Chapter 2.18
Intelligent Search for Experts Using Fuzzy Abstraction Hierarchy in Knowledge Management Systems

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ABSTRACT

In knowledge management systems (KMS), managing explicit knowledge is comparatively easy using information technology such as databases. However, tacit knowledge, usually possessed by human experts in unstructured forms such as know-how and experiences, is hard to systemize. Recent research has shown that it is more effective to provide search mechanisms for experts than to directly search for specific knowledge itself in KMS to pinpoint experts with needed knowledge in the organizations so that users can acquire the knowledge from the found experts. In this article, we propose an intelligent search framework to provide search capabilities for experts who not only match search conditions exactly but also belong to the similar or related subject fields according to the user's needs. In enabling intelligent searches for experts, the Fuzzy Abstraction Hierarchy (FAH) framework has been adopted. Based on FAH, searching for experts with similar or related expertise is facilitated using the subject field hierarchy defined in the system. While adopting FAH, a text categorization approach based on Vector Space Model is also utilized to overcome the limitation of the original FAH framework. To test applicability and practicality of the proposed framework, the prototype system, "Knowledge Portal for Researchers in Science and Technology" sponsored by the Ministry of Science and Technology (MOST) of Korea, has been developed.

INTRODUCTION

Managing tacit knowledge, which is usually embedded in the operating procedures as routines or standards in the organizations, has been considered as important as or even more important than managing its counterpart, explicit knowledge, to stay competitive in the business world (Hansen, Nohria, & Tierney, 1999; Kakabadse, Kouzmin & Kakabadse, 2001; King, 2006; Nonaka & Takeuchi, 1995). Therefore, the need for the effective management of tacit knowledge has been taking up much of the research time and effort by knowledge management system (KMS) researchers and practitioners (Kwan & Cheung, 2006; Liebowitz, 2001; Nah, Siau & Tian, 2005; Rus & Lindvall, 2002; Siau, 2000; Zack, 1999). However, the results of the research effort to develop an effective and efficient way to store, retrieve, and share tacit knowledge has not been successful enough to be widely accepted in practice due to its limited applicability and inflexibility.

Examples of the research in this direction include best practice systems in which organizational best practices are stored in the database for later uses (O'Dell & Grayson, 1998; Sorensen & Snis, 2001). In addition, design rationale systems can be another example, through which design rationale is represented and maintained (Buckingham-Shum & Hammond, 1994; Conklin & Yakemovic, 1991; Hu, Pang, Pang, Atwood, Sun, & Regli, 2000). However, since the former requires context-specific knowledge for someone to fully take advantage, it has not been actively utilized in a real business environment. Also, due to its limited applicability and domain dependency, a single design rationale system cannot be used across many different fields. In the meantime, other research in manipulating tacit knowledge proposes providing appropriate ways to search for individual experts in the organizations rather than deliberately codifying their knowledge (Alavi & Leidner, 2001; Desouza, 2003). This search approach for experts can be applied to almost any domain due to its generality while avoiding the possible degradation of the knowledge resulted from the deliberate separation of it from the holders (Augier & Vendelo, 1999; Desouza, 2003; Kreiner, 2002). Following this type of research, some of commercial KM tools started to include search functionality for experts in their suites (Handysoft, 2003; Microsoft, 2004; Verity, 2004).

To enable the search functionality for experts, the experts themselves in the organization should be identified in terms of the type of expertise they possess. There can be two approaches for compiling this expertise information. One is a manual registration approach which requires the system administrator or the expert to put the expertise information into the system. The other is to automate the expert profiling process based on the knowledge activities of each expert in KMS. Most of commercial KM products with search functionality for experts adopt the former approach which requires constant human intervention to keep expert profile information current. The maintenance cost of profile information is not the only disadvantage of this approach. Other shortcomings of manual profiling include (1) the difficulty of reflecting the changes in each subject field such as new concepts or terminology that continue to evolve, (2) the difficulty of maintaining objectivity and consistency in classifying experts or measuring the level of expertise by people involving the classifying task, either the experts themselves or system administrators, and (3) the lack of expertise in classifying all the experts in many different subject fields if the classifying task is done by one person. Considering all those limitations of the manual profiling approach, it is needed to have an efficient as well as automatic way to build and maintain those expert profiles using an objective classifying methodology.

Analyzing the knowledge artifacts registered by experts such as uploaded documents or posted articles on bulletin boards and classifying those artifacts into predefined subject fields are the most feasible ways to automate the expert profiling