

## Chapter 2.18

# Developing Knowledge Management Systems from a Knowledge-Based and Multi-Agent Approach

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### ABSTRACT

Developing knowledge management systems is a complicated task since it is necessary to take into account how the knowledge is generated, how it can be distributed in order to reuse it, and other aspects related to the knowledge flows. On the other hand, many technical aspects should also be considered such as what knowledge representation or retrieval technique is going to be used. To find a balance between both aspects is important if we

want to develop a successful system. However, developers often focus on technical aspects, giving less importance to knowledge issues. In order to avoid this, we have developed a model to help computer science engineers to develop these kinds of systems. In our proposal we first define a knowledge life cycle model that, according to literature and our experience, ponders all the stages that a knowledge management system should give support to. Later, we describe the technology (software agents) that we recommend

to support the activities of each stage. The article explains why we consider that software agents are suitable for this end and how they can work in order to reach their goals. Moreover, a prototype that uses these agents is also described.

## INTRODUCTION

In the last decades, knowledge management (KM) has captured enterprises' attention as one of the most promising ways to reach success in this information era (Malone, 2002). A shorter life cycle of products, globalization, and strategic alliances between companies demand a deeper and more systematic organizational knowledge management. Consequently, one way to assess an organization's performance is to determine how well it manages its critical knowledge.

In order to assist organizations to manage their knowledge, systems have been designed. These are called knowledge management systems (KMS), defined by Alavi and Leidner (2001) as IT-based systems developed to support/enhance the processes of knowledge creation, storage/retrieval, transfer, and application.

However, developing KMS is a difficult task; since knowledge *per se* is intensively domain dependent whereas KMS often are context specific applications. Thus, reusability is a complex issue. On the other hand, the lack of sophisticated methodologies or theories for the extraction of reusable knowledge and reusable knowledge patterns has proven to be extremely costly, time consuming, and error prone (Gkotsis, Evangelou, Karacapilidis & Tzagarakis, 2006). Moreover, there are several approaches towards KMS developing. For instance, the process/task based approach focuses on the use of knowledge by participants in a project, or the infrastructure/generic system based approach focuses on building a base system to capture and distribute knowledge for use throughout the organization (Jennex, 2005). On the other hand, before developing this kind of

system it is advisable to study and understand how the transfer of knowledge is carried out by people in real life. However, when developing KMS, developers often focus on the technology without taking into account the fundamental knowledge problems that KMS are likely to support (Hahn & Subramani, 2000).

Different techniques have been used to implement KMS. One of them, which is proving to be quite useful, is that of intelligent agents (van Elst, Dignum & Abecker, 2003). Software agent technology can monitor and coordinate events or meetings and disseminate information (Wooldridge & Jennings, 1995). Furthermore, agents are proactive in the sense that they can take the initiative and achieve their own goals. The autonomous behavior of the agents is critical to the goal of this research since it can reduce the amount of work that employees have to perform when using a KM system. Another important issue is that agents can learn from their own experience. Consequently, agent systems are expected to become more efficient with time since the agents learn from their previous mistakes and successes (Maes, 1994).

Because of these advantages, different agent-based architectures have been proposed to support activities related to KM (Gandon, 2000). Some architectures have even been designed to help in the development of KMS. However, most of them focus on a particular domain and can only be used under specific circumstances. What is more, they do not take into account the cycles of knowledge in order to use knowledge management in the system itself. For these reasons, in this article we propose a generic model for developing KMS. Therefore, in the next section we describe the model and the software agents that we propose to support it. In the following section, we explain how the agents are structured and how they have been modeled using the INGENIAS methodology. Later, the next section describes a prototype that we are implementing by using the agents proposed in the model. The following section summarizes

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