Technologies in Support of Knowledge Management Systems

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INTRODUCTION

Knowledge management systems (KMSs) support the various knowledge management (KM) functions of knowledge capture, storage, search, retrieval, and use. To do this, KMSs utilize a variety of technologies and enterprise systems. This chapter surveys the various technologies and enterprise systems. Specific attention is placed on enterprise systems that integrate KM into organizational business processes, and technologies that enhance the effectiveness of these implementations. The chapter is based primarily on research summarized in *Case Studies in Knowledge Management* (Jennex, 2005a) and articles published by the Knowledge Management Track at the Hawaii International Conference on System Sciences (HICSS).

BACKGROUND

Knowledge

Davenport and Prusak (1998) view knowledge as an evolving mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information. They found that in organizations, knowledge often becomes embedded in artifacts such as documents, video, audio, or repositories and in organizational routines, processes, practices, and norms. They also say that for knowledge to have value, it must include the human additions of context, culture, experience, and interpretation. Nonaka (1994) expands this view by stating that knowledge is about meaning in the sense that it is context specific. This implies that users of knowledge must understand and have experience with the context, or surrounding conditions and influences in which the knowledge is generated and used for it to have meaning to them. This also implies that for a knowledge repository to be useful, it must also store the context in which the knowledge was generated. That knowledge is context specific argues against the idea that knowledge can be applied universally, however it does not argue against the concept of organizational knowledge. Organizational knowledge is considered to be an integral component of what organizational members remember and use, meaning that knowledge is actionable.

Polanyi (1967) and Nonaka and Takeuchi (1995) describe two types of knowledge, tacit and explicit. Tacit knowledge is that which is understood within a knower's mind, and which cannot be directly expressed by data or knowledge representations and is commonly understood as unstructured knowledge. Explicit knowledge on the other hand is that knowledge which can be directly expressed by knowledge representations and is commonly known as structured knowledge. Current thought has knowledge existing as neither purely tacit nor purely explicit. Rather, knowledge is a mix of tacit and explicit, with the amount of explicitness (only one dimension needs to be measured) varying with each user. This is the knowledge continuum where purely tacit and purely explicit form the end points, with knowledge existing somewhere on the continuum between the two end points. Smolnik, Kremer, and Kolbe (2005) have an individual position of knowledge on the continuum through context explication, where context explication reflects the experience and background of the individual. Nissen and Jennex (2005) expand knowledge into a multidimensional view by adding the dimensions of reach (social aggregation), lifecycle (stage of the knowledge lifecycle), and flow time (timeliness) to explicitness. Research is continuing to refine the concept of knowledge and its dimensions.

Knowledge Management

Jennex (2005c) utilized an expert panel, the editorial review board of the *International Journal of Knowledge Management,* to generate a definition of KM as the practice of selectively applying knowledge from previous experiences of decision making to current and future decision-making activities, with the express purpose of improving the organization's effectiveness. Another key definition of KM includes Holsapple and Joshi (2004) who consider KM as an entity's systematic and deliberate efforts to expand, cultivate, and apply available knowledge in ways that add value to the entity, in the sense of positive results in accomplishing its objectives or fulfilling its purpose. Finally, Alavi and Leidner (2001) concluded that KM involves distinct but interdependent processes of knowledge creation, knowledge storage and retrieval, knowledge transfer, and knowledge application. Taken in context, these definitions of KM focus on the key elements of KM: a focus on using knowledge for

decision making and selective knowledge capture. This is important as the selective focus on knowledge capture separates KM from library science, which attempts to organize all knowledge and information, and the decision-making focus emphasizes that KM is an action discipline focused on moving knowledge to where it can be applied. Ultimately, KM may best be described by the phrase, "getting the right knowledge to the right people at the right time," and can be viewed as a knowledge cycle of acquisition, storing, evaluating, dissemination, and application.

Knowledge Management Systems

Jennex (2005c) views a KM system as that system created to facilitate the capture, storage, retrieval, transfer, and reuse of knowledge. The perception of KM and KMSs is that they holistically combine organizational and technical solutions to achieve the goals of knowledge retention and reuse to ultimately improve organizational and individual decision making. This is a Churchman (1979) view of KM that allows KMSs to take whatever form necessary to accomplish these goals. Alavi and Leidner (2001, p. 114) defined KMSs as "IT-based systems developed to support and enhance the organizational processes of knowledge creation, storage/retrieval, transfer, and application." They observed that not all KM initiatives will implement an IT solution, but they support IT as an enabler of KM. Maier (2002) expanded on the IT concept for the KMS by calling it an information and communication technology (ICT) system that supported the functions of knowledge creation, construction, identification, capturing, acquisition, selection, valuation, organization, linking, structuring, formalization, visualization, distribution, retention, maintenance, refinement, evolution, accessing, search, and application. Stein and Zwass (1995) define an organizational memory information system (OMS) as the processes and IT components necessary to capture, store, and apply knowledge created in the past on decisions currently being made. Jennex and Olfman (2006) expanded this definition by incorporating the OMS into the KMS, and adding strategy and service components to the KMS.

INTERNET KMS

Discussion

One of the most commonly cited KMS success factors (Jennex & Olfman, 2005) is having an integrated technical infrastructure including networks, databases/repositories, computers, software, and KMS experts. KM designers are using the Internet to obtain this integrated network and are using browsers as common software. Various approaches are being utilized by KMS designers to achieve common databases and repositories. Common taxonomies and ontologies are being used to organize storage of unstructured knowledge files and to facilitate knowledge retrieval, while other Internet-based KMSs serve as interfaces to large enterprise databases or data warehouses. Some Internet KMSs are being used to facilitate communication and knowledge transfer between groups. Knowledge portals are being used by organizations to push knowledge to workers and be communities of practice (CoPs) to facilitate communication and share knowledge between community members. The following section describes some examples of Internet-based KMSs.

Internet networks can be scaled to fit any size KMS. Browsers can be tailored to fit processes as desired. Taxonomies can be created that support unstructured knowledge sharing for any size KMS. The following examples illustrate this flexibility as the examples include a project KMS, an industry-wide project KMS, and an enterprise KMS. Knowledge portals can be scaled to fit either form of KMS but are more commonly used for enterprise KMS. A community of practice KMS is a variation of process/task KMSs.

Examples of Internet-Based KMSs

Project-Based KMS for a Single Organization

Jennex (2000) discussed an intranet-based KMS used to manage knowledge for a virtual Y2K project team. This KMS used two different site designs over the life of the project. The purpose of the initial site was to facilitate project formation by generating awareness and providing basic information on issues the project was designed to solve. The design of this site was based on Jennex and Olfman (2002), who suggested a structure providing linkages to expertise, and lessons learned were the knowledge needed by knowledge workers. This was accomplished by providing hot links to sites that contained Y2K knowledge, a project team roster that indicated the areas of expertise for each of the project team members and additional entries for individuals with expertise important to the project, and some basic answers to frequently asked questions. This site was accessed from the corporate intranet site through the special projects section of the IT division page. This made the site hard to find for those who did not know where to look, forcing the project team leadership to provide direction to the site through e-mail directions. The site did not contain guidelines and accumulated knowledge as reflected in test plans, test results, inventories of assets referenced to the division who owned them, and general project knowledge such as project performance data, meeting minutes and decisions, presentations, and other project documentation. This information had not