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ABSTRACT

This paper develops a new conception of organizational knowledge management as "knowledge ecology." The Socrates electronic learning environment is described as an example of a knowledge ecosystem for education and training. The Socrates program was developed as a knowledge management system, viewing classrooms as organizations for lifelong learning. Socrates allows even novice Web users to quickly (in a day) create instructional Web sites with integrated knowledge resources and Web training tools. Based on its early experience, several implementation barriers are identified. Future research needs for developing and implementing organizational knowledge ecologies are discussed. (Author/AEF)

Implementing Socrates Knowledge Management System for Education and Training

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Abstract

This paper discusses implementation of knowledge ecology for organizational learning in the education and training sector. The paper describes the Socrates electronic learning environment, as an example of a knowledge ecosystem for education and training. Socrates allows even novice Web users to quickly (in a day) create teaching and training Web sites with integrated knowledge resources and Web training tools. Based on its early implementation experience, several implementation barriers are identified. Future research needs for developing and implementing organizational knowledge ecologies are discussed.

Introduction

Knowledge management is becoming an increasingly strategic issue in organizations, especially in knowledge intensive business sectors such as software, telecommunications, consulting services, and education and training. Educational and training organizations realize that to succeed in the future, they will need to take better account of their intellectual capital and organize knowledge management as a source of competitive advantage.

In the milieu of rapidly expanding information technology and knowledge work, organizations are challenged to find a framework for knowledge management that combines the human intellectual capital and digital technological processes that jointly enable knowledge work and knowledge value creation. Much of the current literature on knowledge management deals with one of these two themes. This paper develops a new conception of organizational knowledge management as "knowledge ecology". Socrates program was developed as a knowledge management system in the education and training sector, viewing classrooms as learning organizations for life long learning and creating learning communities. Knowledge management features of Socrates program are briefly described. I then discuss implementation of organizational knowledge ecologies and research needs.

The environmental context of the Socrates is business education at colleges and universities in the USA. Its design was premised on the assumption that advent of the Internet/WWWeb, e-commerce and the digital economy called for a different knowledge ecology of education - one that leveraged new information technologies, served the needs of knowledge work, and provided life-long learning communities to learners. Recognizing the strategic importance of the Internet/WWWeb, Socrates was built around a nexus of Internet based services. It allows trainers, teachers and learners to create a learning community for themselves to pursue their interests and commitments over extended periods.

Socrates represents a knowledge ecosystem that simultaneously serves an educational information service, as a Web based course development tool, and as a basis for creating electronic learning communities. It allows instructors, trainers, and students to create their own course or knowledge Web sites, and enhances what they create with embedded knowledge. This embedded knowledge is in the form of regularly updated links to numerous educational and student interest resources on the Web. Instructors, learners and other knowledge sources can interact via this program to co-create knowledge and perform educational functions typical in education. Learners can cumulate their own personal learning in affiliated Web sites.

The program is designed for Web-shy instructors and students who are allergic to programming, but still want all the benefits of WWWeb/Internet based teaching and learning. It is built on the technological core of the Internet/WWWeb, but can be executed on corporate or University intranets. This technological core is transparent to instructors, administrators, and students. That means any registered user can create courses or knowledge sites and use them for learning without knowing any programming, HTML, FTP, or telecommunications or owning and managing servers, networks, and software. The user interface is flexible to be any Internet accessible computer.

The program performs common educational functions in a networked environment. These include course administration function, knowledge management and exchange, and cumulation of knowledge for learners. Course administration includes course description in terms of its objectives, design, structure, expectations, tasks, instructor background, experience/expertise, grading scheme used, assignments, class schedule, class/lesson notes, exams etc. It assists learners to acquire relevant knowledge, perform communicative tasks, cumulate knowledge and apply it in relevant real life settings.

Knowledge agents resources are embedded in Socrates course Web sites in the form of an electronic library and links to knowledge experts. It contains over 750 hot links to corporate sites, full text articles, other publications, book reviews, business research tools, investment information, access to databases, newspapers and magazines. Learners (business students) have additional peripheral knowledge links to job and career information, resume help, entrepreneurship information, graduate studies, general learning skills, discount books and supplies and fun/humor Web sites. These links are automatically updated periodically and maintained by the program. Instructors can add additional knowledge resources of their own, when ever they want.

Networked communications occur via a bulletin board, individualized email, and community listservs. A variety of communications options and formats are available for threaded discussion, administrative notices, interaction on projects, and personal communication. The communicative network can be expanded to other courses and learning opportunities outside the school/university via the use of the Web Ring capability. This is a ring of links to similar or affiliated Web sites (The Socrates Program, 1997).

The Socrates knowledge ecology adds different types of values to the education function. For instructors it is a means for extending their knowledge base to include the rich resources of the Internet/WWW and Intranets into their teaching. Free or very low cost access to these electronic resources has the added value in some cases, of reducing the cost of educational materials. This knowledge ecology is space independent. It is free of geographical constraints of physical classrooms, permitting distance learning. It makes knowledge resources and interactive instruction available to who ever can access the Internet. For educational institutions and corporations, this offers potential cost savings. It allows training to occur when needed and when the learner is most ready for it. Learning can be in-situ at the site of the learners, allowing for mobile learning, off-time learning, and emergency learning. For learners the Socrates knowledge ecosystem provides the value of life-long and continual learning venue. Learners can accumulate their learning from courses, special topics, work projects, and integrate them into their own knowledge sites for future reference. This cumulative knowledge site is an extended virtual brain deployable at will by the learner in different jobs and locations.

Implementation Issues

In 1997 over 170 Socrates site licenses were issued in 20 countries. These sites are being studied to understand further development issues and implementation barriers. Based on early feed back from these trial sites and the author's own experiences in using the system, several initial research needs and generic barriers to adoption of knowledge ecosystems for education/training are identified below. The implementation of knowledge ecologies poses technological, human, social and institutional challenges that we are only beginning to understand.

1. Technological Problems. Knowledge ecology represents the convergence of several disparate but linked technologies. Successful knowledge ecology for education/training involve instructional design, multimedia technology, computers and telecommunications technologies, content area expertise, and business/industry linkages. Integrating these technologies into large-scale systems is a complex and difficult task. To make matters worse many of these component technologies are facing rapid internal changes. More capabilities are continually becoming available. Designers must learn the new capabilities and integrate them into their systems on the fly. New capabilities are not always compatible with old ones, sometimes necessitating wholesale redesign of the entire ecosystem, and increasing the cost of implementation.

2. Human Problems. Implementing knowledge ecosystems requires dealing with emotional responses to artificial knowledge agents. Historically, knowledge and intelligence have been the distinguishing characteristic of human beings. Now computers are able to take over some of the routine and even expert functions of knowledge work. In some areas computers excel over human capabilities. The conflict of human versus computer intelligence is epitomized in such cultural icons as the chess contests between grandmasters and Deep Blue (followed by over 300 million people worldwide). This conflict is an intensely emotional matter. Like other emotional issues it remains largely suppressed in organizations. However, the conflict and deep emotional resistance among users and learners can sabotage implementation of knowledge ecologies, or at least reduce their effectiveness.

A related problem is the very natural human fear that computerized knowledge ecologies come dangerously close to replacing humans in knowledge work. In the education industry this fear is particularly palpable. While there are some innovators who embrace educational technologies such as the Internet/WWWeb, a large number of faculty regard these technologies with deep suspicion. The administrative and institutional demands for productivity in colleges and universities in recent years make the threat more real and immediate.

3. Institutional Problems. Organizational resistance to change is encountered when implementing any new technology. This resistance is more pronounced in implementing knowledge ecologies because the technologies involved are holistic and all-encompassing. They affect the whole organization, all functions and tasks, and performance outcomes at many levels. These technologies reconfigure access to knowledge and consequently power equations within the organization. They change career prospects and earning potential of members. They require organizational members to be retrained. They involve changes in structures and systems, and installation of new equipment. Such organizational changes provoke upheaval and conflicts.

Organizational change problems are compounded by the lack of comprehension of what knowledge ecologies represent. In some senses, knowledge ecology is an extended virtual brain of the organization. The knowledge function and access of this ecology extends well beyond the cognitive capacity of individual humans or even departments and divisions. It represents a new form of organized complexity that many managers and workers find incomprehensible. It falls outside the collective cognitive map of the organization.

4. Creating Electronic Learning Community. One important shortcoming in using electronic knowledge management systems for educational purposes is the lack of interactivity. True community implies high degree of interactivity, multiple mechanisms for interaction and a natural order of communication within the community. Creating learning communities requires improving interactivity of all types. Users have suggested a variety of mechanisms that can make interactions go beyond the classroom to include outside professional experts, international voices, ideologically diverse voices, and mentoring resources. The use of email, listservs, Usenet groups, threaded bulletin boards, and other electronic communications options need to be judiciously balanced. Interactivity also means integrating

multimedia resources into the knowledge ecology. However incorporating these interactivity and multimedia features into knowledge management systems is limited by the quality of "access" that users have. In educational environments the quality of access varies tremendously, and it is easy to provide resources (e.g. video and audio streaming) that users simply cannot download.

Research Issues

Three important research questions need to be addressed for further development of knowledge ecologies. These pertain to the roles to be played by different participants, cost/benefits of such systems, and knowledge quality management

1. Work Roles Within Knowledge Ecosystems. It is apparent from the above discussion that that knowledge creation, work interaction and performance in knowledge ecosystems are significantly different from the conventional use of knowledge as it is currently organized in most organizations. For business educators knowledge ecosystems pose a challenging question about pedagogical roles. Learning in such systems is collective network activity. It requires a community learning process. One of the most difficult thing about effective Internet based teaching for faculty, is that it requires them to play a very different role than the conventional one of content expert and mentor. The Internet displaces and fragments the concept of expertise. Expertise - if it is defined as possessing information, can be resident in places other than the teacher. It can be embedded in transaction systems, in Web Sites, in colleagues, in students.

In knowledge ecosystems the role of the teacher is more that of a co-learner. Because information is expanding at such a Promethean pace, no single person can remain an expert on any subject for very long. This fact becomes apparent very quickly to both students and teachers in the Internet environment. This is empowering for students as they realize that there is possibility of reaching expertise beyond that of the instructor. It is also distressing for faculty as they realize the very real and open limitations of their expertise. To remain effective instructors and students need to forge new relationships of mutual learning through discourse and critique.

Extrapolating this concern about roles to non-educational organizations, I surmise a need for rethinking all organizational roles in knowledge organizations. The conventional categories of functional areas (finance, marketing, accounting, operations, etc.) or hierarchical delineations, or even professional work categories do not fit knowledge work. Knowledge work transcends function, structure and professional expertise due to its intensely networked and integrated nature. In companies engaged in knowledge management new titles are appearing such as, Chief Learning Officer, Chief Information Officer, Chief Knowledge Officer, Webmaster, Chief Technology Officer. Similarly new departmental configurations such as, Client Services (combination of sales, marketing, technical support, billing, etc.) or Knowledge Centers (combination of library, product expert network, databases, public relations, communications, etc.) are emerging to reflect the integrative nature of knowledge work. The efficacy of these titles and new division of labor needs to be examined and contingencies for their application need to be identified.

2. Cost/Benefit Analysis of Knowledge Ecosystems. The willingness to create knowledge ecosystems in education depends on how college/ school administrators understand their costs and benefits. Unfortunately very little is known about this aspect of knowledge ecosystems. Even corporations who have pioneered these systems have done so more on faith than on facts. In a preliminary way we can identify costs of such systems to include hardware & software investments, personnel training, knowledge conversion, Internet access equipment by learners/users, information search time to do quality control, IT infrastructure creation and maintenance. Benefits of knowledge ecosystems include, access to the rich information resources of the WWW/Internet/Intranets, Web publishing opportunity for learners and instructors, savings in time due to electronic communications, savings on paper, transportation and space requirements. A systematic study of these costs/benefits is sorely lacking. However, the explosion of Web based training systems being witnessed currently is significantly driven by the rationale of cost savings (Meister, 1997).

3. Knowledge Quality Management. Electronic knowledge resources particularly the Internet/WWW are notorious for quality problems. Lack of standards, lack of controllability, high dependence on vendors for quality control, lack of universal access all contribute to high variance in information quality. There is no guarantee of truthfulness of information and there is a high noise to

information ratio on public information networks. These problems are partly a function of the newness of the medium. As the Internet and its use mature some of these problems will be resolved through standards, surveillance mechanisms, and regulations.

A related problem is that electronic media is excellent for some types of knowledge and certain types of knowledge work, but poorly suited for other types of knowledge work. It is best for storing and transmitting large volumes of codifiable information. It is poorly suited for capturing tacit, social, and emotional knowledge, which are often difficult to articulate and codify. Knowledge work that has high emotional or tacit knowledge content may not be feasible in the kinds of knowledge ecologies discussed in this paper.

In Lieu of a Conclusion

This exploratory study introduced the concept of knowledge ecology as a frame for understanding the organizational learning and knowledge work. This framework offers a preliminary yet valuable theoretical lens for knowledge management. There is little that can be definitively concluded from this initial analysis, except to point out the lucrative theoretical and practical potential of using ecological theories for understanding organizational knowledge management. Natural ecosystems are complex knowledge systems. They are versatile enough to handle biological, genetic, physical, geological, atmospheric and other types of information in coherent, cyclical, performances. Ecosystem theories and metaphors are powerful, highly mathematized, analytical tools that could be valuable for organizational system analysis and design.

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