Chapter 9
Ontologies in Expertise Finding Systems: Modeling, Analysis, and Design

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ABSTRACT
Knowledge Management Systems that enhance and facilitate the process of finding the right expert in an organization have gained much attention in recent years. This chapter explores the potential benefits and challenges of using ontologies for improving existing systems. A modeling technique from requirements engineering is used to evaluate the proposed system and analyze the impact it would have on the goals of the stakeholders. Based on the analysis, an ontology-based expertise finding system is proposed. This chapter also discusses the organizational settings required for the successful deployment of the system in practice.

INTRODUCTION
Expert profiling and identification are important to both organizations and knowledge workers. In today’s competitive business environment, companies need to understand the skills and competency of their human resources in order to best utilize them. This is particularly important for organizations that engage with multiple and changing clients such as consulting firms and software development companies since these organizations need to be able to flexibly respond to internal and external demands for skills and competencies.

From a knowledge worker’s perspective, finding individuals with appropriate skills and knowing who to go to are important for accomplishing
knowledge intensive tasks and solving complex problems. For these purposes, people often rely on their past experiences, existing documents, and others who have the needed expertise. Two main motives for seeking an expert are (1) finding a source of information and (2) finding someone who can perform a given task (Yimam-Seid & Kobsa, 2003). Finding an expert for these purposes, however, might not be an easy task for many reasons. Expertise is highly dynamic (Maybury, 2006), difficult to quantify (Earl, 2001), and varying in level (Earl, 2001). When expert involvement in a given activity is required, it is also necessary to know if the expert is actually competent enough to perform the task in addition to being knowledgeable in the field. It is also difficult to validate other people’s expertise (Maybury, 2006) and to distinguish a good expert from a bad one. Furthermore, due to the complexity of some problems, the assistance of multiple experts may be required (Earl, 2001). The difficulty of locating experts increases in larger and more geographically distributed organizations and communities.

In order to augment and assist the process of locating expertise within an organization, the study and development of special Knowledge Management Systems that suggest people who have some expertise in a given area, has received the attention of both researchers and organizations. The resulting systems either rely on individuals to provide accurate and comprehensive profiles of their competences and experiences (Earl, 2001), or use mechanisms to automatically discover up-to-date expertise information from secondary sources such as articles, email communications, and forums (Stankovic, Wagner, Jovanovic, & Laublet, 2010; Yimam-Seid & Kobsa, 2003). In a review of these systems in Yimam-Seid and Kobsa (2003); however, problems related to heterogeneous information sources, expertise analysis support, and interoperability were identified.

The common solution to the problems related to heterogeneous information sources and interoperability is to formally specify the meaning of the terminology of each system and to define a mapping between these terminologies. In other words, use ontologies to provide a shared common understanding of the structure of information among systems and software agents. In addition, because of their powerful knowledge representation formalism and associated inference mechanisms (Razmerita, Angehrn, & Maedche, 2003), ontologies can also be incorporated to address problems related to expertise analysis support.

Taking these facts into account, it would seem natural to expect that Expertise Finding Systems (EFS) can benefit from the use of ontologies. However, there are various potential difficulties and challenges associated with the use of ontologies that may cause the system to fail. In this chapter, we are interested in investigating the circumstances under which an ontology-based EFS might or might not work. More specifically, we want to systematically explore and analyze how ontologies might be used in EFS, before creating a prototype and conducting case studies. For this, we use a modeling technique from requirements engineering to evaluate the proposed ontology-based EFS and analyze the impact that it would have on the goals of the stakeholders. This chapter extends our previous work in (Fazel-Zarandi & Yu, 2008) with a more extensive literature review, a description of our proposed ontology-based EFS based on the analysis, and a more detailed discussion of areas of future work.

The organization of this chapter is as follows: A brief presentation of related work on Expert Finding Systems and the role that ontologies can play in such systems is followed by knowledge management analysis and a discussion of knowledge processes, knowledge markets between individuals, and role of technology supported by goal models developed using the i* notation. The required organizational settings for a successful deployment of the technology are also elaborated on in this section. Our proposed ontology-based EFS is then presented. Finally, the chapter con-