Creating Superior Knowledge Discovery Solutions

Nilmini Wickramasinghe
Illinois Institute of Technology, USA

INTRODUCTION

The information age has made information communication technology (ICT) a necessity for conducting business. This in turn has led to the exponential increase in the electronic capture of data and its storage in vast data warehouses. In order to respond quickly to fast changing markets, organizations must maximize these raw data and information resources. Specifically, they need to transform them into germane knowledge to aid superior decision-making (Wickramasinghe & von Lubitz, 2006). To do this effectively not only involves the analysis of the data and information but also requires the use of sophisticated tools to enable such analyses to occur. Knowledge discovery technologies represent a spectrum of new technologies that facilitate the analysis of data to find relationships from the data to finding reasons behind observable patterns (i.e., transform the data into relevant information and germane knowledge). Such new discoveries can have a profound impact on decision making in general and the designing of business strategies. With the massive increase in data being collected and the demands of a new breed of intelligent applications like customer relationship management, demand planning, and predictive forecasting, these knowledge discovery technologies are becoming competitive necessities for providing a high performance and feature rich intelligent application servers for intelligent enterprises.

Knowledge management (KM) tools and technologies are the systems that integrate various legacy systems, databases, ERP systems, and data warehouse to help facilitate an organization's knowledge discovery process. Integrating all of these with advanced decision support and online real time events enables an organization to understand customers better and devise business strategies accordingly. Creating a competitive edge is the goal of all organizations employing knowledge discovery for decision support (Thorne & Smith, 2000).

The following provides a synopsis of the major tools and critical considerations required to enable an organization to successfully effect appropriate knowledge sharing, knowledge distribution, knowledge creation, as well as knowledge capture and codification processes and hence embrace effective knowledge management (KM) techniques and advanced knowledge discovery.

BACKGROUND

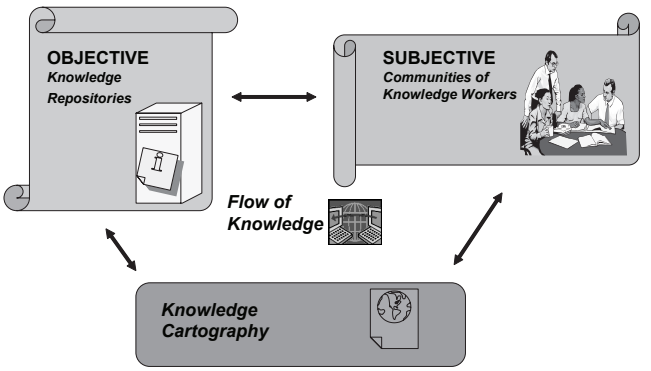
A necessary but not sufficient consideration to facilitate the generation of superior knowledge discovery solutions is the establishment of a sound KM infrastructure (Wickramasinghe et al., 2006). The KM infrastructure, in terms of tools and technologies, (hardware as well as software) should be established so that knowledge can be created from any new event or activity, which in turn will ensure that the extant knowledge base continuously grows (Wickramasinghe, Fadlalla, Geisler, & Schaffer, 2003; Wickramasinghe & Bali, 2006). The entire new know-how or new knowledge can only be created for exchange if the KM infrastructure is established effectively. Critical components of such a KM infrastructure include a repository of knowledge, and networks to distribute the knowledge to the members of organization and a facilitator system for the creation of new knowledge. Such a knowledge-based infrastructure will foster the creation of knowledge, and provide an integrated system to share and diffuse the knowledge in the organization (Srikantaiah & Koenig, 2000).

KNOWLEDGE ARCHITECTURE

Architecture, specifically the information technology architecture is an integrated set of technical choices used to guide an organization in satisfying its business needs (Weil & Broadbent, 1998). Underlying the knowledge architecture (Wickramasinghe, 2003; Wickramasinghe, 2005; refer to Figure 1) is the recognition of the binary nature of knowledge; namely its objective and subjective components. What we realize when we analyze the knowledge architecture closely, is that knowledge is not a clearly defined, easily identifiable phenomenon, rather it has many forms which makes managing it even more challenging (Schultz & Leidner, 2002; Wickramasinghe, 2005).

The knowledge architecture depicted in Figure 1 recognizes the two different, yet key aspects of knowledge; namely, knowledge as an object and a subject. By doing so, it provides the blue prints for an all encompassing knowledge management system (KMS). The pivotal function underlined by the knowledge architecture is the flow of knowledge. The

Figure 1. The knowledge architecture (Adapted from Wickramasinghe & Mills, 2001)



flow of knowledge is fundamentally enabled (or not) by the knowledge management system.

KNOWLEDGE MANAGEMENT SYSTEMS

Given the importance of knowledge, systems are being developed and implemented in organizations that aim to facilitate the sharing and integration of knowledge (i.e., support and facilitate the flow of knowledge). Such systems are called knowledge management systems (KMS) as distinct from transaction processing systems (TPS), management information systems (MIS), decision support systems DSS), and executive information systems (EIS) (Alavi & Leidner, 1999). For example, Cap Gemini Ernst & Young, KPMG, and Acenture all have implemented KMS (Wickramsinghe, 2003). In fact, the large consulting companies were some of the first organizations to realize the benefits of knowledge management and plunge into the knowledge management abyss. These companies treat knowledge management with the same high priority as they do strategy formulation, an illustration of how important knowledge management is viewed in practice (Wickramasinghe, 2003). Essentially, these knowledge management systems use combinations of the following technologies: the Internet, intranets, extranets, browsers, data warehouses, data filters, data mining, client server, multimedia, groupware, and software agents to systematically facilitate and enable the capturing, storing, and dissemination of knowledge across the organization (Alavi et al., 1999; Davenport & Prusak, 1998; Kanter, 1999). Unlike, other types of information systems, knowledge management systems can vary dramatically across organizations. This is appropriate if we consider that each organization's intellectual assets, intangibles, and knowledge should be to a large extent unique and thus systems enabling their management should in fact differ.

KNOWLEDGE MANAGEMENT TOOLS AND TECHNIQUES

KM tools and techniques are defined by their social and community role in the organization in (1) the facilitation of knowledge sharing and socialization of knowledge (production of organizational knowledge); (2) the conversion of information into knowledge through easy access, opportunities of internalization and learning (supported by the right work environment and culture); (3) the conversion of tacit knowledge into "explicit knowledge" or information, for purposes of efficient and systematic storage, retrieval, wider sharing, and application. The most useful KM tools and techniques can be grouped as those that capture and codify knowledge and those that share and distribute knowledge (Duffy, 2000, 2001; Maier, 2001).

Capture and Codify Knowledge

There are various tools that can be used for capture and codify knowledge. These include databases, various types of artificial intelligence systems including expert systems, neural networks, fuzzy logic, genetic algorithms, and intelligent or software agents.

Databases

Databases store structured information and assist in the storing and sharing of knowledge. Knowledge can be acquired from the relationships that exist among different tables in a database. For example, the relationship that might exist between a customer table and a product table could show those products that are producing adequate margins, providing decision-makers with strategic marketing knowledge. Many different relations can exist and are only limited by the human imagination. These relational databases help