



Rethinking competence systems for knowledge-based organizations

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Abstract

Existing competence systems are based on a rationalistic view of competence. While these competence systems might work in job-based organizations, we argue that in more dynamic settings, such as in knowledge-based organizations, the interest-informed actions that capture the emergent competencies of tomorrow require different types of information technology support. The main objective of this paper is to elaborate on the possibilities and implications of using interest-activated technology as a design rationale for competence systems. This paper is based on an action case study of an implemented interest-activated Intranet recommender system prototype at Volvo Information Technology AB in Gothenburg, Sweden. On the basis of how organizational members used this prototype to find information they were interested in, our research team was able to inquire into how personal interest, embodied in information-seeking activities, could be a means for identifying competence. Building on the relation between personal interest and competence, we discuss competence systems design and spell out explicit implications for managerial practice in knowledge-based organizations.

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Introduction

The industrial revolution transformed work in Western society, creating a significant shift in what people do for a living and how work is performed. During the industrial era, workers were brought together in large shops and factories; owners divided tasks into constituent activities that were assigned to individuals who performed them repeatedly (Barley & Orr, 1997). Workers did the physical work and were treated as a collective of muscles that were supposed to execute the owners' decisions. This way of organizing was based on the rationale that actors who hold higher positions in the hierarchy possess the authority to manage and direct the actions of those in subordinate positions (Nelsen, 1997; Zabusky, 1997). Work was structured according to the principles of scientific management, or what management literature defines as 'Taylorism', and each job was specified in a formalized explicit description including tasks and required competence. On the basis of the principles of scientific management, Taylor (1911) argued that workers' competencies should be made apprehensible by classifying and reducing them to rules, laws, and formulas (see, e.g., Sandberg, 1994). 'Time and motion studies' was Taylor's managerial tool to identify and describe the competence of the most efficient workers.

Today's human resource management is not based on time and motion studies, but nevertheless products exhibit the same rationale. Job-based approaches to managing competence, that is, the idea of individuals

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holding jobs (see, e.g., Gael, 1988; Armstrong, 1991), can be traced back to the era of Taylor and several systematic attempts to identify what constitutes fundamental aspects of competence in relation to particular work within organizations have been made (see, e.g., Ghorpade & Atchinson, 1980; Fombrum *et al.*, 1984). Job descriptions are used in most organizations as a basis for training, selection, career development, and pay determination (Lawler, 1994). According to Lawler & Ledford (1992), however, it is now time for organizations to concentrate on individuals and their competencies. Organizing and managing people based on the concept of an individual holding a job is no longer optimum. Instead of thinking of jobs in terms of a relatively fixed position occupied by a person, it seems to be more suitable to see the person as a knowledge resource working for an organization (cf., Lawler, 1994). The competence of knowledge workers or 'symbolic analytic workers' is varied, for example, problem identification, problem solving, and brokerage (see Reich, 1991; Starbuck, 1992; Alvesson, 1993). Since knowledge workers perform their work based on accumulated experiences and a tacit understanding of how to accomplish their tasks, they are likely to resist routines. In this sense, the level of autonomy separates them from administrative workers (see Davenport *et al.*, 1996). Autonomy and self-motivation can be regarded as driving forces for the knowledge worker and it has been argued that a knowledge worker's interest regarding the task in question affects the end result of the work (see, e.g., Nonaka, 1994; von Krogh & Roos, 1996). Moreover, research in a corporate setting has shown that professional interest, rather than espoused theory, is what motivates people (Stenmark, 2000).

Management literature has suggested that the job paradigm, where competence is outlined as primarily directed towards formalized knowledge and skills, is insufficient for describing knowledge work practice (cf., Sandberg, 1994). Nonetheless, competence systems are still based on an oversimplified rationalistic perspective on competence rooted in early 20th century scientific management thinking. Needless to say, the adoption of such systems in organizational knowledge work practice has become problematic (Lindgren & Henfridsson, 2002). Competence systems are typically used for personnel administration by human resource departments.

In this paper, we argue that there is a misfit between existing competence systems handling formalized competence descriptions related to well-defined tasks and the dynamic nature of knowledge work. Knowledge-based organizations distinguished by changing conditions, unforeseen requirements, continuous learning, and a constant need for innovation require competence systems based on a richer interpretation of competence. Such an interpretation should include the form of competence-in-action that is primarily driven by individuals' own interests in the work. This in turn requires competence systems that are emergent, dynamic, which

depict real-time status and are based on the interest-driven actions of organizational members.

The main objective of this paper is to elaborate on the possibilities and implications of using interest-activated technology as a design rationale for competence systems. The paper is based on an action case study of an implemented interest-activated Intranet recommender system prototype at Volvo Information Technology AB (Volvo IT) in Gothenburg, Sweden. By studying how people used this prototype to find information in which they were interested, we were able to inquire into how personal interests, embodied in information-seeking activities, could be a means for identifying the competence of organizational members. Building on how people perceived the relation between personal interest and competence, this paper presents implications for competence systems design and more specifically for managerial practice in knowledge-based organizations. The remainder of this paper is organized as follows. The next section outlines the related research. The subsequent section discusses the concept of competence. Thereafter, we relate competence to job-based and knowledge-based organizations. The following section presents our research approach, while the next one outlines the empirical results. Then there is a discussion of personal interest vs competence, and here we describe some concrete effects this research has had on Volvo IT's competence management strategy. The penultimate section presents the lessons learned and spells out the implications our competence systems design has on management practice. Finally, our conclusions finish the paper.

Related research

There have been many studies focusing on how to use information technology (IT) to manage knowledge and expertise, such as Intranets for knowledge sharing (Scott, 1998), database technologies for handling organizational knowledge (Maier & Lehner, 2000), groupware technologies to facilitate knowledge creation (Robertson *et al.*, 2001), and recommender systems for leveraging tacit knowledge (Stenmark, 2001) and identifying expertise (McDonald & Ackerman, 2000). Furthermore, empirical studies have been carried out in order to elicit implications for knowledge management systems design, for example, analyses of expertise location in a software development company (McDonald & Ackerman, 1998), knowledge representation and integration in a paper machinery delivery project (Karsten *et al.*, 2001), and work conducted in a telephone hotline group (Ackerman & Halverson, 1998).

This paper concentrates on a particular type of knowledge management system designated as competence systems. There is little research on such systems to be found in the literature. Davenport & Prusak's (1998) study of competence mapping at Microsoft is one of very few accessible accounts. While their report on the SPUD project presents 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, less attention was given to the implemented competence system. Lindgren & Henfridsson (2002) are, however, more specific about the technology when they report the results from their multiple-case study of competence systems in practical use. The main characteristic that the competence systems they study have in common is that the systems store measurements of 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 stored competence data as a point of departure, the competence systems facilitate search for specific competencies and analyze gaps between existing and wanted competencies. The investigated competence systems were specifically designed and implemented to support the organizations in managing their competence in a structured and efficient way, that is, to insure the right competence in the right place at the right time.

According to Lindgren & Henfridsson (2002), this objective has not been reached. On the basis of eight identified adoption barriers, the authors describe the competence systems as traditional administrative systems complemented with features that passively archive formalized descriptions of competencies. In order to facilitate successful integration of competence systems in organizations, the authors suggest general design changes for future competence systems. First, they suggest that competence systems need features for flexible analyses of both existing competencies and competence interests of organizational members. How such features can be developed and implemented is described in Lindgren (2002b). A second suggestion is that recommender systems supporting information-seeking activities of organizational members could be an action-oriented approach to competence mapping. In addressing Lindgren and Henfridsson's second suggestion, here we elaborate on the possibilities and implications of using interest-activated technology as a design rationale for competence systems. Since design-specific knowledge about how to exploit and develop such technology for competence management is addressed elsewhere (see Lindgren & Stenmark, 2002), we concentrate on managerial implications in this paper.

Competence

The concepts of knowledge, expertise, and competence are closely related and historically these have been discussed in terms of distinctive or firm specific resources (Hitt & Ireland, 1985), invisible assets (Itami & Roehl, 1987), skills (Aaker, 1989), core competencies (Prahalad & Hamel, 1990), organizational memory (Walsh & Ungson, 1991), intangible resources (Hall, 1992), core capabilities (Amit & Shoemaker, 1993), and collective knowledge (Spender, 1996). In this paper, both expertise and competence are seen as enacted and strictly work-related

knowledge (cf., Allee, 1997). The difference, however, is that expertise is understood as an individual aspect, while competence is discussed on an organizational level. Throughout this paper, we adhere to this notion.

Established in early 20th century scientific management (Taylor, 1911), competence is a concept that was frequently used in human resource management approaches during the 1970s and 1980s (see, e.g., McClelland, 1973; Boyatzis, 1982). Competence is comprehended as the relation between humans and work tasks, that is, the concern is not about knowledge and skills in itself, but what knowledge and skills are required to perform a specific job or task in an efficient way (McClelland, 1973). Early management thinkers addressing competence criticized the *ad hoc* and unstructured way in which competence was managed. As part of 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 causally related to [...] superior performance in a job or situation' (Spencer & Spencer, 1993, p. 9). A plethora of espoused theories and human resource management approaches used by practitioners is based on different sets of such characteristics including attributes like knowledge, skill, ability, experience, attitude, willingness, and personality (see, e.g., Veres III *et al.*, 1990).

According to Sandberg (1994), however, the rationalistic perspective on competence suffers from three basic limitations. Firstly, descriptions of competence are fragmentary and atomistic. Secondly, competence is categorized beforehand in an *ad hoc* way with weak connections to both empirical data and theory. Thirdly, competence descriptions are based on the assumption that there exists an external relation between the worker's attributes and the work activities. In sum, regardless of the number of categories, competence descriptions are static, indirect, and general representations of human competence. Competence descriptions do not demonstrate whether workers actually apply the competence in accomplishing work, that is, the competence descriptions are not rooted in work practice. At best, competence descriptions indicate prerequisites for being able to accomplish a certain job or task. In line with this argument, Lawler & Ledford (1992) point out that the most serious problem with job-based competence descriptions lies in their focus on jobs, rather than on individuals. The rationale is to find individuals who can be shaped to fit job descriptions. Furthermore, formalized competence descriptions all too often reflect how the organization has operated in the past. Such descriptions, the authors argue, are not capable of anticipating future needs of the organization. Formalized competence descriptions also fail to acknowledge the individuals' ability to contribute in ways out of line with their present job and how it is described. Finally, flexibility in competencies and career

changes are discouraged since application and development of competence have to be managed within the boundaries of job descriptions.

In order to address the problems with job-centered descriptions of formalized competence, alternative approaches have been developed that focus directly on the competence used by individuals in accomplishing work. Building on researchers such as Silverman, Weick, Schön, and Dreyfus and Dreyfus, Sandberg (1994) outlines an interpretative approach to human competence at work. In an attempt to move away from the job-based model for managing competence, Lawler & Ledford (1992) introduce a skill-based approach to human resource management. Despite the emergence of approaches addressing the limitations of the rationalistic perspective on competence, however, competence systems still rely heavily on such a perspective (Lindgren & Henfridsson, 2002). In order to understand why the adoption of competence systems has become problematic, competence must be understood in relation to the organizational practice in which the systems are implemented.

From job-based to knowledge-based organizations

Generally speaking, two ideal forms of organizations have been used to divide and coordinate labor in Western society: the goal-oriented rationalistic form suitable for a stable and predictable environment, and the organic form appropriate for changing conditions and unforeseen requirements for action. Based on this dichotomy, which relates to the extensive literature describing typologies of organizational forms, we shall separate the job-based from the knowledge-based organization (*cf.*, Lawler, 1994). It is to be noted, however, that job-based and knowledge-based organizations do not necessarily have to be mutually exclusive. Normally, both forms can be found in different areas, departments, or layers within the same organization (*cf.*, Nonaka, 1994).

The job-based approach to organizing has been addressed by different schools and has been expressed in terms that can be traced to scientific management (Taylor, 1911), bureaucracy (Weber, 1947), mechanistic systems (Burns & Stalker, 1961), and goal-directed rationalistic organizations (Pfeffer, 1982), and it has a perspective on organizations as closed and stable systems (Thompson, 1967). The overall picture of the job-based organization is one of order, predictability, and hierarchy. An organization 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). A job-based organization can be described as a well-coordinated machine with a fixed repertoire of routines. The hierarchy of responsibilities, duties, and accountabilities that is part of the bureaucratic approach leads to a command and control structure, which has as its foundation the principles of scientific management with each job specified in an explicit description and tasks clearly

differentiated across jobs. The rationale is that the best way to optimize organizational performance is to fill jobs with appropriately skilled individuals and motivate them to perform effectively through pay and other extrinsic rewards (Lawler, 1994). The organization–individual relation could be characterized as ‘I pay you to do, not to think’. The job-based organization is knowledge-routinized and knowledge is encoded in rules, roles, and procedures that are invested in positions, rather than people (Whalley & Barley, 1997). The development of knowledge over time was systematic and sequential, that is, previous knowledge was the base for advanced knowledge. Competence is either defined as the knowledge or experience of technologies or as the rules and procedures required to perform the repetitive 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 having to reinvent the wheel. Since future tasks and problems are presumed to be known, competence is defined and categorized in beforehand.

Over the past several years, however, the conception of work has changed from a focus on narrow and specific tasks carried out by individuals, constrained by rules and procedures, to be viewed as a collective effort conducted by teams with diverse skills working with considerable discretion judged on results and outcomes. Drucker (1988, 1993) coined the phrase ‘knowledge work’ in order to describe the increased importance of knowledge in the emerging postindustrial society. Recent literature on organization theory has discussed knowledge work in relation to knowledge-based organizations and knowledge-intensive workers (*see, e.g.*, Starbuck, 1992; Alvesson, 1993; Blackler, 1995; Boland & Tenkasi, 1995; Schultze, 1999). According to Starbuck’s (1992) definition, knowledge work is knowledge-intensive and requires a formal education, that is, abstract, technical, and theoretical knowledge. Furthermore, knowledge work can be characterized by variety, rather than routine and is problematic to describe in manuals, job descriptions, and charts (*see, e.g.*, Brown & Duguid, 1991; Nelsen, 1997). Knowledge work defies routinization and requires the use of creativity in order to produce idiosyncratic and esoteric knowledge (Blackler, 1995). Accordingly, knowledge work is disorderly in comparison with administrative or operational business processes in which tangible inputs are acted on and converted to outputs in some predictable and structured way. The inputs and outputs of knowledge work, that is, ideas, inspirations, are usually less tangible and discrete and in knowledge work there is no predetermined task sequences that, if correctly executed, guarantee the desired outcome (Davenport *et al.*, 1996). Finally, as pointed out by Davenport *et al.*, (1996), activities dealing with acquiring, creating, packing, and applying knowledge lie at the heart of any knowledge work, which in turn can be identified inside the core competence of more and more modern organizations across the service, industrial, and

governmental sectors (Prahalad & Hamel, 1990). Although it is easiest to appreciate the significance of knowledge work in organizations involved in leading edge technology development, the rapid pace of and change in today's market means, basically, that all organizations will increasingly rely on their ability to create new knowledge.

The knowledge-based organization, in contrast to the job-based, is based on a rationality that has much in common with descriptions such as organic organizations (Burns & Stalker, 1961) and emergent, almost-random organizations (Pfeffer, 1982). From this perspective, organizations are seen as open and dynamic systems (Burns & Stalker, 1961). The major issue for knowledge-based organizations is to find creative ways for representing and integrating knowledge across their lateral units (see, e.g., Weick & Roberts, 1993; Nonaka, 1994), and in such organizations dynamic processes and project groups will characterize work. This is a form of work that builds upon cooperation across boundaries, self-governing project groups, quick communication, and tight networks (Castells, 1996). It is simply a question of cooperation between people having different knowledge and experiences for the purpose of solving common problems (Nonaka, 1994; Brown & Duguid, 1998; Nonaka & Konno, 1998). This particular perspective on organizations is based on the idea that knowledge exists in a variety of forms, for example, tacit and explicit (Nonaka, 1994), in a variety of locations, for example, in the individuals, the brains, the dialogue, the group, and the organization (Blackler, 1995), and is continuously shaping and being shaped by the social practices of communities (Brown & Duguid, 1991; Boland & Tenkasi, 1995). Therefore, knowledge-based organizations can be seen as consisting of multiple communities with specialized expertise, that is, 'communities-of-knowing' (Boland & Tenkasi, 1995), 'communities-of-practice' (Lave & Wenger, 1990; Orr, 1990; Brown & Duguid, 1991), and 'communities-of-practitioners' (Blackler, 1995) and it is through the dynamic interactions between such communities that new configurations of knowledge emerge (Boland & Tenkasi, 1995). Expressed differently, knowledge is emergent (Weick & Robert, 1993), is not possessed by a single individual, and is never complete at any point (Tsoukas, 1996). Thus, in order to sustain their capability to perform, knowledge-based organizations must continuously maintain and develop their knowledge and utilize the existing knowledge that otherwise degenerates (Nonaka, 1994). Accordingly, in knowledge-based organizations both rule-bound action and novelty are present in order to find a balance between regularity and creativity or between 'exploitation' and 'exploration' (March, 1991; Tsoukas, 1996).

To solve tasks, knowledge-based organizations, according to Starbuck (1992), rely on knowledge workers and the organization-individual relation could be described as 'I pay you to think and not just to do'. Knowledge workers draw upon individual or collective knowledge

(Spender, 1996; Brown & Duguid, 1998; Cook & Brown, 1999) and creating new knowledge is vital for these workers in order to prevent themselves to be caught in competence traps (Levitt & March, 1988). However, the new knowledge need not be in the same area as the old knowledge. In the knowledge-based organization, competitive advantage on the organizational and the individual level is bounded to here and now. To learn C++, Visual Basic, or Java programming, it is not necessary to know how to program in BASIC, and, analogously, a BASIC programmer need not develop into a C++ programmer. Making lateral competence jumps instead of simply extrapolating the previous direction, stresses the importance also of unlearning in the knowledge-based organization. Competence has to be associated with processes of change and should be seen as dynamic, emergent, and situated in constantly evolving practice. Competence is therefore hard to define precisely and categorize in beforehand. Making knowledge workers 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. Individual autonomy is a basis for self-organizing and increases the likelihood that individuals will motivate themselves to continuous learning in terms of creating novel knowledge and developing new competencies (Nonaka, 1994). As stated previously in this paper, existing competence systems are designed based on a rationalistic perspective on competence (cf., Lindgren & Henfridsson, 2002). Such competence systems might work in a job-based organization, but do not support a knowledge-based organization. Consequently, there is a lack of contributions that deal with competence systems suited for organizational knowledge work practice. Competence systems for knowledge-based organizations, we argue, must be based on a richer understanding of competence including interest-driven working practice.

Research approach

Ordinary office activities performed by the organizational members leave behind tangible traces that can be exploited to deduct the nature of these activities. Tasks carried out on an Intranet can, for example, be captured in the form of web server log files, published documents, or submitted search engine queries. By exploiting a user's everyday actions in an unobtrusive manner, the Intranet activities a user is already engaged in during an ordinary workday can be aggregated and turned into an organizational benefit revealing otherwise invisible patterns (Stenmark, 2002).

On a corporate Intranet, where all material is work-related, it has been suggested that information retrieval systems could be used to reveal part of our tacit knowledge by making salient our search patterns (Stenmark, 2001). Elaborating on these ideas, 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 relation between interest and competence contrasts with the rationalistic view on competence as something well defined and stable and opens for new ideas about how to design competence systems better suited for the dynamic nature of knowledge work. To be able to study the relation between interest and competence, we implemented an interest-activated recommender system prototype on Volvo IT's Intranet.

Site

Volvo IT AB is the competence center for IT services within the Volvo Group. At the time of our research in the spring of year 2000, Volvo IT had approximately 2400 employees worldwide and some 900 of these worked at the headquarter in Gothenburg, Sweden.

In an attempt to take a firmer grip on its competence management, in late 1999 Volvo IT had initiated a pilot installation of Tieto Persona/Human Resource (TP/HR), which is a traditional competence system, 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 or techniques 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.

Though being an IT company, the legacy from the manufacturing industry was evident and the size of the company made it more hierarchically organized and somewhat more bureaucratic than smaller IT consultancy firms. For many decades, Volvo IT had benefited from its centralized mainframe operation, which had received several international awards for high efficiency and cost-effectiveness. As is often the case in industry settings, a high degree of standardization was typically the norm. However, in contrast to the highly controlled mainframe environment, the Intranet, consisting of over 700 web servers and approximately 750,000 web pages, was rather decentralized and characterized by a bottom-up ap-

proach. While the official information was maintained by appointed information providers via coherent structures and by using design guidelines, the major part of the Intranet structure, although containing much valuable information, seemed *ad hoc* and haphazard.

Recommender system prototype

Finding the right information was commonly conceived as a major problem at Volvo IT and to address this, a recommender system (RS) (Resnick & Varian, 1997) was implemented and evaluated in 1998 (see Stenmark, 2001). The primary objective of the RS prototype, which was based on AgentWare™ (Autonomy, 2001), was to provide the organizational members with relevant and targeted information retrieved from the corporate Intranet. The system regularly spidered the Intranet, and retrieved and synthesized every web document into a 0.5 K digital representation. Using this representation, the system allowed the users to create information agents, which search the created index for documents matching the users' interests. An interest was defined in a free text natural language sentence, that is, a richer representation of an interest than merely a keyword-based query from which the system created a 0.5 K digital representation. The search results from each agent were displayed in a simple list. When the user had read the results and identified one or more of the returned documents as relevant, the user could mark the document(s) that best represented his or her interest and click the retrain button. The digital signature of the agent was then merged with the signature(s) of the selected document(s) and the result became a new signature that replaced the previous one. This mechanism made it easy to update the agent profile to reflect one's actual interest.

Building on the experiences reported in Stenmark (2001), we designed and implemented a second RS prototype: The Volvo Information Portal (VIP). VIP was released on Volvo's Intranet in January 2000 and the 50 or so individuals who had participated in or otherwise shown an interest in our previous prototype were notified of its existence. No formal training was offered, but an introduction e-mail was submitted to all interested parties and the prototype had built-in help files. Although the prototype was not explicitly announced or promoted to the larger audience, being an Intranet application, it was generally available to all Volvo employees. When we conducted our research during the period April–June 2000, approximately 20 users had active agents.

In addition to the standard RS function of providing the employees with targeted and relevant information, we added a Find competence feature. This feature enabled the VIP users to enter a natural-language text describing a specific interest, for example, 'database administration on an Oracle system'. VIP would then list all users with matching agents, that is, all users who had agents actively searching for information related to the specified interest. Obviously, the VIP prototype did not locate people with

formalized competence but people with an interest. To label this feature 'Find competence' was a deliberate provocation intended to cause organizational members to reflect upon the relation between interest and competence.

Method

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 a mix between action research and case studies, that is, an action case study (Braa & Vidgen, 1999). 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 change-oriented part lies in our desire to make the organizational members aware of and appreciative of a broader understanding of competence and to inform the design of competence systems capable of embracing this new conception. The empirical data consist of 16 semistructured interviews with organizational members having used the VIP prototype. The interviews, each lasting approximately 1 h, 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 business analyst to technology watchers and systems developers, as shown in Table 1. All interviews were recorded and transcribed.

The data were then approached in an open-minded manner, meaning that we let the data itself suggest concepts and categories, rather than importing these from a preselected theory. In this aspect, our approach is similar to the open-coding technique used in grounded theory (Strauss & Corbin, 1990) although we do not subscribe to the entire framework. The data were thus categorized, conceptualized, and interpreted and the concepts derived were analyzed and evaluated in an iterative fashion where the initial categories were revised and refined until they sufficiently explained all data. Accordingly, the empirical results can be said to 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 relation between interest and competence.

Empirical results

Regarding the prototype's Find competence feature, it was evident that many users were uncertain of what this feature 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:

'First, I interpreted [the Find competence feature] as if you came to some kind of competence database. There is one competence database that I subscribe to where you search for competencies. 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.'

According to this software developer, competence is typically something that is formalized and refers to specific roles and work tasks within the organization. This was a rather typical attitude among the organizational members who thought of competence in terms of named entities and discrete levels. A department manager, when answering the question whether he thought the Find Competence feature in VIP could be of any use, gave an example of this position:

'Yes, definitely, if it took off and people started to use it. If we, for example, have a shortage in some situation... like, with Java, or if we are to start a new project and we need a particular sort of competence and we don't know where to find it. We're a big company, so there might be a Java programmer sitting idle somewhere... But some sort of grading scale for competencies would be needed.'

Furthermore, some respondents saw the Find competence feature as a way to become aware of areas where the organization did not have any competence. The absence of interests, one of the interviewed system programmers argued, reveals missing competencies within the organization:

'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. You could find areas that were neglected or where you were weak.'

The idea of using the prototype as an instrument 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

Table 1 The number of interviewees and their occupational roles

<i>Occupational role</i>	<i>#</i>
Systems developer	4
Technician	2
Project manager	2
Department manager	2
Human relation staff	2
Business analyst	1
Information staff	1
Technology watcher	1
Product manager	1
Sum	16

possibility of using the prototype for competence management:

'A personal agent speaks about an element that people want. Then maybe you realize, through analyzing personal agents, that 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 expresses a view on interest as a 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. There were, however, interviewees who 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 [than formal competence], because I do not 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. 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. This is not a problem, however, since it is essential for the organization to identify the driving forces among the employees. 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. When elaborating on how the prototype could be used, one technology watcher said:

'The most powerful thing I see is a possibility to visualize. If one can use VIP 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 of interests over time on an aggregated level, it is possible for the organization to trace the historical development of the employees' interests. Such an approach could facilitate the discovery of emerging new initiatives and hence have a strategic impact.

Relation between interest and competence

In this section, the different personal views of the relation 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 job-based and the knowledge-based organizations as well as to existing competence systems.

A considerable part of the interviewees discussed the prototype in relation to TP/HR, which is a competence system that embodies and expresses the rationalistic view of competence. The respondents 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; Spencer & Spencer, 1993). In line with the rationale of the job-based approach to organizing, the TP/HR system is based on formal descriptions of competencies in the form of skills related to certain tasks and can therefore be described as a traditional tool for managing competence. Most, if not all, of today's existing competence systems are designed with this rationalistic perspective on competence as a basis (see Lindgren & Henfridsson, 2002). 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 special 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. Interests, in regard to competence, were ignored by both the TP/HR system and by this category of respondents.

There were interviewees who recognized interests as essential because they say something about work-practices. 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. The respondents, for instance, discussed the possibility to have the VIP prototype update the content of the TP/HR system. Although the perspective of the relation between interest and competence expressed by these respondents also has its roots in the job-based approach to organizing, the importance of interest as an addition to the formalized view of competence was acknowledged. Embryos of competence systems supporting this perspective on competence can be seen in the form of features 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 (Lindgren, 2002a).

The most radical perspective found among the respondents suggested that interest is more important than formal competence. This way of understanding the interest-competence relation stresses the need for continuous competence development as a result of the

ever-changing environment. 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 knowledge work practice 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 knowledge-based 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 knowledge-based organization business rely more on identifying individuals with the ability to learn as they go along than on finding employees matching predefined and formalized competence descriptions. 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 we have illustrated in this paper.

Condensed into three categories, the different personal views of the relation between interest and competence are illustrated in Table 2.

The categories present how the interviewed people at Volvo IT perceived the relation between personal interest and competence. Although three perspectives were derived, the first category represents the dominating perspective within the organization. The second and third categories could be seen as products of this research's action orientation. In line with the rationale of action research (see, e.g., Susman & Evered, 1978; Argyris *et al.*, 1985; Baskerville & Wood-Harper, 1998; Braa & Vidgen, 1999), the intention was partly to make the organizational members aware of and appreciative of a broader understanding of competence and partly to inform the design of competence systems capable of embracing this new conception. A tangible result of our research is that Volvo IT has applied some of the ideas presented in this paper. Currently, Volvo IT in Gothenburg conducts a project that aims at improving the organization's competence management worldwide.

Based on the lessons learned from TP/HR and the VIP system, Volvo IT has decided that personal interest profiles should be included in the organization's competence descriptions (see Lindgren, 2002a).

Discussion

Since organizational members have varying perceptions of the relation between interest and competence, it seems important that competence systems of the future are able to accommodate a mix of these entities. Therefore, interests satisfying the need for up-to-date indications of competence 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 & 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 that plague traditional competence systems. Instead, interests must be derived unobtrusively from the users actions, while pursuing other tasks (Stenmark, 2001). Therefore, the 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. As we can see, the novel perspective on competence advocated in this paper has implications for competence systems design and such have also been suggested (see Lindgren & Stenmark, 2002). Although the work described here is based on the use of information seeking as a proxy for professional interests, there are other ways in which interests may be captured in an organizational context. For example, document management or content management systems may be used to derive what employees write about; e-mail and chat applications could capture what topics organizational members discuss; and subscription services might uncover what they read. This area offers many new opportunities for future research. Despite being in an organizational context where content and activities can be expected to be work related, personal integrity and privacy are nonetheless important

Table 2 Three categories of the interest-competence relation

<i>Category</i>	<i>Example of attitude</i>
Competence as a formal merit	Competence is formalized, categorized, and graded
Interest as a complementing aspect	Lack of interest indicates missing competence
Interests transcend competence	Interest and commitment is more important than formal competence

aspects to consider when leveraging interests. More research is therefore needed to understand the tradeoff between giving up personal details and gaining tangible benefits.

New and different IT artifacts *per se* are, however, seldom sufficient to improve work. Only when matched by appropriate organizational changes and managerial attitudes can the full potentials be unleashed. For the enriched interpretation of competence that also includes personal interest in effect to become useful, it must be paired with a corresponding change of management mindset. To give an example, consider two fictional IT companies, Alpha and Bravo. Alpha's management is characterized by a traditional view on competence and the company is equipped with a competence systems based on formalized competence descriptions, whereas Bravo has a management team who appreciate the intrinsic motivation of the employees and consequently has invested in an interest-driven competence system. Top management at the two companies decides to investigate whether WAP is a technology the companies should start to explore.

At Alpha, Jane, head of the software development department, gets the assignment and she assembles a team of three of her employees and tells them to do a 2-week evaluation of WAP technology from a business perspective. Jane picks the team members based on availability and does not consult the competence systems since she knows she would not find anything should she search for WAP. Meanwhile at Bravo, the assignment goes to John, who is managing their software development department. John realizes that there are probably a number of employees around the company who have already looked into WAP technology out of sheer interest. Using the interest-driven competency system, he quickly identifies eight different candidates. Seven of these belong to departments other than SW development. One is from marketing, another is with accounting, and some are from operations. Having consulted their managers, respectively, John selects three employees who get to do a 2-week evaluation. Note that we are not suggesting that interest should be used instead of formal competence. The team selected at Bravo is equally competent as the Alpha team in doing evaluation work. The difference between the two teams is, however, that the Bravo team has a head start since its members have much more preknowledge from personal experiences and an intrinsic motivation. Being sincerely interested, they have probably already played around with the technology, set up their own WAP servers, used or possibly also developed WAP services, bought and used WAP-phones, and read all there is to read in popular press. Our first managerial implication is therefore to actively take advantage of the interests of the organizational members.

Much if not all of the WAP knowledge gained by the Bravo team were probably acquired outside business hours during their spare time. It has been noted that employees driven by intrinsic motivation, and who thus

have extraordinary dedication and commitment, are willing to do far more than the company could possibly ask of them if only they were allowed to work with things in which they were really interested (Stenmark, 2000). Although the boundaries between business hours and spare time are blurring, organizations should not base their future competitiveness on their employees' willingness to do unpaid work. Instead, more slack should be allowed for the organizational members to explore and exploit their interests during office hours. Knowledge-based organizations cannot be managed with the rationalistic 'measure and control' attitude that has characterized the 20th century industry environment. Instead, it has been argued that innovation must be managed through a 'coach and facilitate' approach. Such a management style should acknowledge the need for redundancy, autonomy, intrinsic motivation, and give recognition to creative initiatives (cf., Nonaka, 1994; Scarbrough, 1999). When deadlines and budgets are cut so tight that the employees barely manage to do what is expected, their opportunities to pursue personal interests are limited. The sort of competence systems we advocate in this paper can only capture activities occurring at work. To be able to take advantage of such traces of work, our second managerial implication is that at least a minimum amount of redundancy must be allowed.

In hierarchical bureaucracies, it takes time for new trends and emerging interests at grass-root level to reach the top executives, be converted to official corporate strategy and implemented in traditional job descriptions and competence systems. By the time the process is completed and the new directives are communicated back to the employees, the interest and the business opportunity may be long gone. By empowering the employees to act autonomously and follow their interests, new, unplanned, and rapidly emerging 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 even though this means that they need to act outside of their job descriptions. Although such actions involve risk-taking and hence occasional failure, they should not only be considered acceptable but also necessary. Our third managerial implication is to allow employees to pursue interests outside their job descriptions.

Following emerging interests, communicating laterally, and crossing organizational borders may upset prevailing practices and established routines and can seem threatening to managers who see it as their duty to guard their own territory and their own resources. In job-based organizations, employees therefore cannot be encouraged to contribute to the success of external projects without returning tangible benefits also to their own organizational unit. Knowledge is power and knowledge sharing is typically conceived as a zero-sum game where if there is a winner there must be a loser. Recognizing that

work increasingly is performed not by isolated workers but by cross-organizational project groups and that sustainable knowledge creation and business innovation depend on mixing input from a variety of competencies, the knowledge-based organization should not engage in this sort of in-house competition and territorial warfare. For interest-activated competence systems to be successfully exploited, our fourth and final managerial implication is to encourage collaboration and cooperation.

Conclusions

Despite the fact that competence systems are supposed to support knowledge-based organizations, previous competence systems research shows that the systems do not fit this type of organization. Current competence systems conceptualize the workers as 'machines' without needs and wants, and consequently little attention has been paid to the individuals' own interests in their work.

In contrast, we have argued in favor of interest-activated technology for managing competence in knowledge-based organizations. Since personal interests highlight things for which individuals have a passion, competence systems should support expressions of inter-

ests so that they become visible and valued. As elaborated in this paper, the VIP prototype was primarily designed to cater for the interests of the organizational members. VIP is an example of interest-driven technology in the form of a recommender system and we have shown how it can be used as a competence management tool. Obviously, there are many other ways in which professional interests may be leveraged in an organizational setting and more research in this area is thus called for.

We have further elaborated on the notion of knowledge-based organization and contrasted it to the job-based organization. Our main conclusion is that the shift towards knowledge-based organizations that is currently taking place calls for a rethinking of current competence systems and that such a new approach has consequences for management. The four managerial implications identified and discussed in the paper are (1) actively utilize the interests of employees, (2) allocate slack time for employees to do skunk work, (3) empower employees to pursue interest outside their job descriptions, and (4) encourage employees to collaborate and actively share knowledge.

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