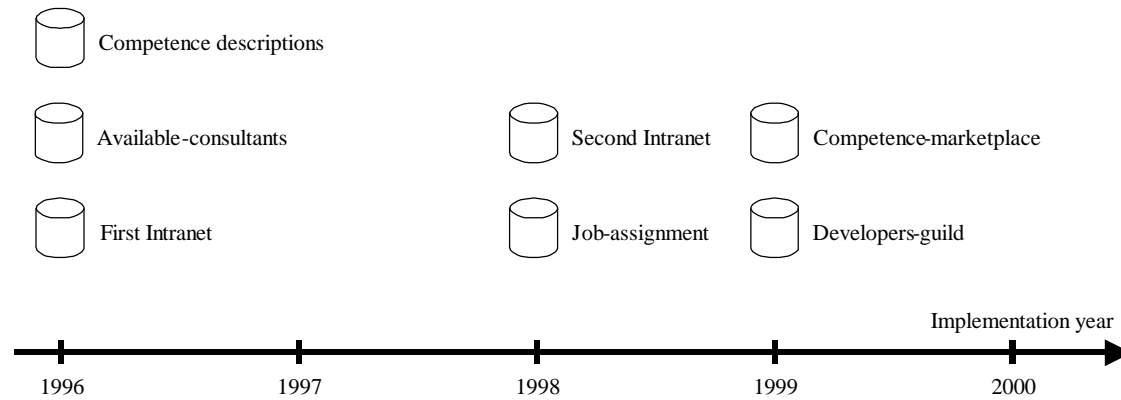


Figure 2: KM-systems at Guide.

4.3. Complexity and the risk of KM-systems failures

With regard to the KM-systems use at Guide's office in Göteborg, the situation early 2000 was characterized by unnecessary complexity. The situation can be described as consisting of several objects and relations, and the data quality in the KM-systems is low. Overall, the KM-systems are not used. The desired effects have not occurred and the risk for failures is considerable. Below, technical and organizational dimensions regarding the complex situation are presented. These dimensions are illustrated by quotations from the interviews.

4.3.1. Competing systems

Competing systems is about that the KM-systems within the organization have an influence on each other. In the present situation, co-ordination for reducing conflicts between KM-systems is missing. The KM-systems have to be updated with similar data, and the consultants have to update several systems. A sales manager and one of the project managers for the implementation of the Competence marketplace system in Göteborg discussed this:

“In 1998 the Job-assignment system was developed in Lotus Notes. The problem with the Competence-marketplace system was that the consultants were compelled to update the Notes system as well. If you had merged these systems, it would have worked better... as it is now, the data is not replicated between the systems.”

“The problem has been that there is no connection between the Competencemarketplace system and the Competence descriptions. There are no defined routines concerning how to... for example update. The original idea was that the Competencemarketplace system would generate competence descriptions... but this is not the case.”

Consequently, at Guide's office in Göteborg there are several similar KM-systems containing the same type of data. Their reciprocal relationships have neither been elucidated nor defined, which has in turn resulted in low compatibility.

4.3.2. Related systems

Related systems deal with other systems within the organization that have "invisible" relations to the KM-systems, and in the current situation value adding co-ordination is missing. Compulsory systems like, for instance, financial systems have data that is relevant for the KM-systems. One management consultant and a competence area manager explained:

"In our more compulsory systems there are time reports... these you have to hand in... otherwise you will not get your salary. The time reports contain information regarding what assignments you have worked in, and every assignment has a description concerning what competencies it consists of. It should be quite simple to scan these documents, and in this way update systems like the Competencemarketplace system."

"The Competence-marketplace system should contain information about what assignments different consultants have accomplished. Actually, we have invoices and basic data in our operative systems that could be useful to have in the Competencemarketplace system. I do not think that it is integrated with other types of systems within the organization."

Accordingly, there are other systems within Guide's activity that to a great extent are related to the KM-systems. However, useful data from these more compulsory systems are not utilized in the present situation. In consequence, the consultants are expected to supply and update data that already exist in other systems within the organization.

4.3.3. Heterogenous usegroups

Heterogenous usegroups is about the relations between the KM-systems and different usegroups within the organization. In the prevailing situation there is uncertainty regarding which groups of users that are served by the KM-systems. Furthermore, it is not consolidated who is producer and consumer of the KM-systems' information. Regarding the Competence-marketplace system a personnel manager and a project manager discussed this:

"The greatest winners concerning this are the personnel managers. Maybe, it should be their responsibility to secure that the system is updated. The consultants are interested in having the right assignments, and if the Competence-marketplace system was the way for this... then the incentives are in place, but this is really not the situation. I think this is due to misapprehensions regarding what the system is supposed to do."

"The Competence-marketplace system has a built-in conflict. From my point of view, it is developed with the sales organization's demands as a starting point... the sellers argue that they need to be able to search for information about competence within the organization. But, you must remember that someone is needed in order to provide that information."

The Competence-marketplace system primarily serves the personnel managers and the sales part of the organization. The consultants that are supposed to supply the information regarding their competencies do not get much in return. Thus, it seems that an organizational awareness regarding which groups of users that are producers and consumers of the Competencemarketplace system's information is missing.

4.4. Ad hoc management of KM-systems' evolution

In the previous sub-section, we presented the complex situation at Guide's office in Göteborg with regard to the KM-systems use. Here follows an analysis of the period 1995 to 1999, which outlines ad hoc management of the KM-systems' evolution as a cause to the unnecessarily complex situation. In order to illustrate the evolution of KM-systems, we have chosen to discuss different types of changes. These changes, which we have categorized as functional and structural changes, have been generated from the analysis of the empirical data. Functional changes deal with new KM-systems in the organization, new versions of a KM-system, and new functions in one KM-system. Structural changes are about new business models in the organization, new subsidiaries in the organization and new competencies in the organization. To illustrate each type of change we use quotations from the interviews. The reason for this presentation is to show that evolution of KM-systems is an important dimension, which needs to be managed.

4.4.1. Functional changes

Functional changes are about new KM-systems in the organization, new versions of a KM-system and new features in one KM-system. Below we describe and illustrate each type of change.

New KM-systems in the organization

This change deals with that several different KM-systems are implemented in the organization over time. This is illustrated by a management consultant at Guide:

“We changed Intranet... and then we unfortunately lost speed. At the same time the Competence-marketplace system came in by leaps and bounds, and took over... this regarding the information about individuals' competencies. The marketing of the Developers-guild system at the time of its introduction was insignificant... so, there are merely a few who take part... some even do not know that it exists. In the midst of it all the Competence-marketplace system appeared, and it can be described more as the essential thing... the core... it is like the heart in our knowledge bank.”

This quotation highlights that the Intranet, the Competence-marketplace system and the Developers-guild were developed in different quarters within the organization, and there was a lack of coordination between the different initiatives. The development and the implementations of the KM-systems can be characterized as locally driven, and their relations were managed in an ad hoc manner.

New versions of a KM-system

This change is about that new versions of existing KM-systems are developed and implemented in the organization. A sales manager at Guide in Göteborg discussed this in relation to the development of the different versions of the Intranet:

“Competence descriptions as well as the competence-areas were put up as sites on the Intranet [version 1]. These sites were supposed to indicate work tasks, actually what we were doing, projects and anybody was permitted to go there and have a look. This was the first attempt in order to display something for the consultants, and it really set off the competence development. Then the Intranet [version 2] became more of an information channel consisting of general information. Our ambition was this huge competence mass, but it did not turn out that way. This implementation becomes more of a news channel, rather than a knowledge system.”

The quotation highlights that the development of the Intranet has been problematic. The first version of the Intranet was adapted to Guide's activity and the management of knowledge and competence was supported. However, when the second version of the Intranet was developed the experiences gained from the first Intranet version were missed. This resulted in that the new Intranet did not have the qualities, which made the former version useful for the organization.

New features in one KM-system

This change is about that new functions are developed and added to existing KM-systems within the organization. Concerning this a sales manager at Guide's office in Göteborg phrased the following:

“The development of the Intranet [version 2] was conducted top-down. Since there was no organization that managed the implementation of the system, sub-intranets emerged. These local initiatives evolved in order to meet needs belonging to particular parts of the organization... driven by personnel, and around these sub-intranets forums developed. These have, of course, effected the use of other systems within the organization.”

This quotation illustrates that the functions in the second version of the Intranet did not satisfy local needs. Therefore, local initiatives were initiated in an ad hoc manner to adapt the system for their respective demands.

4.4.2. Structural changes

Structural changes deal with new business models, new subsidiaries and new competencies in the organization. Below we describe and illustrate each type of change.

New business models in the organization

This change deals with that new business models in the organization are developed over time. One business area manager in Göteborg discussed this in relation to the Competence-marketplace system:

“The business model resulted in certain questions such as, for example, are there any persons who are suitable for this project. This is reflected in the Competencemarketplace system. However, reality as well as business models change, but this is not mirrored in the systems. Our business has changed... from selling individual consultants to selling complete solutions.”

The quotation highlights that Guide developed a new business model, which in turn was not implemented in the Competence-marketplace system. Consequently, the Competencemarketplace system did not support the new way of working within the organization.

New subsidiaries in the organization

This change deals with new subsidiaries in the organization, which adds new business areas as well as perspectives to the existing activity. A sales manager at Guide in Göteborg discussed this increased heterogeneity:

“At the same time as we acquired companies with new lines of business we tried to implement the system. Guide had 22 subsidiaries... all of them with their respective perspectives. Who has the right to change the Competencemarketplace system's structure... who owns the information so to speak... from this viewpoint it would have failed irrespective of our efforts.”

The quotation highlights that the implementation of the Competencemarketplace system was difficult since different parts of Guide's decentralized organization had varying demands. It was unclear who had the responsibility for the information and the authority to change the structure of the system.

New competencies in the organization

This change is about new employees in the organization, which leads to new competencies and greater diversity within the organization. A management consultant at Guide's office in Göteborg articulated this:

“Oslo has contributed with the original competence structure, but... then we have done nothing, and it has been the new consultants' task to take care of the structure if they are not satisfied. That is the way it has been... it is not properly handled.”

This quotation illustrates that the original competence structure in the Competencemarketplace system was developed at Guide in Oslo, and when the system was implemented at Guide's office in Göteborg the original competence structure was applied. However, when new consultants with new competencies have been recruited to the activity in Göteborg, the updating of the competence structure has been managed in an ad hoc manner. Accordingly, there have been competencies within the organization that are not represented in the Competencemarketplace system.

5. DISCUSSION

Our interpretation of the Guide case shows that the evolution of KM-systems must be deliberately managed in order to avoid unnecessary complexity. Ad hoc management of KM-systems' evolution may work in a short-term perspective, but to avoid unnecessary complexity and failures in the long run the management process must be a dedicated area of responsibility. An interesting development since our field research study was conducted, which is outside the scope of our analysis, is that Guide has been bought by the Internet consultant corporation Framfab. This means that the number of systems, organizations, competencies, business models etc. have increased and the organization is now in an even more complex situation than we have reported. The evolution at Guide has thus continued, and the need for management is even more apparent. We believe that the situation at Guide is common in other knowledge-intensive, fast-growing and dynamic organizations. It is easy to imagine the turbulence in such organizations and the problems with KM-systems that eventually will arise if evolution is not managed. Also, in less dynamic organizations the problems related to evolution are likely to occur, although being less frequent and immediate.

From the Guide case we can see that both the organizational change process and the system-structure need to be managed. The change process in a dynamic organization involves frequent and sometimes unpredictable changes. These need to be co-ordinated in some way to avoid unwanted changes and promote wanted changes, but at the same time not killing local and spontaneous initiatives that are crucial for the vitality and competitiveness of the organization. In other words, to create degrees of freedom for local initiatives while creating synergies and added value through co-ordination of these initiatives. Managing the system-structure means to deal with questions of a more technical character such as system boundaries, system relations, system interoperability, data interoperability, and system co-ordination. This is necessary to avoid redundant data, lock-ins to certain technical standards, large and complex systems that are difficult to change, etc. We are not arguing for a certain approach to managing the organizational change process and the system-structure, but stress that management is a difficult and complex process that lacks easy solutions.

There have been a few contributions in the KM research literature that problematize the implementation and use of KM-systems, and to some extent highlight the evolution of KM-systems [see Pan and Scarbrough, 1998; Mentzas, 1999; Hellström et al. 2000; Ciborra and Hanseth, 1998]. These non-mainstream contributions strengthen the arguments in this paper. Also, our experiences from other KM projects, collaborations, and networking events in the Göteborg vicinity, have provided additional evidence, although of a less systematic and more anecdotal nature.

The main implication of this paper for the KM research is that more studies are needed that focus on the evolution of KM-systems. Empirical studies of KM-systems, which take into account the organizational dynamics over time and the relations between many systems in the organization, can produce results that help researchers and practitioners understand the evolution of KM-systems and improve the associated management. Moreover, KM researchers need to investigate if knowledge in the broader literature regarding the evolution of organizations and their information systems can be drawn upon for the management of KM-systems' evolution. Exploring this possibility is beyond the scope of this paper, but we believe that there is much to learn from previous experiences and guidelines in other fields, e.g. IT management [see e.g. Magoulas and Pessi, 1998].

6. CONCLUSIONS

With our field research study of KMsystems and literature study of KM research as a basis, we draw three main conclusions:

- Evolution, which refers to the process in which organizations and their information systems change over time, is an important dimension of KM-system implementation and use.
- Managing the evolution of KM-systems on an ad hoc basis and treating them as stand-alone systems can lead to unnecessary complexity and KMsystems failures. The evolution of KM-systems needs to be managed, by deliberately managing both the organizational change process and the system-structure from a long-term perspective.
- The KM research has paid little attention to the evolution of KM-systems. Limited support and guidelines for managing KM-systems' evolution are available in the mainstream KM research literature. Consequently, this is an important issue to add to the KM research agenda.

REFERENCES

- Abecker, A., Bernardi, A. and Sintek, M. (1999). Enterprise Information Infrastructures for Active, Context-Sensitive Knowledge Delivery. In Proceedings of the 7th European Conference on Information Systems – ECIS 1999.
- Ackerman, M. S. (1994). 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.
- Ackerman, M. S. and McDonald, D. W. (1996). 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.
- Ackerman, M. S. and Halverson, C. (1998). Considering an Organization's Memory. In Proceedings of ACM 1998 Conference on Computer Supported Cooperative Work, pp. 39-48. Seattle, WA: ACM Press.
- Bannon, L. J. and Kuutti, K. (1996). Shifting Perspectives on Organizational Memory: From Storage to Active Remembering. In Proceedings of the 29th Hawaii Conference on System Sciences (HICSS29), Vol. IV, pp. 156-167, IEEE Computer Society Press, Los Alamitos.
- Blackler, F. (1995). Knowledge, Knowledge Work and Organizations. *Organization Studies*, 16/6.
- Brown, J. S. (1998). Organizing Knowledge. *California Management Review*, Vol 40, No. 3, pp. 90-111.
- Brown, J. S. (1998). Internet Technology in Support of the Concept of "Communities of Practice": the Case of Xerox. *Accounting, Management and Information Technologies*, 8, pp. 227-236.
- Brown, J. S. and Duguid, P. (1991). Organizational Learning and Communities-of-practice: Toward a Unified View of Working, Learning and Innovation. *Organization Science*, Vol. 2, No. 1, pp. 40-56.
- Ciborra, C. (1996). Introduction: What Does Groupware Mean for the Organization Hosting It? In C. Ciborra (Ed.) *Groupware and Teamwork*, pp. 1-19. New York: John Wiley & Sons.
- Ciborra, C. (2000). *From Control to Drift*. Oxford University Press.

-
- Ciborra, C. U. and Hanseth, O. (1998). Toward a Contingency View of Infrastructure and Knowledge: An Exploratory Study. *International Conference on Information Systems*, pp. 263-272.
- Cook, S. D. N. and Brown, J. S. (1996). Bridging Epistemologies: The Generative Dance between Organizational Knowledge and Organizational Knowing. *Organization Science*, Vol. 10, No. 4, July-August, pp. 381-400. Mimeo, Palo Alto, CA: Xerox Parc.
- Davenport, T. H. and Prusak, L. (1998). *Working Knowledge: How Organizations Manage What They Know*. Harvard Business School Press, Boston.
- Fagrell, H., Ljungberg, F. and Kristoffersen, S. (1999). Exploring Support for Knowledge Management Work. In *Proceedings of the Sixth European Conference on Computer Cooperative Work*, Copenhagen, Denmark.
- Fahey, L. and Prusak, L. (1998). The Eleven Deadliest Sins of Knowledge Management. *California Management Review*. Vol. 40, No. 3, Spring.
- Grant, R. M. (1996). Toward a Knowledge-Based Theory of the Firm. *Strategic Management Journal*, Vol. 17 (Winter Special Issue), pp. 109-122.
- Hansen, M. T., Nohira, N. and Tierney, T. (1999). What's Your Strategy for Managing Knowledge. *Harvard Business Review*, pp. 106-116.
- Hanseth, O. and Monteiro, E. (1997). Inscribing Behaviour in Information Infrastructure Standards. *Accounting, Management and Information Technology*, 7(4), pp. 183-211.
- Hauck, R. V. and Chen, H. (1999). Coplink: A Case of Intelligent Analysis and Knowledge Management. In *Proceedings of International Conference on Information Systems*.
- Hedesstrom, T. and Whitley, E. A. (2000). What is Meant by Tacit Knowledge? Towards a Better Understanding of the Shape of Actions. In *Proceedings of the 8th European Conference on Information Systems – ECIS 2000*.
- Hellström, T., Kemlin, P. and Malmquist, U. (2000). Knowledge and Competence Management at Ericsson: Decentralization and Organizational Fit. *Journal of Knowledge Management*, Vol. 4, No. 2, pp. 99-110.
- Henfridsson, O. (1999). *IT-Adaptation as Sensemaking*. Doctoral Dissertation. Department of Informatics, Umeå University.
- Karduck, A. (1994). TeamBuilder - A CSCW Tool for Augmenting Expertise and Team Formation. In *Computer Communications*, Butterworth-Heinemann Publ., 17(11), No v 1994, pp. 777-787.
- Kovalainen, M., Robinson, M. and Auramäki, E. (1998). Diaries at Work. In *Proceedings of ACM 1998 Conference on Computer Supportive Cooperative Work*, pp. 49-58. Seattle, WA: ACM Press.
- Lindgren, R. and Wallström, C. (2000). Features Missing in Action: Knowledge Management Systems in Practice. In *Proceedings of the 8th European Conference on Information Systems– ECIS 2000*.
- Lyytinen, K. and Hirschheim, R. (1987). Information Systems Failures – A Survey and Classification of the Empirical Literature. *Oxford Surveys in Information Technology*, Vol. 4, 257– 309.
- Lyytinen, R. and Robey, D. (1999). Learning Failure in Information Systems Development. *Information Systems Journal*, 9, 85-101.
- Magoulas, T and Pessi, K. (1998). *Strategic IT-management*. Doctoral Dissertation. Department of Informatics, Göteborg University.

- McDonald, D. W. and Ackerman, M. S. (1998). 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.
- Mentzas, G. (1999). IS-Enabled Corporate Knowledge Management: Research Directions and Lessons from the Field. In Proceedings of the 7th European Conference on Information Systems – ECIS 1999.
- Milton, N., Shadbolt, N., Cottam, H. and Hammersley, M. (1999). Towards a Knowledge Technology for Knowledge Management. *Int. J. Human-Computer Studies* 51: 615-641.
- Newell, S., Scarbrough, H., Swan, J. and Hislop, D. (1999). Intranets and Knowledge Management: Complex Processes and Ironic Outcomes. In Proceedings of the 32nd Hawaii International Conference on System Sciences.
- Nonaka, I. (1994). A Dynamic Theory of Organizational Knowledge Creation. *Organizational science*, 5, pp. 14-37.
- Nonaka, I. and Konno, N. (1998). The Concept of Ba. *California Management Review*, Vol. 40, No. 3, pp. 40-54.
- Orlikowski, W. J. (1992). The Duality of Technology: Rethinking the Concept of Technology in Organizations. *Organization Science*, 3(3), pp. 398-427.
- Orlikowski, W. J. (1996). Improvising Organizational Transformation Over Time: A Situated Change Perspective. *Information Systems Research*, 7(1), pp. 63-92.
- Pan, S. L. and Scarbrough, H. (1998). A Socio-Technical View of Knowledge-Sharing at Buckman Laboratories. *Journal of Knowledge Management*, Vol. 2, No. 1, pp. 55-66.
- Parker, M.M (1996). *Strategic Transformation and Information Technology, Paradigms for Performing While Transforming*. Prentice-Hall.
- Randall, D. Rouncefield, M. and Hughes, J. A. (1995). Chalk and Cheese: BPR and Ethnomethodologically Informed Ethnography in CSCW. In Proceedings of the Fourth European Conference on Computer Supported Cooperative Work, Stockholm, Sweden: Kluwer Academic Publishers, pp. 325-340.
- Scarbrough, H. (1998). Path(ological) Dependency? Core Competencies from an Organizational Perspective. *British Journal of Management*, Vol. 9, pp. 219-232.
- Schultze, U. (1999). Investigating the Contradictions in Knowledge Management, *Information Systems: Current Issues and Future Changes*, IFIP, Laxenberg, pp. 155-174.
- Spender, J. C. (1996). Organizational Knowledge, Learning and Memory: Three Concepts in Search for Theory. *Journal of Organizational Change Management*, Vol. 9, No.1.
- Storey, J. and Barnett, E. (2000). Knowledge Management Initiatives: Learning from Failure. *Journal of Knowledge Management*. Vol. 4, number 2, pp. 145-156.
- Swan, J., Newell, S. and Robertson, M. (2000). Limits of IT-Driven Knowledge Management Initiatives for Interactive Innovation Processes: Towards a Community-Based Approach. In *Thirty-Third Hawaii International Conference on Systems Sciences (HICSS-33)*. Maui, Hawaii, ed IEEE.
- Terveen, L. G., Selfridge, P. G. and Long, M. D. (1993). From Folklore to Living Design Memory. In *ACM 1993 Proceedings on Human Factors in Computing Systems*.

-
- Tuomi, I. (1999). Data is More than Knowledge: Implications of the Reversed Knowledge Hierarchy for Knowledge Management and Organizational Memory. In Proceedings of the 32^d Hawaii International Conference on System Sciences.
- Tsoukas, H. (1996). The Firm as a Distributed Knowledge System: A Constructivist Approach. *Strategic Management Journal*, Vol. 17, 11-25.
- Van Maanen, J. (1979). The Fact of Fiction in Organizational Ethnography. *Administrative Science Quarterly*, 24(4), pp. 539-550.
- Van Maanen, J. (1988). *Tales of the Field: On Writing Ethnography*. Chicago: University of Chicago Press.
- Walsham, G. (1995). Interpretive Case Studies in IS Research: Nature and Method. *European Journal of Information Systems*, 4, pp. 74-81.
- Wiig, K. M., De Hoog, R. and Van Der Spek, R. (1997). Supporting Knowledge Management: A Selection of Methods and Techniques. *Expert Systems With Applications*, 13, pp. 15-27.
- Zack, M. H. (1999). Developing a Knowledge Strategy, *California Management Review*, 41(3), Spring 1999, pp. 125-145.