THE CONSTRUCTION OF A VIRTUAL LEARNING COMMUNITY ABOUT ENGINEERING EDUCATION

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Abstract *With the rapid growth of information technologies, our economic society and life are changing significantly in this digital age. The digital revolution in our world is spurring on facilities, hardware, software, services, and capital investment. In order to keep competitive advantage in the times of digital economy, more and more countries and enterprises pay more and more attention to the development and application of information technologies to help collect and diffuse the knowledge. The virtual community is one of the most powerful tools. A virtual community can build an interactive learning environment for people. This helps the development of knowledge management and e-learning. In this study, the concept for developing and constructing a virtual learning community about engineering education will be investigated.*
Index Terms virtual community, distance learning, e-learning

INTRODUCTION

As we enter the 21st century, we experience one of the most important changes in our lives - the move to a digital age. Due to the recent rapid advances in information and communication technologies, our society changes rapidly. With the rapid growth of information technologies, a new era, the digital age, has arrived. They make more and more innovative products and electronic/digital services possible. The digital revolution is happening much more quickly. Our economic society and life are changing significantly in this digital age. The digital revolution in our world is spurring on facilities, hardware, software, services, and capital investment. In order to keep competitive advantage in the digital age, many countries and enterprises pay much attention to the development and application of information technologies.

In the digital age, the Internet conducts a new business model-electronic business. The electronic business implies that business transactions are held by computer-mediated network. Internet provides a two-way communication channel to let enterprises fulfill the whole or part of traditional business activities. It is an important task for all enterprises and countries and engineering educational systems to use the Internet to help collect the global information and then to diffuse the innovative knowledge effectively and efficiently. We think that the virtual community is a powerful tool for this purpose. A virtual community can provide an interactive environment for learning. This study will investigate the constructing concept for a virtual learning community about engineering education.

VIRTUAL COMMUNITY

For decades, scientists have used the Internet to share data, collaborate on research, and exchange information. When the Internet was opened to business since 1991, millions of

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computer users all over the world have started to use the Internet and online services. The Internet is a growing platform on which many killer applications stand. The essential hardware and software on constructing the Internet infrastructure and supporting the Internet applications include fiber technology, compression tools, database management technology, powerful processor, ease-of-use operating system, software in navigating and communication, and so on. With continuous improvements of related technologies, organizations can build virtual communities easily with adequate tools while netizens get cheaper personal computers and peripherals connecting to the Internet and surf on the WWW (World Wide Web) more easily and interestingly.

One of the oldest virtual communities is the Well (http://www.well.com) which is launched by a group of high-tech enthusiasts located near San Francisco in 1985. Thousands of users have communicated with each other through the Well and developed strong personal relationships. What is the "virtual community"? The virtual community is also called "cybercommunity" or "electronic community". The virtual community can be defined as incontrovertible social cyberspace in which people still meet face-to-face, but under new definitions of both "meet" and "face". Virtual communities are formed by computer-mediated communication. They are passage points for collections of common beliefs and practices that unite people who are physical separated[1]. People are social animals, thus we all need sense of belonging and esteem no matter in the physical world or virtual cyberspace. The true promise of cyberspace is infinite opportunities for human interests and activities to be shared. The cyberspace is predicated on knowledge and information, and on the common beliefs and practices of a society abstracted from physical space. The important element of members' relationship in a virtual community is the sharing and exchange of information.

As sociologists and philosophers have pointed all the time, human beings are social animals with needs that cannot be isolated from one another. An individual joins particular community because he or she expects to find them self-affirming and satisfying. Accordingly, this leads another sustainability of virtual community - active engagement. When community members actively engage with others and contribute to the common affairs, such as establish directions, goals, content, and context, a sense of community is established. Another appealing advantage of the virtual community is that it allows us to belong to thousands of communities at once, greatly multiplying our connections and enriching our lives. Virtual communities will supplement rather than supplant existing real communities. We do not need to forgo to other places or real-life communities and can enjoy more amusement online. In a virtual community, sharing common interests, goals, or needs filters unwanted information for members as well as provides more solid information with the engagement for the community.

Essences of the Virtual Community

The community is a prerequisite for the trust and interdependence that sustains personal relationships. No matter "real" or "virtual", communities can be defined with the following five elements[2]: shared space, shared values, shared language, shared experiences, and shared purpose.

However, these five elements are prerequisites of a community, but do not guarantee the formation of a community. Two more critical elements, interaction and interdependence, should also be emphasized. Hagel III and co-workers[3] illustrated the explication about elements of a virtual community as followings:

(1) distinct focus

(2) capacity to integrate content and communication
(3) appreciation of member-generated content
(4) access to competing publishers and vendors
(5) commercial orientation

Types of the Virtual Community

The virtual community can be classified into the following four basic types [4] :

(1) communities of transaction: This kind of virtual communities mainly facilitates the buying and selling of products or services. Members with specific needs for some product or service are encouraged to interact with others for further advice or exchanging experiences. Members may also be provoked interest for some kind product or service which has been discussed fervently in that community.

(2) communities of interest: This kind of virtual communities brings together members interacting extensively with one another on specific topics. Interpersonal communication plays an important role in these communities.

(3) communities of fantasy: This kind of virtual communities encourage members create new environments, personalities, or stories. The Internet has no limitation but one's imagination. Members can exercise their imagination and creativity as possible as they can.

(4) communities of relationship: This kind of virtual communities encourage members to share their own feelings or real unendurable life experiences such as love, marriage, parents, or education.

The virtual community provides an interactive environment for people to share and exchange information and knowledge anywhere almost at any moment. Up to date, more and more virtual communities have been built. However, most of these virtual communities only focus on the development of B2C (Business to Customers), C2B (Customers to Business), or C2C (Customers to Customers) electronic commerce models. Actually, virtual communities can also provide an excellent learning environment to support the engineering education.

VIRTUAL LEARNING COMMUNITY

The use of modern information and communication technologies and global information networks will greatly influence the way of work and life of people in the information society. Teachers and schools play an important role in the all-side preparation of the younger generation for an information society and for the integration of new information technology into teaching plans of school. From the very developed nations to those emerging from the primary levels of agriculture and manufacturing, the use of information and communication technologies of all kinds is increasing as fast as the schools can install and implement campus wide information systems, workstations, and personal computers. More and more schools place much emphasis on the application of information technology to education. When the concept of the Internet is introduced into the learning system, we should consider how to form an learning system in which students and teachers can learn to consider information technology to be a useful tool for formation and reviewing their knowledge, and how to build the framework for spreading experiences among students, teachers and people.

In the cyber world, people are able to communicate and exchange information anywhere almost at any moment. Because of providing a fast, efficient and easy way to access the information, the WWW provides a variety of information in the forms of database, pictures, movies, multimedia or interactive displays. More and more

academic and research institutions or universities in the world construct their own web sites to demonstrate their engineering educational goals, academic activities, excellent training programs, and their innovative and important research results. Through these web sites and the associated links with other web sites, people can easily obtain new information and knowledge they need, and learn how to solve their problems and do their innovative works.

Although there are great differences worldwide as to how the Internet is being conceptualized and applied within the schools, several elements are generally used. These include multi-media, computing, communications, software standards, electronic publication, and common database. According to our research results, many learning theories ask for personalized access to information, interactive simulation systems, providing material for learning at his own speed, learning alone or in groups, and more personalized guidance through tutors.

According to the characteristics of virtual communities, we think that the virtual learning community is one of the most powerful tools to meet requirements of engineering educational systems in the digital age. A virtual learning community can provide an open learning environment for people to share their knowledge and to learn the knowledge they want. The school can also capture, classify and understand those knowledge posted in the virtual learning community. A complete virtual learning community should provide the following four key functions:

(1) collaboration services: providing an environment for knowledge sharing

(2) discovery services: helping users retrieve and analyze the information in the corporate memory

(3) knowledge repository: providing the information-management functions for captured knowledge

(4) knowledge map: providing a corporate schema for knowledge classification

The purpose of constructing a virtual learning community is to build an interactive environment for e-learning. Due to the development of Internet, e-learning will be a novel learning model in the engineering education system. Elearning constructs a teaching platform which is put on the Internet. The major advantage of e-learning is that it makes the individual become the master of the learning system. In an e-learning system, everybody can decide what to learn, when to learn, and where to learn by oneself. Through the interactive learning structure, one can raise questions or solve problems anywhere at any moment. E-learning also provides multimedia contents to make learning more attractive. All of these requirements can be done in the virtual learning community.

According to our investigation, students appreciate the idea of the WWW material in general. But they would not learn directly from the WWW but rather print out at least parts of it and use it as a reference. What they really wanted were interactive tutorial and online testing. As already known, hypertext material can be established in a much more structured way. The browser can choose to go deeper into a subject or to move on. This can help to build a student-centered learning environment and the student can learn at his own speed. Additionally, he can configure the pages according to his personal preferences of fonts or even colors. A further advantage is the possible integration of multi-media into hypertext. In many cases, a good animation gives a better explanation than single pictures and words. Moreover, the other main attraction of the WWW is interactivity. Therefore, many schools begin to establish their distance learning environment by constructing the virtual learning communities. In developing the virtual learning communities, the students have to be better trained how to use the online environment

from beginning.

According to a recent survey of several virtual learning communities, the establishment of a virtual learning community include the following features:

(1) **web browsing:** including accessibility, bookmarks, multimedia, search engine, and security

(2) **asynchronous sharing:** including e-mail, BBS file exchange, and newsgroups

(3) **synchronous sharing:** including chat, whiteboard, application sharing, virtual space, group browsing, teleconferencing, and videoconferencing

(4) **students tools:** including self-assessing, progress tracking, motivation building, and study skill building

(5) **course tools:** including course planning, course managing, rapid course revising, and course monitoring

(6) **lesson tools:** including instructional designing, presenting information, and testing

(7) **data tools:** including marking on-line, managing records, and analyzing and tracking

(8) **resource tools:** including building knowledge, team building, and building motivation

(9) **system tools:** including authorization tools, security tools, resource monitoring, remote access tools, and crash recovery tools

(10) **help desk tools:** including student support tools, and instructor support tools

CONCLUSIONS

The end of the last millennium has been marked by the transition from industrial to information society. Methods and means of computer, automated control, use of information technology, and elements of artificial intelligence had already been employed in industrial society. In this millennium, during the transition to information and education society, new learning perspectives should open to these methods and means. The information society imposes a paradigm shift in learning and training. People in the digital age need to be trained and retrained to keep up with the pace of technological and social change. Traditional learning systems, based mainly on lectures and textbooks supplemented by workshops in disciplines that are only loosely coupled and which is completed when students leave school, cannot prepare them for solution of complex problems in interdisciplinary teams. Thus the construction of virtual learning community to promote the development of e-learning will be an important task for most schools in the digital age.

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