Global Co-Operation in the New Millennium
The 9th European Conference on Information Systems
Bled, Slovenia, June 27-29, 2001

RETHINKING COMPETENCE SYSTEMS FOR INNOVATIVE ORGANIZATIONS

Rikard Lindgren

Viktoria Institute, Viktoriagatan 13, 405 30 Gothenburg, Sweden
Tel.: +46 31 773 5564, Fax: +46 31 773 5530
Rikard@viktoria.se

Dick Stenmark

Volvo Information Technology, Dept 9634, HD3N, 40508 Gothenburg, Sweden
Tel.: +46 31 765 7037, Fax: +46 31 667711
Dick.Stenmark@volvo.com

Magnus Bergquist

Viktoria Institute, Viktoriagatan 13, 405 30 Gothenburg, Sweden
Tel.: +46 31 773 5534, Fax: +46 31 773 5530
Magnus@viktoria.se

Jan Ljungberg

Viktoria Institute, Viktoriagatan 13, 405 30 Gothenburg, Sweden
Tel.: +46 31 773 2746, Fax: +46 31 773 5530
Janl@viktoria.se

ABSTRACT

Information technology (IT) support for managing competence is based on a rationalistic view of competence. While these competence systems might work in rationalistic organizations, we argue that in more dynamic settings, such as in innovative organizations, the interest-informed actions that capture the emergent competencies of tomorrow require different types of IT support. We theorize about these two separate forms of organizations and use them as a means to interpret and classify empirical findings from an action case study of an implemented interest-activated recommender system prototype. The interviews show that competence is perceived as complex and multifaceted and three categories emerge: competence as a formal merit; interest as a complementary aspect of competence; and interest as something that transcends competence. The findings offer an empirical platform for rethinking competence systems for innovative organizations. We suggest a new design rationale promoting systems that are able to detect, visualize and leverage interests of organizational members.

1. INTRODUCTION

Much work on knowledge management (KM) systems has focused on handling knowledge (in a general and unspecified sense) or on expertise, i.e. individually held work-related knowledge [see e.g. Ruggles, 1997; McDonald and Ackerman, 2000]. Relatively little attention has been paid to IT support for managing *competence*, i.e. organizationally managed work-related knowledge (see [Lindgren and Wallström, 2000] for an exception). Furthermore, most competence systems have adopted an over-simplified rationalistic perspective on competence rooted in early 20th century management thinking. Needless to say, the adoption of such systems has been problematic in terms of conceptualization, function, and user acceptance. Competence systems are typically used for personnel administration by human resource departments [Lindgren and Wallström, 2000]. Systems that passively store formalized competence descriptions related to well-defined tasks might work in organizations characterized by perfunctory activities acting in a stable environment. As we shall argue, organizations distinguished by changing conditions, unforeseen requirements and a constant need for innovations need a richer interpretation of competence. A more dynamic view should include the form of competence-in-action that is primarily driven by individual *interest*. This in term requires competence systems that are emergent, dynamic, and based on interest-driven actions that depict real-time status. We show this by reporting from an action case study of an implemented interest-activated recommender system prototype at Volvo Information Technology AB in Göteborg, Sweden. By analyzing how people used this prototype to find information they were interested in, we were able to understand how personal interests resulted in observable actions. This enabled us to both inquire into how organizational members perceived the relationship between interest and competence, and elaborate on what IT support competence management in innovative organizations would require.

This paper is organized as follows. The next section discusses the related research, and is followed by a section on the concept of competence. Thereafter, we relate competence to the notions of rationalistic and innovative organizations in section four. In section five, we present our research approach before reporting the empirical results in section six. Section seven contains a discussion of interest versus competence, and in section eight we discuss implications for future competence systems. Our conclusions in section nine finish the paper.

2. RELATED RESEARCH

Over the past several years, the management of knowledge and competence has been promoted as a critical factor for organizational survival and maintenance of competitive advantage [see e.g. Nelson and Winter, 1982; Drucker, 1993; Nonaka, 1994]. A number of researchers have suggested that individuals' knowledge, expertise and ability to learn are at the heart of today's competency-based organizations [see e.g. Senge, 1990; Leonard-Barton, 1992; Lawler, 1994]. The notions of knowledge, expertise and competence are closely related, and historically these have been discussed in a variety of ways [see e.g. Prahalad and Hamel, 1990; Walsh and Ungson, 1991; Amit and Shoemaker, 1993]. In this paper, both expertise and competence are seen as enacted and work-related knowledge. These two concepts are highly interrelated and used somewhat interchangingly in the literature. The difference, however, is that expertise is oftenly understood as an individual aspect, while competence usually is discussed on an organizational level. Our ambition is to adhere to this notion.

How organizations manage their knowledge and expertise, e.g., as narratives [Orr, 1990], through knowledge mapping [Zack, 1999], or via gatekeeping [Schultze and Boland, 2000], has been studied frequently. Moreover, there have been many studies focusing on KM systems for knowledge and expertise, e.g., intranets for sharing knowledge [Scott, 1998], database technologies for handling organizational knowledge [Maier and Lehner, 2000], groupware technologies to facilitate knowledge creation [Robertson *et al*., 2000], and recommender systems for leveraging tacit knowledge [Stenmark, 2001] and identifying expertise [McDonald and Ackerman, 2000]. Finally, empirical studies have been conducted in order to point out implications for design of KM systems, e.g., by analyzing work conducted in a telephone hotline group

[Ackerman and Halverson, 1998], and expertise location in a software development company [McDonald and Ackerman, 1998].

Comparatively little research on how organizations handle their competence has been reported in the KM literature. Davenport and Prusak's [1998] study of competence mapping at Microsoft is one of very few accessible accounts. While their report on the SPUD project contains details about the process of identifying competence types and levels, defining competencies needed for particular jobs, and rating of individuals performance based on the competencies, not much attention was given to the role of IT in these processes. In Lindgren and Wallström [2000], results from a multiple-case study of competence systems in practical use are reported. The main characteristic that the competence systems, included in their study, has in common, is that they store organizational members' competencies in hierarchical tree structures. The competence systems use a grading scale to indicate the level of skill for a certain competence. With competence data as point of departure, it is possible to search for a specific competence, overview the status of competencies, and measure the difference between existing and wanted competencies. The investigated systems are particularly designed to support the organizations in managing their competence in a structured and efficient way, i.e. to have the right competence at the right place and the right time. According to the authors, this is not achieved, though. Their results highlight general problem areas related to conceptualization, function, and user acceptance. Competence systems are reduced to tools for creating *passive* inventories of formalized competencies, instead of being seen as vehicles for making competence *active* as wished by the organizations (cf. [Bannon and Kuutti, 1996] for an analogous argument concerning organizational memory). We have used the results from Lindgren and Wallström's study as a starting point for the research reported in this paper.

3. COMPETENCE

While knowledge is a broad and abstract concept discussed by philosophers for ages, competence is a more specific concept firmly established in scientific management of the early 20th century [Taylor, 1911], and more frequently used in human resource management in the 70's and 80's [McClelland, 1973; Boyatzis, 1982]. Competence is understood as the relation between humans and work tasks, i.e. the concern is not about knowledge and skills in itself, but which knowledge and skills are required to perform a specific task in an efficient way [McClelland, 1973].

Early management thinkers addressing competence criticized the ad hoc and unstructured way in which competence was managed. In his scientific management approach, Taylor [1911] introduced time and motion studies as one way of making the employees' competence visible and measurable. In this tradition, competence consists of a set of properties needed to perform a specific task: "A competency is an underlying characteristic of an individual that is casually related to […] superior performance in a job or situation" [Spencer and Spencer, 1993:9]. A plethora of methods and espoused theories used by practitioners is based on varying sets of such characteristics, including attributes such as knowledge, skill, ability, experience, attitude, willingness, and personality [see e.g. Veres III *et al*., 1990; Sandberg, 1994; von Krogh and Ross, 1996]. Organizational activities such as competence mapping and competence gap analyses are based on the same rationalistic view of competence, which suffers from several limitations: First, descriptions of competence are fragmentary and atomistic; Second, competence is categorized beforehand in an *ad hoc* way with weak connections to both empirical data and theory, which rather confirm the model of competence itself than the workers' competence; Third, regardless of the number of categories, competence profiles are static, indirect, and general descriptions concerning human competence. Competence profiles do not demonstrate whether workers actually use the competence in accomplishing work, i.e. the competence profiles are not rooted in work practice [Sandberg, 1994].

Despite this critique, organizational approaches to competence as well as accompanying IT support still rely heavily on a rationalistic view of competence [cf. Lindgren and Wallström, 2000]. In order to understand why using such competence systems is problematic, competence must be understood in *relation* to the organizational forms in which the systems are implemented. Therefore, we have to be aware of how organizational frameworks create different demands for competence management.

4. RATIONALISTIC AND INNOVATIVE ORGANIZATIONS

On an organizational level, we shall separate the rationalistic from the innovative organization [cf. Hedlund, 1994]. This separation is based on a dichotomy that relates to the extensive literature describing typologies of organizational forms. The two main strands in this discourse are the goal-oriented rationalistic form suitable for a stable and predictable environment, and the organic form appropriate for changing conditions, fresh problems, and unforeseen requirements for action. However, it is important to note that rationalistic and innovative organizations do not necessarily have to be mutually exclusive. We often find both models in the same organization, in different areas, departments, or layers in the establishment [cf. Nonaka, 1994].

The rationalistic organization includes characteristics from scientific management [Taylor, 1911], bureaucracy [Weber, 1947], mechanistic systems [Burns and Stalker, 1961], goal-directed rationalistic organizations [Pfeffer, 1982], and a perspective on organizations as closed and stable systems [Thompson, 1967]. The rationalistic organization is knowledge-routinized or expert-dependent. It has well-established recurrent activities characterized by repetitive tasks and known problems, and is driven by an ambition to optimize performance and eliminate redundancy [Blackler, 1995]. Competence is therefore either defined as the knowledge and experience of technologies, the rules and procedures required to perform the repetitive tasks, or as levels of expertise for more qualified tasks. Making competence visible and retrievable, and thereby available to the organization as a whole, is thought of as a way to enhance performance as well as a way to avoid reinventing the wheel. Since future tasks and problems are presumed to be known, competence is defined and categorized beforehand.

The innovative organization, in contrast, depends on a different sort of rationality that includes characteristics of organic organizations [Burns and Stalker, 1961], emergent, almost-random organizations [Pfeffer, 1982], and a perspective on organizations as open and dynamic systems [Burns and Stalker, 1961]. The innovative organization has little or no prior knowledge regarding the requirements of tomorrow. The problem at hand is not that of recurrence and redundancy, but to create a surplus of innovative ideas that can guide knowledge workers when developing new solutions. In the innovative organization, competence has to be associated with processes of change. Competence must be seen as dynamic, emergent, and situated in constantly changing practice, and is therefore hard to define precisely and beforehand. Communication and collaboration are key processes, and the ability to master symbolic manipulations is vital [Blackler, 1995]. Making the organization more efficient by rationalizations is not an issue. Instead, people's commitment and motivation become crucial assets alongside technology's role of enabling new possibilities and connections [Nonaka, 1994].

As stated previously, most IT support for managing competence is designed based on a rationalistic perspective on competence [cf. Lindgren and Wallström, 2000]. This way of handling competence *might* work in a rationalistic organization, but does not support an innovative organization. Consequently, there is a lack of contributions that deal with competence systems for innovative organizations. Therefore, we argue that the innovative organization needs systems based on a richer understanding of competence that includes an interest-driven working practice. Computer mediated communication platforms such as email have been used to connect organizational members with similar interests [Finnholt and Sproull, 1990]. While it might be difficult to exhaustively and explicitly articulate what constitutes an interesting text, we often have no problem determining whether any given document is interesting or not. Elaborating on this fact, Stenmark [2001] uses Polanyi's theories to show how interests are instances of tacit knowledge, and how professional interests, because they provide a natural incentive for actions, are useful from an organizational perspective. Professional interest dictate which reports we read and which documents we write, and thus govern much of the daily office activities. The actions that we focus on in this particular case are those related to information seeking on a corporate intranet. In such a context, where all material is work-related, the underlying interest can be assumed to be relevant to the organization. The challenge is to somehow capture these actions and identify the motivating interest. The approach suggested by Stenmark [2001] is that information retrieval systems could be used to reveal part of our tacit knowledge by making salient our search patterns. Building on Stenmark, we suggest that pursuing a professional interest in a corporate setting eventually leads to competence within that area, and that it seems plausible that interests can be a means for identifying

competencies applied in practice. The idea of a relationship between interest and competence contrasts with the rationalistic view, and opens for new ideas about how to design competence systems for innovative organizations. To be able to study the relationship between interest and competence, we implemented a recommender system prototype at Volvo IT.

5. RESEARCH APPROACH

During the spring of 2000, the *recommender system prototype* was implemented at Volvo Information Technology AB, which is the competence center for IT services within the Volvo Group. Though the corporate group was in many aspects more of a rationalistic type of organization with an evident industrial legacy, Volvo IT had to be more innovative. This was because the IT company was not the only provider of IT services since they had to compete with external firms. The recommender system prototype operated on the corporate intranet, which had been implemented in 1995. The intranet consisted of more than 700 web servers and contained both official information, and semi- or unofficial material. While the official information was maintained via coherent structures and relied on meta-information to improve search capabilities, the major part of the intranet structure, although containing much valuable information, seemed ad hoc and haphazard. This motivated the employees to engage information agents to find relevant information.

The primary objective of the implemented recommender system prototype was to provide the organizational members with relevant and targeted information retrieved from the corporate intranet. The prototype used in this research was a development of a previous prototype [Stenmark, 2001] based on Autonomy's AgentWare, which is a commercially available tool that uses neural networks and advanced pattern-matching techniques to identify text patterns in profiles. The system spiders the intranet, and retrieves and synthesizes every web document into a 0.5K digital representation. Using this representation, the system allows the users to define their areas of interest by creating one or more information agents, which search the created index for documents matching the user's interest. An interest is defined in a free text natural language sentence, i.e. a richer representation of an interest than merely a keyword-based query from which the system creates a digital representation. Each user can define several agents, and the search results from each agent are displayed in a simple list. When the user has read and identified one or more of the returned documents as relevant, the user can provide the agent with explicit feedback by marking the best document(s) and clicking a retrain button. The digital signature of the agent is then merged with the signature(s) of the selected document(s), and the result becomes the new signature replacing the previous one. This mechanism makes it easy to update the agent profile to reflect one's actual interest.

A novel addition to the standard recommender system function was the *Find competence* feature, which allowed the user to enter a free-text description of any desired competence, e.g. "database administration on an oracle system". In sharp contrast to traditional competence systems, our prototype did not answer such a query with a set of formalized database records, but presented lists of employees who, at this very moment in time, had agents actively searching for information similar to the content of the query. Hence, the Find competence feature facilitated the active and up-to-date information that is otherwise so difficult to maintain in a traditional competence system.

Unrelated to the intranet, the company had in late 1999 initiated a pilot installation of *Tieto Persona/Human Resource* (TP/HR), which is a traditional system for managing competence, designed to support mapping, categorization, and visualization of an organization's competencies. TP/HR is based upon a pre-established competence structure where competencies are defined as functional skills (practical work tasks) and technical skills (methods used to perform the tasks). Each skill is graded on a five level scale, ranging from no competence to expert competence. The system's main features are functions for measurement of employees' competencies status and competence gap analyses. The gap analyses are used to indicate discrepancies between existing competence and competence needed in the future. The analyses show both how well the employees' competencies match the given competence demands for a given work task, and how critical competencies related to specific work tasks are distributed within a certain group. Volvo IT planned to use these analyses as a support for organizational activities such as resource and availability

planning, internal and external recruiting, goal and personal development discussions, forming teams of employees, finding competence when manning assignments and mission steering. Consequently, the TP/HR system was assumed to support Volvo IT in managing their competence in a short as well as long perspective.

When the researcher has the intention not only to observe, interpret, and understand, but also to intervene in and change the practice under study, the approach can be described as an action case study [Vidgen and Braa, 1997]. Although small-scale intervention is part of our approach the initial focus was to gain in-context understanding of prevailing attitudes and mental references. The case study data consists of 16 semi-structured interviews with organizational members using the prototype recommender system. The interviews, each lasting approximately one hour, were conducted in May and June 2000 after a 10-week test period. The interviewees occupied different positions within the organization, ranging from non-technicians such as HR staff members and financial controllers to technology watchers and systems programmers. All interviews were recorded and transcribed, and the empirical results have emerged from an iterative and interpretative analysis of the collected data [Walsham, 1995]. In the next section, we present the empirical results in order to highlight how the interviewees perceived the relationship between interest and competence.

6. EMPIRICAL RESULTS

Concerning the prototype's Find competence feature, it was evident that many users were *uncertain* of what this function actually returned. The interviewees' understandings varied between "formal competence descriptions", "tasks that the employees are designated or hired to do", or merely "representations of people's interest". One software developer, familiar with both conventional information retrieval tools and the TP/HR system, expressed his uncertainty in the following way:

> *"Well, Find competence [in the prototype system]… first I interpreted it as if you came to some kind of competence database. There is one competence database that I subscribe to where you search for competencies. If someone knows C++ for example and Cobol and what have you… then you can search for it. So it does not seem intuitive that this is called Find competence, but maybe it is right. I guess it is something you have to get used to if you want to use it. But it does not seem intuitive […] I am still puzzled when I look at it."*

According to this software developer, competence is normally something that is formalized and refers to specific roles and work tasks within the organization. Further, some respondents discussed competence as something transcending what can be formalized, but also enacted and emerging from practice. One HR staff member saw potential in the prototype, since it could be a complement to the formalized way of mapping competencies supported by the TP/HR system:

> *"TP/HR is a lot more about order… order and being in control of the situation. And to know what we have and the level of education of our employees… how many of these and how many of those. Then this [prototype] is something else. It is what people do on an everyday basis. It is what they use their skills for. It is sort of the next step."*

This HR staff member's view was that the prototype displays what people actually do, rather than merely displaying a historic description of the employees' competencies. The quotation further illustrates a perspective on competence where formalized descriptions as well as competence applied in practice are important and *complement* each other. In addition, there were interviewees who not only regarded the prototype as a complement to the formalized competence systems, but also saw it as a tool that could support the activity of keeping the TP/HR's role categorization up to date. Manually updated work descriptions are problematic since people change work tasks continually, and therefore systems that contain such profiles are hard to keep up to date. This perspective on the prototype indicates an action-oriented view of competence. In line with this, a project manager discussed the need for information that makes salient people's actions. Interests in similar areas mean working with comparable problems, which in turn indicates related competence. However, one of the interviewed system programmers took this discussion an additional step further by arguing that lack of interests reveals missing competencies within the organization:

> *"Yes, of course it gives a hint of that there is no one else but me who is interested in these areas. Yes, it would be able to show shortcomings… missing competence for instance, and that there is a shortage in a certain area. Yes, then you could find areas that are neglected or where you are weak…"*

The idea of using the prototype as an instrument in order to identify missing competence areas is based on the assumption that interest is linked to competence. This way of reasoning about competence analyses was also expressed by a technology watcher, who highlighted the possibility to use the prototype for managing competence within the organization:

> *"A personal agent speaks about an element that people want. Then maybe you realize that, through analyzing personal agents, you can discover that there is a competence gap in comparison with what the organization would like to have. Then you can create new areas that enable people to see that there are more possibilities to discover."*

The above quotation represents a perspective in which interest is considered as means for managing the organization's competence. This respondent also meant that interest is so important for competence that they should be taken into account when configuring new projects. Other interviewees stressed the importance of interests even more. One member of the HR staff commented:

> *"When you take initiatives beyond your assigned tasks, there is a commitment to and an interest in participating in changing things. Commitment really is worth more and says more, because I do not really have to do it. No one is forcing me to do it, and I am not measured by it. You can perform miracles in 10 minutes if you have enough motivation. It does not have to take days. Therefore, it would have been exciting to find those with an interest and not those who are assigned to do it, because they are not always the most suitable."*

According to this respondent, people's interests do not necessarily indicate their formal competencies. However, this is not a problem, rather our main point. Identifying the driving forces among the employees is essential for the organization. People's interests hint at their ambitions as well as motivation, and in some situations such qualities are more valuable than formal competencies. Therefore, representations of interests can be of great value, and one technology watcher elaborated on using the prototype for this purpose:

> *"The most powerful thing I see is a possibility to visualize. If one can use this tool in a proper way then there is a possibility to visualize [interests] in order to get a quick feeling for where people have been, where they are heading and what they want […]. Looking ahead is the difficult part."*

By visualizing the status regarding interests over time on an *aggregated* level, it is possible for the organization to partly trace the historical development of the employees' interests, and partly discover emerging new initiatives with a potential strategic impact.

7. THE RELATIONSHIP BETWEEN INTEREST AND COMPETENCE

In this section, the different personal views concerning the relationship between interest and competence, illustrated in the previous section, will be condensed into three themes: competence as formalized description; interest as competence; and interest beyond competence. These themes will be discussed in relation to the rationalistic and the innovative organizations as well as to existing IT support for managing competence.

A considerable part of the interviewees discussed the prototype in relation to TP/HR, which is a system that embodies and expresses the rationalistic view of competence. Interests, in this context, were *ignored* by these respondents, who implicitly perceived competence as primarily constituted of attributes such as knowledge, skills and ability that can be represented in formalized descriptions [cf. Veres III *et al*., 1990; Sandberg, 1994]. The TP/HR system is based on formal descriptions of competencies in form of skills and thereby reflects the idea of the rationalistic organization. The system can be described as a traditional tool for managing competence since it is designed to match an activity, based on standard procedures and constituted of well-defined tasks with available competencies. Thus, the representations of competencies provided by

TP/HR are needed in order to match tasks with qualified persons or to get an experts view of a certain problem [cf. Blackler, 1995]. Further, the competence resides somewhere in the organization, and the TP/HR system's role is to support the identification of that particular competence in a rationalistic and effective way. This logic builds on the assumption that tasks are recurrent and competencies are largely stable over time and therefore reusable. Existing competence systems are designed with this rationalistic perspective on competence as a basis [Lindgren and Wallström, 2000].

Some interviewees recognized interests as essential because it says something about work-practices [cf. Argyris and Schön, 1974; Suchman, 1995]. This represents a view in which people's *actions* speak about what they do, and that interests in similar areas mean working with comparable problems, which in turn indicates related competence. Interests thus give important information about individuals' and hence also organizations' competencies, and were seen by some respondents as equally important as the rationalistic way of understanding competence. Consequently, in this perspective formalized descriptions and competence applied in practice are both important and complement each other. For example, the respondents discussed the possibility to have the prototype update the content of the TP/HR system. Though this perspective regarding the relationship between interest and competence also has its roots in the rationalistic idea of the organization, the importance of interest as an addition to the formalized view of competence was acknowledged. Embryos to systems supporting this perspective on competence can be seen in the form of functions for free text expressions of personal interests. However, free text descriptions do not support statistic analyses of the expressions, and there is no possibility to aggregate such information in order to visualize interest and ambitions [cf. Lindgren and Wallström, 2000].

The most radical perspective found amongst the respondents suggested that interest is more important than formal competence. This way of understanding the interest-competence relationship stresses the need for *continuous* competence development as a result of the ever-changing environment [cf. Levitt and March, 1988]. It is the intrinsic motivation that comes from personal interests that sets the limits for the organization's future, and it is therefore crucial for people to be motivated and "hungry", as one interviewee expressed it. To actively nurture and develop these interests thus becomes more important than to archive records of past achievements. Although the respondents do not explicitly refer to the two organizational forms, it became obvious to them that innovative work requires other ways of organizing as well as a new understanding of competence. The view of interest as something that goes beyond competence belongs to the innovative organization, where tomorrow's tasks are more difficult to foresee, and people's interests, their motivation and their commitment become the main assets [Nonaka, 1994; Stenmark, 2000]. Hence, in the innovative organization business relies more on identifying individuals with the ability to learn as they go along than on finding employees matching predefined competence profiles. IT support for detecting emerging interest with the potentials of becoming new competence areas is difficult to realize since much of the input required is only tacitly expressed. However, this does not mean that such support is entirely out of reach, as shall be discussed next.

8. COMPETENCE SYSTEMS

In situations when real-time and action-based status is expected, it is crucial that the systems are up to date. If only historical records are available, the systems are useless to the innovative organization regardless of whether interests or formal competencies are stored. There is a strong resemblance to the problem of the common good discussed extensively in the groupware literature. It has been concluded that such problems, e.g. keeping electronic calendars current, can be attributed to the fact that the person doing the job is not the one benefiting [Grudin, 1987]. To avoid this situation, a possible approach would be to design systems to primarily solve another problem, or perform a different task on the user's behalf, and update the competence profile as a spin-off. To do this as *unobtrusively* as possible, the primary activity must be such that it delivers an added value to the user that motivates her to go through the process. Such activities should therefore activate the user's true interests rather than some espoused or politically correct theory. One such activity, exploited in this paper, is information seeking, and the challenge for future information systems researchers is to come up with more such activities.

As shown in this paper, the implemented recommender system prototype opens up for a variety of different possibilities, ranging from complement to formalized competence systems to a tool for visualizing and managing shifting interests. Traditional IS/IT solutions support merely the rationalistic perspective on competence. To support and facilitate also the other two perspectives presented in this paper, we need systems that are able to detect, visualize, and leverage interest on an organizational level. Future competence systems for the innovative organization should therefore be able to capture the actual interests and actions, rather than "static" records of past achievements. It has been suggested that though some organizational processes are only tacitly understood they may nevertheless be supported by IT [Stenmark, 2001], and we have showed that analogous arrangements could be employed to support competence management in the innovative organization. As is evident from the testimonies of the interviewees reported in this paper, interest-driven competence systems have *implications* on both systems design and managerial attitudes. Below, we shall briefly hint at some of these implications.

Since organizational members have varying perceptions of the relationship between interest and competence, it seems important that competence systems of the future are able to accommodate a *mix* of these entities. While interests satisfy the need for up-to-date indications of competence, it should be paired with integrated access to formal competencies and descriptions of previous achievements. The dynamic characteristics of a recommender system enable it to handle unstructured information and emerging topics without having to manually adjust labels and categories. However, this inability to distinguish between different levels of interests also makes it impossible to know whether an organizational member has developed the interest yesterday and thus is a novice, or has had it for years and thus has gained a lot of experience [cf. McDonald and Ackerman, 1998]. By allowing formal descriptions and dynamic interests to complement each other, the users would have enough information to eliminate possible misunderstandings and enhance the perception of an individual's background. Furthermore, information about interests should not be entered manually, since such an approach would suffer from the same problems as traditional competence systems have. Instead, interests must be derived unobtrusively from the users actions while pursuing other tasks [Stenmark, 2001]. Therefore, competence systems of tomorrow must be able to aggregate interest-derived information more *automatically* and over time. A compiled and aggregated picture of the number of information agents searching a certain area and how frequently they are updated would show how different groups of individuals use their competence in practice. Such features would provide management with a quick and flexible overview of the organization's competence status. By aggregating interests, we thus elevate ourselves from the individual to the organizational level.

For the enriched interpretation of competence, which also includes personal interest, in effect to become useful, it must be paired with a corresponding change of management mindset. The innovative organization cannot be managed with the rationalistic "*measure and control*" attitude that has characterized twentieth century industry. Instead, it has been argued that innovation must be managed through a "*coach and facilitate*" approach. Such a management style should consider redundancy, autonomy, intrinsic motivation, and recognition of creative initiatives [Nonaka, 1994; Stenmark, 2000]. When deadlines and budgets are cut so tight that the employees barely manage to do what is expected, their opportunities to pursuit personal interest are limited. Therefore, management must allow at least a minimum amount of redundancy. In addition, it takes time for new trends and emerging interests to reach top executive level, be converted to official corporate strategy, and be implemented in traditional competence systems, and by the time they are communicated back to the employees the interest and the business opportunity may be long gone. By empowering employees to act autonomously and follow their interests, new unplanned openings may be encountered [cf. Drucker, 1999]. It has been shown that when people are driven by intrinsic motivation such as personal interests, they are more creative than when aiming for goal imposed on them by outside actors. Finally, management should show that risk-taking and occasional failure is not only acceptable, but also necessary. All entrepreneurial activities involve an element of risk and not all interests end up as profitable core competencies [cf. Prahalad and Hamel, 1990]. The element of risk lies in that it cannot be determined in beforehand what the winning interest is [Stenmark, 2000].

9. CONCLUSIONS

With an implemented interest-activated recommender systems prototype in a real organizational setting as a starting point, we have in this research empirically evaluated the relationship between interest and competence. Three different perspectives are derived; competence as formalized description, interest as competence, and interest beyond competence. Traditional IT support for managing competence merely handles one of these views, namely the formalized perspective on competence as applied in the rationalistic organization. Since today's competence systems are designed to function as competence silos hoarding old information, they cannot support the view of competence as something evolving. As organizations become more and more knowledge-intensive and innovative, the importance of the other two perspectives on competence will increase. Our results have implications for the design of competence systems for innovative organizations, since the systems need the potential to detect, visualize and leverage interests. Competence in innovative organizations cannot be categorized beforehand, and IT support thus has to be emergent, dynamic, and based on interest-driven actions that depict real time status. Finally, we have in this paper argued in favor of a *new* design rationale for competence systems that is based not on a stable history, but on an active interest. Moreover, for the innovative organization to be successful, management must abandon the rationalistic view of competence and embrace interest and intrinsic motivation of organizational members as the primary drivers. Competence, we claim, consists of components that are emergent, dynamic, and situated, and not only based on experiences and past achievements.

ACKNOWLEDGEMENT

This reseach has been funded, in part, by the Swedish National Board for Industrial and Technical Development (NUTEK) through the Competitive KIFs project within the AIS-program. The authors wish to thank Ola Henfridsson, Alan B. Carlson, and the anonymous ECIS reviewers for helpful comments and suggestions.

REFERENCES

Ackerman, M. S. and C. Halverson (1998). Considering an Organization's Memory. In *Proceedings of CSCW'98*, Seattle: ACM Press, pp. 39-48.

Amit, R. and P. J. H. Shoemaker (1993). Strategic Assets and Organizational Rent. *Strategic Management Journal*, 14, pp. 33-46.

Argyris, C. and D. Schön (1974). *Theory in Practice: Increasing Professional Effectiveness*. San Francisco: Jossey Bass.

Bannon, L. J. and K. Kuutti (1996). Shifting Perspective on Organizational Memory: From Storage to Active Remembering. In *Proceedings of HICSS-29*, IEEE press.

Blackler, F. (1995). Knowledge, Knowledge Work and Organizations: An Overview and Interpretation. *Organization Studies*, 16 (6), pp. 1021-1046.

Boyatzis, R. E. (1982). *The Competent Manager: A Model for Effective Performance*. New York: John Wiley and Sons.

Burns, T. and G. M. Stalker (1961). *The Management of Innovation*. London: Tavistock Publications.

Davenport, T. H. and L. Prusak (1998). *Working Knowledge*. Boston: Harvard Business School Press.

Drucker, P. F. (1993). *The Post-Capitalist Society*. New York: Harper Collins Publishers.

Drucker, P. (1999). Knowledge-Worker Productivity: The Biggest Challenge. *California Management Review*, 41 (2), pp. 79-94.

Finnholt, T. and L. S. Sproull (1990). Electronic Groups at Work. *Organization Science*, 1 (1), pp. 41-64.

Grudin, J. (1987). Social Evaluation of the User Interface: Who does the Work and Who gets the Benefit? In *Proceedings of INTERACT '87*, North-Holland: Elsevier Science Publishers.

Hedlund, G. (1994). A Model of Knowledge Management and the N-form Corporation. *Strategic Management Journal*, 15, pp. 73-90.

Lawler Iii, E. E. (1994). From Job-Based to Competency-Based Organizations. *Journal of Organizational Behavior*, 15, pp. 3-15.

Leonard-Barton, D. (1992). Core Capabilities and Core Rigidities: A Paradox in Managing New Product Development. *Strategic Management Journal*, 13, pp. 111-125.

Levitt, B. and J. G. March (1988). Organizational Learning. *Annual Review of Sociology*, 14, pp. 319-340.

Lindgren, R. and C. Wallström (2000). Features Missing in Action: Knowledge Management Systems in Practice. In *Proceedings of ECIS 2000*, Vienna: Vienna University of Economics and Business Administration.

Maier, R. and F. Lehner (2000). Perspectives on Knowledge Management Systems – Theoretical Framework and Design of an Empirical Study. In *Proceedings of ECIS 2000*, Vienna, Austria.

Mcclelland, D. C. (1973). Testing for Competence rather than for "Intelligence". *American Psychologist*, 28, pp. 1-14.

Mcdonald, D. W. And M. S. ACKERMAN (1998). Just Talk to Me: A Field Study of Expertise Location. In *Proceedings of CSCW 1998*, Seattle: ACM press, pp. 315-324.

Mcdonald, D. W. and M. S. Ackerman (2000). Expertise Recommender: A Flexible Recommender System and Architecture. In *Proceedings of CSCW 2000*, New York: ACM press, pp. 231-240.

Nelson, R. R. and S. G. Winter (1982). *An Evolutionary Theory of Economic Change*. Cambridge, MA: Harvard University Press.

Nonaka, I. (1994). A Dynamic Theory of Organizational Knowledge Creation. *Organization Science*, 5 (1), pp. 14-37.

Orr, J. E. (1990). Sharing Knowledge, Celebrating Identity: Community Memory in a Service Culture. In *Collective Remembering: Memory in Society* (Middleton and Edwards, Eds.), Beverly Hills, CA.: Sage Publications, pp. 169-189.

Pfeffer, J. (1982). *Organizations and Organization Theory*. Marshfield: Pitman Publishing.

Prahalad, C. K. and G. Hamel (1990). The Core Competence of the Corporation. *Harvard Business Review*, 68 (3), pp. 79-91.

Robertson, M., C. Sorensen and J. Swan (2000). Facilitating Knowledge Creation with GroupWare: A Case Study of a Knowledge Intensive Firm. In *Proceedings of HICSS-33*, Maui: IEEE Press.

Ruggles, R.L. (1997). *Knowledge Management Tools*, Butterworth-Heinemann.

Vidgen, R. And K. BRAA (1997). Balancing Interpretation and Intervention in Information Systems Research: the "Action Case" Approach. In *Proceedings of IFIP WG8.2*, Philadelphia, USA.

Sandberg, J. (1994). *Human Competence at Work: An Interpretative Approach*. Gothenburg: BAS.

Schultze, U. and Boland, R. J. Jr. (2000). Knowledge Management Technology and the Reproduction of Knowledge Work Practices. *Journal of Strategic Information Systems*, 9, pp. 193-212.

Scott, J. E. (1998). Organizational Knowledge and the Intranet. *Decision Support Systems*, 23, pp. 3-17.

Senge, P. M. (1990). *The Fifth Discipline: The Art and Practice of the Learning Organization*. New York: Doubleday.

Spencer, L. M. and S. M. Spencer (1993). *Competence at Work: Models for Superior Performance*. John Wiley & Sons.

Stenmark, D. (2000). The Role of Intrinsic Motivation when Managing Creative Work. In *Proceedings of ICMIT 2000*, Singapore: IEEE Press.

Stenmark, D. (2001). Leveraging Tacit Organizational Knowledge. *Journal of Management Information Systems*, 17 (3), pp. 9-24.

Suchman, L. (1995). Making Work Visible. *Communications of the ACM*, 38, pp. 56-64.

Taylor, F. (1911). *The Principles of Scientific Management*. New York: Harper & Row.

Thompson, J. D. (1967). *Organizations in Action.* New York: McGraw-Hill.

Veres Iii, J. G., T. S. Locklear, and R. R. SIMS (1990). Job Analysis in Practice: A Brief Review of the Role of Job Analysis in Human Resource Management. In *Human Resource Management: Perspectives and Issues* (Ferris *et al*. Eds.), Boston: Allyn and Boston.

Von Krogh, G. and J. ROSS (1996). *Perspectives on Cooperation and Competition*. Sage Publications.

Walsh, J. P. and G. R. UNGSON (1991). Organizational Memory. *Academy of Management Review*, 16 (1), pp. 57-91.

Walsham, G. (1995). Interpretive Case Studies in IS Research: Nature and Method. *European Journal of Information Systems*, 4 (2), pp. 74-81.

Weber, M. (1947). *The Theory of Social and Economic Organization*. New York: The Free Press.

Zack, M. H. (1999). Developing a Knowledge Strategy. *California Management Review*, 41 (3), pp. 125-145.