Client/Server and the Knowledge Directory

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INTRODUCTION

Data, information, and knowledge are three related but not interchangeable concepts. Data are a set of discrete, objective facts about events. Information is organized data presented in context. Data become information when their creator adds meaning or value. Similarly, knowledge derives from information as information derives from data. Knowledge can be viewed as information in context, together with an understanding of how to use it. Knowledge can be either explicit (knowledge for which a person is able to make available for inspection) or tacit (knowledge for which a person is unable to make available for inspection) (Brooking, 1999; Davenpot & Prusak, 1998). In Table 1, a list of knowledge that is particularly critical for business organizations is given.

Knowledge is an intellectual property that although paid for in part by the employer is a difficult asset to control, as it is fragmented in documents, policies, procedures, and other data storage mediums. Another challenge for management is to retain this knowledge in a form that is easily retrievable. This is not an easy task, since the enterprise must first identify the location of all needed knowledge, and second, determine the easiest way to retrieve it.

There are many definitions of knowledge management, but the Gartner Group (1999) description seems most appropriate for the perspective expressed in our article: "Knowledge management promotes an integrated approach to identifying, capturing, retrieving, sharing, and evaluating an enterprise's information assets. These information assets may include databases, documents, policies and procedures, as well as the un-captured tacit expertise and experience stored in individual workers' heads."

This definition implies that information assets are plentiful and are stored in numerous locations throughout the organization. Storage options include documents, documents in document management systems, groupware such as Lotus Notes, and expert or knowledge-based systems (Brooking, 1999). Physically these information assets can be electronically stored on compact disk, laser disk, mechanical hard drives, microfilm, microfiche, and embedded in computer programs. Further, information assets are also stored in books, documents, and other paper-based medium.

BACKGROUND

In a world of multiple computer languages, database management systems, assorted collaborative and group support software, network technologies, and data storage methods, it can be a difficult and complex problem to

Table 1. Knowledge that is particularly critical (Brooking, 1999)

• Knowledge of a particular job
• Knowledge of who knows what in a company
• Knowledge of how to get things done in a company using the corporate culture
• Knowledge of who is best to perform a particular job or task
• Knowledge of corporate history (how and why)
• Knowledge of business customs
• Knowledge of a particular customer account
• Knowledge of how to put together a team that can achieve a particular task
• Knowledge of how to approach a particular problem which is difficult to solve

locate and retrieve enterprise knowledge. If KM promotes an integrated approach to identifying, capturing, retrieving, sharing, and evaluating an enterprise's information assets, then the challenge is to create a knowledge management system in order to get the right information to the right person at the right time.

"An integrated and integrative technology architecture is a key driver for Knowledge Management Systems (KMS) … KMS seem to require a variety of technologies: database and database management, communication and messaging, and browsing and retrieval. The need for seamless integration of the various technologies may lead to the dominance of the Internet and Internet-based KMS architectures" (Alavi & Leidner, 1999). Alavi and Leidner (1999) also note that "organizational intranets will also play a dominant role in support of internal knowledge management activities due to cost-effective technical capabilities including: access to the legacy systems, platform independence, access to multimedia data formats, a uniform and easy-to-use point-and-click interface, and capability for easy multi-media publication for knowledge sharing."

A CLIENT/SERVER ARCHITECTURE FOR KMS

Computing sources for the first 30 years of the information technology revolution were dominated by isolated hardware and network environments. Mainframes, mini-computers and local area networks were initially set up to support specific business functions. Each computing complex was installed with a separate physical data network. IBM mainframes used coaxial cable and 3270 terminal emulation and the IBM System 38 mini-computer used twin-axial cable and 5250 terminal emulation. Local area networks used their own respective cabling medium and data network architecture. As a result, these environments were isolated and data sharing was almost impossible (Kern et al., 1998).

Information systems written for these monolithic computer complexes contain three basic components: a presentation layer, a processing layer, and a data storage layer (Boar, 1996; Borthick & Roth, 1994). All three layers execute on one hardware platform. During the 1980s and 1990s, multiple protocol support between different platforms across inexpensive connections became more common. This connectivity enhancement helped the development of client/server technologies, which distributed these layers across hardware and operating systems platforms (Boar, 1996; Duchessi & Chengalur-Smith, 1998; Schulte, 1995). A client/server architecture consists of three layers: the presentation layer, the business logic layer, and the data layer. A two-tier client/server architecture places the presentation layer on the client and data layer on the server. The business layer may reside on either the client or server, or both. A three-tier client/server architecture places the presentation layer on the client, the business logic layer on a middle tier, and the data layer on a server. Although there are many variation of the client/server model, two-tier and three-tier are the two basic deployments (Edwards, 1999; Weston, 1998).

The three-tier client/server architecture has many advantages over the two-tier client/server architecture, including less complexity, higher security, higher encapsulation of data, better performance efficiency, excellent scalability, excellent application reuse, a good server-to-server infrastructure (via server-side middleware), legacy application integration (via gateways), excellent internal support, support for heterogeneous databases, rich communication choices, excellent hardware architecture flexibility, and excellent availability. The main disadvantage is the difficulties in development, but these difficulties are getting less and less over time (Orfali et al., 1999). One way around this development problem is to adopt a component-based architecture design.

Employing a three-tier client/server architecture would provide a good flexible architecture for KMS. The structure would be very similar to the three-tier client/server architecture detailed by Orfali et al. (1999), except it would also have a knowledge directory (covered in the next section). The client layer would have at least the following: a nice GUI, a Web browser, the client operating system, and any required client-side applications for KM (such as Lotus Notes). The middle layer would contain a network operating system, and transport stack (such as TCP/IP) and service specific middleware for: databases (such as ODBC, JDBC, and SQLJ), internet/intranets (such as HTTP and CGI), e-mail (such as SMTP and POP3), storing and accessing multimedia documents, coordinating group conferencing, linking individuals in group scheduling, and workflow processes. The server layer would contain the server operating system and specific server-based applications such as database management systems, document management systems, server side groupware, and so forth.

KNOWLEDGE MANAGEMENT DIRECTORY

Achieving the connection to numerous data and information sources is a serious challenge for the development of KMS. Organizational knowledge management strives to cultivate, nurture and exploit knowledge at different levels and in different contexts throughout the organization (Handzic & Bewsell, 2001). The demands placed on the