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skillMap: Identification of parallel developments and of Communities of Practice in distributed organizations

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ABSTRACT

Virtual and large organizations are facing issues of reduced knowledge transparency. Graph-based knowledge management (KM) systems promise to improve transparency: They visualize connections between individuals and fields of expertise and are thus able to display shared organizational context that may otherwise be buried in traditional document management systems. In this paper, we present a system called skillMap. It not only visualizes connections between knowledge entities, but is equally capable of automatically identifying undesired parallel developments and communities of practice. It includes people, skills and the relations between them. In this way, organizational knowledge communication is facilitated.

Keywords: social software, knowledge management, graph-based systems, social matching, communication support systems

1. INTRODUCTION

There is a lack of transparency of employees' knowledge and expertise in many large distributed organizations. People don't know who is dealing with what in which context. Undesirable parallel developments can result. Meanwhile, organizations seek to shape, identify and support Communities of Practices (CoP), informal groups of experts from various parts of the organization that get together around a specific topic [1]. Such CoPs play a vital role in organizational innovation processes [2] and thus drive organizational success.

So far, systems supporting Communities of Practice and the linkage between individuals for increased organizational transparency primarily target employees within an organization (for example Commetrix [3]). Yet, according to Trier's knowledge entity model [3; 4], individuals are only one out of four key knowledge entities that can be supported by KM applications. The other entities are actions/processes, documents and topics. Consequently, KM systems differ in scope when they include a different range of these entities. Equally, they vary in the degree to which they are able to communicate the links between these entities.

One way of supporting knowledge transparency inside organizations is to visualize the links between knowledge entities with the use of graph-based IT systems. Examples include Fujitsu's KnowWho system [5;6], which is based on the D-ABDUCTOR system [7] and Trier's Commetrix [3]. By visualizing complex knowledge domains, such systems reduce search complexity, raise awareness for closely entwined subjects and knowledge structures and are more natural and easy to use. As a result, they promise to enhance the *dissemination* of knowledge through the organization. Dissemination is crucial according to Takeuchi and Nonaka. They define KM as "the process of continuously creating new knowledge, disseminating it widely through the organization, and embodying it quickly in new products/services, technologies and systems" [8, pIX].

Another important aspect is that graph-based systems can operationalize shared organizational context or common ground, so-called "*ba*" [9]. In the absence of physical ba, shared relations, fields of expertise and shared interests create a common ground between individuals that is fruitful for their knowledge exchange. On a cognitive level, this common ground resides in shared interpretative frameworks [10]. By visualizing individuals that share relations, fields of expertise and interests, graph-based systems can lead to the identification of shared interpretative frameworks between individuals, triggering knowledge exchange and creation between them.

However promising graph-based systems may be with regard to dissemination and ba, they are limited to visualizations that are easily navigated and are effectively adopted and accepted by users. Ideally, a KM system

that supports the identification of shared context should therefore be easy to use, contain some automation to facilitate search and leave sufficient control in the hands of the users represented in the system. Transparency of where, how and why entities are interlinked is crucial. In the following section, we introduce a system that meets these requirements: the skillMap.

2. SUPPORTING KNOWLEDGE TRANSPARANCY WITH IT SYSTEMS

The skillMap is a web-based tool that is capable of (a) identifying individuals within an organization that work on the same subject or have expertise in common without knowing each other (possible parallel development), (b) identifying groups of individuals that exchange knowledge and have a connection to a shared area of expertise or interest (possible Community of Practice).

These functions are achieved by connecting two graphs: A skill inventory graph (SIG) and a social network graph (SNG). In the SIG, all fields of work and expertise within an organization are connected, forming a general undirected graph that has both hierarchic as well as non-hierarchic freely labelled connections. A social network analysis leads to the construction of the SNG and every member of the organization can then be assigned to or assign himself to fields of expertise in the SIG (see figure 1).

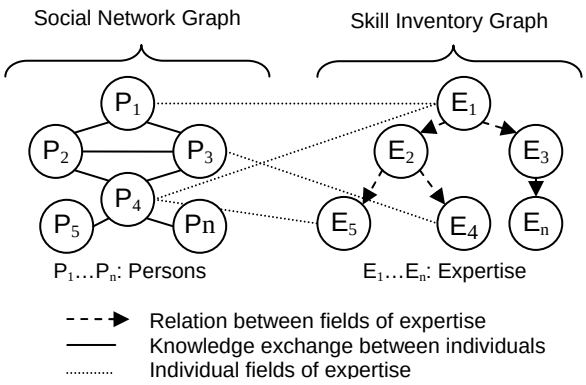

Figure 1: Graph structure underlying the skillMap system

The initial social network graph is elicited through a web-based social network questionnaire. After the construction of the initial graph, users can manually add other users to their individual network. The social network graph is thus dynamically created by organizational members. Separate from this dynamic community growth, a basic skill inventory graph is elicited through workshops, group discussions or existing knowledge ontologies. Ideally, users can freely change and adapt this skill inventory after system roll-out; a means to continuously enhance and mirror a firm's knowledge ontology. Similar to Wiki-Webs, the graph is expected to converge towards a stable state.

3. IT BACKGROUND AND EXAMPLES

skillMap is currently under evaluation at the German Research Centre for Internet Economics (InterVal) where it is used under realistic circumstances since mid-August 2005. The following example configurations indicate where the system would assume a possible unrecognized parallel development (Figure 2) and a possible Community of Practice (Figure 3). Figure 4 shows the skillMap's visualization of organizational context of an employee. Around the highlighted individual in the center, his fields of expertise are visible. Furthermore, the people he exchanges knowledge with and their fields of expertise are visible. The algorithms for automatic similarity discovery in more complex networks are currently under development. They will allow to automate search for this type of pattern in the overall structure.

skillMap is implemented in Java and relies on the JavaWebStart technology for launching the application. The client browser requires JRE 1.4 or higher and the application WebStart which are available for all platforms from SUN. For visualization of the graphs, preFuse [11] is used. For describing the graphs and for data exchange between client and server, XGMML [12] is employed.

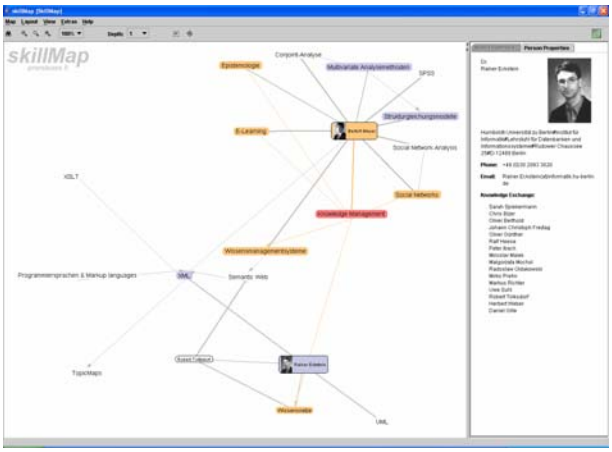

Figure 2: Possible unrecognized parallel development: Two individuals work with the same technology (XML) and have expertise in similar fields (Knowledge Networks & KM resp, path distance = 1) but do not know each other. In this case, the SkillMap will automatically inform both individuals of the other.

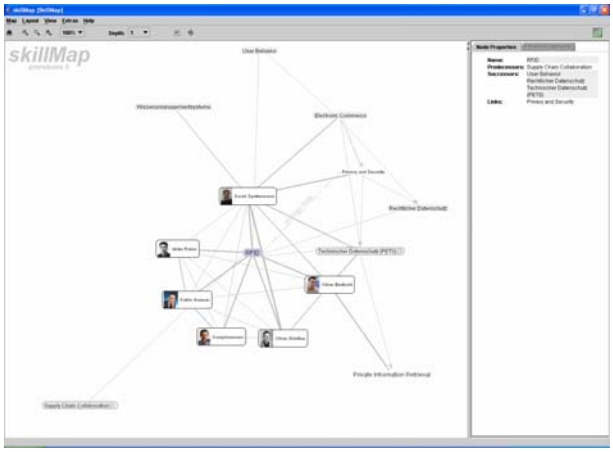

Figure 3: Possible Community of Practice: A group of individuals share expertise in the same field (RFID) and know each other. The system would automatically identify this group and would suggest its organizational support.

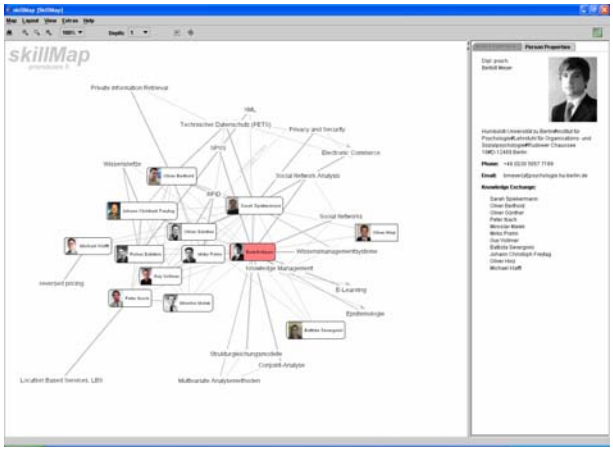

Figure 4: Visualization of organizational context. After log-in, the user is presented with his fields of interests and expertise, the people he exchanges knowledge with and with their fields of expertise and interests.

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