Knowledge-Based Support Environment

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INTRODUCTION

Organizations and universities alike depend on the collection of the data pertaining to the purpose (Curtis, 1999) of the domain in which they operate. Internally, each functional part of the organization works with data collected from the different types of systems used (Laudon & Laudon, 2000). Organizations, therefore, use technology to collect and store data (Whitten, Bentley, & Barlow, 1994) to be processed by the rules formulated to produce valuable information (Connelly, Begg & Strachan, 1996) and eventually knowledge. Universities, too, collect data, processes them, and endow them with relevance and importance (Drucker, 1993). Most organizations use knowledge, for example, regarding their target audience, to gain a competitive advantage. Knowledge and knowledge workers are theoretically the "products" produced by universities. However, they face the same dilemma as the majority of firms, that is, too much data and information but not enough knowledge. Information can be described as explicit knowledge, the significance of which is that information has meaning and it is clearly understood. Knowledge is regarded as volumes of relevant information but, importantly, in addition to experience (tacit knowledge) in the form of an expert (Avison & Fitzgerald, 1995). An expert, to be effective, must use extensively both formal (quantitative) and informal (qualitative) information in decision making. Knowledge is regarded as a strategic asset and therefore the creation of which is often an enterprise-wide goal. Alavi and Leidner (1999) argued that the importance of knowledge is based on the hypothesis that the barriers to the transfer and duplication of knowledge award it with enormous strategic importance. Universities, with the technological capability necessary, are developing systems that can collect and manage knowledge. The combination or integration along with the capability to combine an expert's experience in the form of a system is regarded as a strategic tool. Systems capable of combining both explicit and tacit knowledge are referred to as knowledge management systems (KMSs). Research in this area is not very detailed due to the fact that organizations, not universities, have only been implementing the systems in the last few years. These systems are used to acquire and manage knowledge and distribute it among the different functional units as well as with any external collaborating groups. The idea of disseminating knowledge is not a new concept, be it in education or in industry. Like the classroom, the traditional approach, such as paper-based knowledge sharing, and the virtual are used, depending on factors such as the number of students or the type of decisions to be made. An organization creates a knowledge base to reduce the level of experience needed by managers and to improve the effectiveness of their decisions (Peterson & Davie, 1996). Industry invests an enormous amount of capital in the training of its employees and therefore in the creation of so called "experts in the field"; a "true" knowledge base will allow the acquisition of the experience of experts to reduce the loss of investment should the employee leave (Curtis, 1999).

BACKGROUND

Nonaka (1995) define knowledge as "just true belief." Knowledge is regarded, in this information-driven economy (Drucker, 1993), as power or a source of competitive advantage (Barua, 1996; Drucker, 1993; Grant, 1996; Laudon & Laudon, 2000). Powell et al. (2001) and Casey (1995) describe knowledge as a combination of both information and expertise. Knowledge is acquired or created when an individual, with expertise in a field, uses relevant information productively (Hertog & Huizenga, 2000). The training and the experience that academics amass over the years (knowledge) allow them to both teach and collaborate to produce additional knowledge. Therefore, a knowledge base support environment (KBSE) in this case can be described as a dynamic repository of existing learning and processing systems such as discussion forums, virtual libraries, and research to allow academics and students to retrieve knowledge (either tacit or explicit) based on individual profiles. The possibilities of such a system are limited only by constraints imposed by the university in question, such as technological or managerial support (Neville, 2000). Innovative universities could use this implementation for a number of reasons, specifically to keep staff and students abreast of research and emerging technologies in their fields (Khan, 1997). Designing the system requires a thorough investigation into the use of the Web as a medium for delivery (Driscoll, 1998; McCormack & Jones, 1997; Ritchie & Hoffman, 1996). The designer must be aware of the attributes of the

WWW (World Wide Web) and the principles of instructional design to create a meaningful learning environment (Gagne, Briggs, & Wagner, 1988; Driscoll, 1998). The Web-based classroom is viewed, as already stated, as an innovative approach to teaching (Relan & Gillani, 1997). It, like the traditional method, requires careful planning to be both effective and beneficial (Dick & Reiser, 1989). A Web-based classroom must do more than just distribute information, it should include resources such as discussion forums to support collaboration between learners and ultimately it should also support the needs of both the novice and advanced learner (McCormack et al., 1997; Sherry, 1996; Willis, 1995). A KBSE is composed of a number of components that are integral to the success of the environment (Banathy, 1994): (a) a student mentoring system to support both full- and part-time learners, (b) an exam domain to test both practical and cognitive abilities, (c) a virtual library to allow easy access to conference papers and journals, and (d) the knowledge base facilitated by an agent to integrate all of the components and automate the retrieval of information for the end users.

THE SYSTEM

The KBSE can be developed to support a (generic) university environment. As well as providing a support system for both students (postgraduate or undergraduate) and staff, the system produces a large amount of reports for managing and expanding research within the test department. The environment tests students' problem-solving skills with "real-world" simulations and Multiple Choice Questions (MCQs) providing feedback to both lecturers and students. The environment will grow and change as both staff and students collaborate to add and extract material from the system. Duplication of work by staff can be dramatically reduced, freeing staff to concentrate on other tasks. The environment itself can be used by the university in training and in the management and creation of knowledge. The system will enable or automate four of the many components that constitute a university, and therefore support virtual learning and research. The four components of the system are as follows.

STUDENT MENTORING SYSTEM

Web-based mentoring systems (WBMSs) can be described as learning-delivery environments in which the WWW is its medium of delivery (Crossman, 1997; Driscoll, 1998). Due to the increase in student numbers, there is a need for greater student support, which can be provided through the Web. The mentoring component of the system allows students to log in and view lecture and tutorial material. In addition, a discussion forum will enable both the mentors (lecturers and tutors) and students to exchange ideas and add to the environment, eliminating constraints such as time and location, making the knowledge base available to each type of student. The mentoring component of the system will do the following.

- allow lecturers and tutors to update the content segments of the Web site (for example, course homepages or online reading lists) through a Web browser on or off campus
- provide 24-hour online support to students
- facilitate group collaboration, for example, in discussion forums
- allow students to have positive input into courses
- provide students with the ability to add to the environment through discussion forums, link, and papers enable anonymous feedback and questioning, for example, with feedback forms

EXAM DOMAIN

Students attend tutorials and demonstrations for practical subjects, for example, programming languages and computer networking. However, due to security systems in place to protect network resources (for example, workstations and servers), students' access rights are restricted. Therefore, written exams are used in universities to test practical skills when industry itself tests the student's practical ability rather than the student's ability to memorise material. A domain (server) with user accounts allocated to test material will enable lecturers to fully evaluate the skills gained through practical work. The exam domain will do the following.

- give students and lecturers the opportunity to both test and evaluate skills in a simulated environment where they can assume roles such as a network or database administrator without risk to departmental resources
- house written exam material for IT and other courses
- reduce the duplication of course materials (MCQs and research) on the part of teaching staff
- enable students to assess their understanding of course material and prepare for summer assessment
- supply lecturers and instructors with case examples to expand students understanding of a particular topic

VIRTUAL LIBRARY

Every college department and individual lecturers archive material in the form of journals and books related to specific topics. However, few use systems to track depart-