An Evaluating model for the Usage of Web-based Information Technology in Computer Aided Architectural Design and Engineering Education

Attila Dikbas

New technologies often reshape expectations, needs and opportunities so as to develop strategic plans for the implementation of Information Techniques in education and research. The widespread acceptance of the internet and more specifically the World Wide Web (WWW) has raised the awareness of educators to the potential for online education, virtual classrooms and even virtual universities. With the advent of computer mediated communication, especially the widespread adoption of the web as a publishing medium, educators see the advantages and potential of delivering educational material over the Internet. The Web offers an excellent medium for content delivery with full text, colour graphics support and hyperlinks. The purpose of this paper is to present a model for the usage of web-based information technology in computer aided architectural design and engineering education. It involves the key features of a full educational system that is capable of offering the teacher and the student flexibility with which to approach their teaching and learning tasks in ways most appropriate to the architectural design and engineering education. Web-based educational system aims at creating quality in on-line educational materials taking collaboration, support, new skills, and, most of all, time. The paper concludes with a discussion of the benefits of such an education system suggesting directions for further work needed to improve the quality of architectural design and engineering education.

Keywords*: Web-based Information Technology, online education, virtual campus, Computer Aided Architectural Design and Engineering Education*

Information Technology in Construction

The exchange of information in computerized environments now covers new research areas in information modeling, such as computer-based documentation, the construction of information models, the development of product models and computer integration of design and construction knowledge. The major approaches to information modeling in construction are *data modelling, activity modelling, and product modelling.* Aquad et al (1993) suggests that data modeling allows the identification and modeling of information for a certain domain (for an exact construction work). Activity modeling is used to model processes such as design, procurement, estimating and planning, and data and materials flow between these processes. Product modeling can be considered as a sub-set of data modeling and can be used to model the components found in a particular

product and their relationships (a building is an example of a product). The product model contains information for all-life-cycle stages and for all participants in the design and construction process. Eastman (1999) offers scenarios common to building practice and an analysis of the information flow issues named Information Exchange Architectures. Gorlick and Froese (1999) developed a prototype distributing Computer Integrated Construction (CIC) system to model building product and process information using IAI standards. Ma and Chen (1999) proposed a model of collaborative environment for building construction project toward computerization of total information based on the usage of LAN.

The increasing technical complexity of projects creates a demand for the integration of construction project information. The development and deployment of new construction industry software applications, improvements in network technology, the application of robotics to the building process, the development of new modeling methodologies and languages and the definition of standards for information exchange all create new opportunities for integration. Turk (1997) suggests that information technology has assisted the collaboration and coordination of many professionals. The nature of the construction industry is such that virtual teams are often brought together for projects before being broken apart again upon completion. The software applications used may also vary from one construction project to another. The organizations and individuals forming the team contribute to the project with their specific skills and resources, which may include legacy applications and data. The collaboration effort created by the team environment must therefore be carefully coordinated and managed.

The introduction of new communication technologies such as the World Wide Web (WWW) is creating unique opportunities for project teams to develop new coordination and communication strategies. Of particular interest is the capability of teams to interact remotely in a virtual team environment. Specifically, researchers are focusing on the capability of the World Wide Web to serve as a

facilitator of remote team interaction. The decision to use the WWW as a project information center generates important issues regarding the amount and type of information to be placed on the pages. Coleman and Mroz (1997) suggest that as project management begins to move onto the Web, its functionality is evolving once again. The vision for a Web-based application is a project database intranet/internet server providing easy but secure access through distributed clients. These range from using the Web as a means to simply share project information to the creation of innovative redesign of the application to support a collaborative work team environment. Internet equips project management software with the ability to directly publish project management schedules and related reports to a web server, which offers tremendous benefits to organizations. These reports can be viewed through a regular web browser, which is virtually device independent and can be distributed to any part of the globe.

The application of Web Technology in Computer Aided Design and Engineering Education

As our eCAADe organisation becomes more complex and distributed, there is a greater need to manage projects across time and space. The WWW and intranets now provide a less inexpensive way to transfer information and collaborate in a distributed manner, so it is no surprise that many users and vendors (students, instructors and so on.) are looking at these infrastructures as a way to manage distributed projects. With the need for better information management and project control throughout the education process, CAD/CAM lessons within the education system are embracing change in the form of Internet-based project web sites (also called project extranets) to communicate project in a fast, cost effective and efficient manner.

In the education program, project success relies heavily on timely transfer of information. The WWW

provides new opportunities for the development of distributed systems. These systems can cross the organizational boundaries and provide a unique opportunity for teamwork and workflow automation among otherwise isolated entities. Some examples of the content of research conducted in the different area are as follows:

Dikbas and Yitmen (1998) developed a model of approach showing an example of an integrated management information system in multi-project scheduling using a collaborative web-based project management tool for Eastern Mediterranean University's campus construction projects. The current research project concerning Management Information Systems for Istanbul Technical University Construction Projects involves decision-support utilities for communicating, organizing and managing project information using web-based technology and the network (Dikbas et al, 1999). Rojas (1999) developed a model called "Field Inspection Reporting System" of the Boulder Campus of the University of Colorado for reporting and implementation and evaluation of a web-centric system that supports inspection. Al-Reshaid and Kartam (1999) suggests a web-based Information delivery Intranet Site as a complimentary communication tool that would enhance the delivery and exchange of information on the Special Projects Administration (SPA) of the Ministry of Public Work in the State of Kuwait construction projects. Saad (1999) discusses a new interactive multimedia system that can be used by different project members to document and report progress in construction projects as well as a tool to analyze the progress and help predict the final project outcome. Ahmad and Nunoo (1999) present a model of data warehousing as an emerging database management technology to provide resource for decision making in the context of construction organizations.

Objective of the study

The aim of the proposed system presented in this paper is to establish a web-based management information system for CADD/CAM programs through internet using active databases for reporting purposes throughout the eCAADe life-cycle. It is aimed to provide an easy and structured access to the information contained within project documentation and regulations involved in the project process of the education. This kind of approach will enhance control procedures for problem recognition, combining data from different applications to evaluate performances in the education environment. It is designed to assist a tutor in organizing, analyzing, modifying and reevaluating existing or needed spatial information within education by implementing an effective process for managing multiple CADD/CAM courses.

Proposed Model

A LAN-based system that will provide a fast communication in information distribution and eliminate the unnecessary paper work is a primary necessity for the Online Education Management Reporting System. The system modules enable instructors easy access to data for different processing needs. The web-based education control system provides a complete courses overview.

The major steps in the development of the Online Education Reporting System are as follows:

• Defining the structure of a progress reporting system to reflect courses status at any period
• Collection of field data from the course projects running in CADD/CAM packages.
• Recording the updated course projects data in the applications
• Producing the final report based on the updated data
• Designing custom report formats

Discussion and Conclusion

One of the omitted topic nowadays in the eCAADe is multi-project analysis and reporting in the courses. Instructors need to know in a timely and accurate

manner, how is the project progressing, where they are currently in comparison to the initially set plans. This can be achieved by setting up a successful multi-project environment with a comprehensive implementation plan. Current research in information technology in specific areas is directed towards the achievement of the functions in computer-based environments via networks using web-based technology. Creating an integrated automated information system for multi-course analysis and reporting enables education management to visualize various types of planning information to support decision making and evaluating. The Online Reporting System aims to improve information accuracy and accessibility, to eliminate redundant files, to provide multi-locations access to information, to improve process efficiency since communication uses less time and fewer resources and to obtain accurate and timely information. The system formulates a process for calculating data from various software/course packages, accumulating this data in a multi-project environment and formatting this data to create integrated reports.

The growing demand from CADD/CAM education programs proves that the proposed model fills a tremendous gap of information flow to different level courses in the education.

References

Aquad, G.F. et al.1993. Information Modeling in The Construction Industry: The Information Engineering Approach, Construction Management and Economics, Vol.11, No.5, 384-397, E&F.N. SPON, London, England.

Eastman, C.M. (1999), Information Exchange Arcitectures for Building Models, Proceedings of International Conference on Durability of Building Materials and Components 8 – Service Life and Asset Management, Information Technology in Construction, CIB W78 Workshop, Vancouver, Canada, Vol.4, pp. 2139-2155.

Gorlick, A.L. and Froese T.M. (1999), A Prototype Distributed CIC System Based on IAI Standards, Proceedings of International Conference on Durability of Building Materials and Components 8 – Service Life and Asset Management, Information Technology in Construction, CIB W78 Workshop, Vancouver, Canada, Vol.4, pp.2171-2179.

Ma, Z., and Chen, J. (1999), A Collaborative Environment for Building Construction Project Toward Computerization of Total Information, Proceedings of International Conference on Durability of Building Materials and Components 8 – Service Life and Asset Management, Information Technology in Construction, CIB W78 Workshop, Vancouver, Canada, Vol.4, 2214-2223.

Turk, Z., Drogemuller, R. (1997), Robots in Construction: An Outlook, Information Technology Support for Construction Process Re-engineering, CIB Proceedings, Publication 208, James Cook University, Queensland, Australia, pp. 375-388.

Coleman, D., Mroz, B. (1997), Project Management on the Web, White paper, http://www.collaborate.com/hot_tip/tip0397.html

Dikbas, A., Yitmen. _. (1998), An example of an integrated management information system in multi-project scheduling for construction projects, Proceedings of Sixth International Workshop on Project Management and Scheduling, Bo_aziçi University, _stanbul, Turkey, pp. 32-37.

Dikbas, A., Morten, B., Bayramoglu, S., Yitmen. _. (1999), An Automated Decision Support System Model for Construction Management, Proceedings of International Conference on Durability of Building Materials and Components 8 – Service Life and Asset Management, Information Technology in Construction, CIB W78 Workshop, Vancouver, Canada, Vol.4, pp. 2452-2464.

Attila Dikbas
Faculty of Architecture
Istanbul Technical University