The Development and Implementation of a Virtual Teaching Environment

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ABSTRACT: *The development and implementation of virtual educational environments is now becoming a strategic advantage as is becoming an integral part of the new universities. The Deakin Electronic Trading Community is an online education system that attempts to solve the problems of providing supportive educational tools in the education of electronic commerce.*

Keywords: Virtual Teaching Environments, On-line Education.

INTRODUCTION

The world of commerce has dramatically changed. With the wide spread introduction of electronic commerce systems and technology it is now seen as the future of commerce. However, many electronic commerce systems use extremely new technologies and strategies with many of these basic concepts and principles not being fully formed nor understood. Moreover, the mechanisms and standards of the Internet and the WWW are only now being developed and utilised. The central problem faced by all organisations implementing electronic commerce will be twofold. First, organisations will need to closely examine the approaches used in conventional commerce and effectively adapt these to electronic commerce or develop new electronic commerce systems. Second, organisations will need suitably skilled graduates in not only the principles of electronic commerce but also the basic building block mechanisms of the Internet and WWW. Today's graduates must have good understanding of the more common mechanism and programming languages used on the Internet and WWW for electronic commerce. Clearly, to address these two salient points the education of students in the area of electronic commerce is a challenging task.

Distance education and learning pose many new and exciting challenges for tertiary educators and commercial trainers worldwide, not least of which is the issue of how to develop and implement computer information systems that provide students with distance education and learning opportunities. The World Wide Web is fast becoming the mechanism of choice for the delivery of educational material for flexible learning. This rapid development has been seen in the wider development and implementation of educational environments, such as WebCT, Blackboard, Eteach. The primary advantage in utilising the WWW is that it is seen to be free from geographical, time and participation constraints providing the student with greater flexibility. Similarly, the WWW provides a simple and universal method of receiving and displaying information through the use of a common web browser. Fuelling this trend is the growing economic and government pressure on tertiary institutions to provide flexible delivery modes of their courses utilising the WWW to increase the student base. Indeed numerous tertiary institutions are rapidly investing considerable resources, time and intellectual property in the WWW as a means of conveying pedagogical materials for student learning. Indeed, most implementations have taken paper-based educational material and converted these into "electronic page turning" educational material (Wild and Henderson 1997). Tragically, these implementations have paid little or no regard to any appropriate pedagogic design models and strategies for exploiting the WWW as an instructional medium. Moreover, this will require a rethink of the current pedagogical design models to examine how they are applicable to the delivery of course material by the WWW. This may require the redevelopment or completely new pedagogical approaches to educational models over the WWW.

This paper describes the development, implementation and use of the Deakin Electronic Trading Community (DETC): a WWW-based teaching environment. The DETC has been developed to increase the student's knowledge in the area of Electronic Commerce by providing a tailored educational teaching electronic environment that allows to interact with many of the policies and mechanism of Electronic Commerce that are current not available to the student due to technical constraints of the technology. The paper provides an insight into the ways in which the DETC is able to use the WWW to

provide an effective manner to enhance students' learning the concepts and skills of Electronic Commerce.

Genesis of the Deakin Electronic Trading Community

The primary design principle of the Deakin Electronic Trading Community is to logically draw together groups of organisations from a wide range of industries into effective trading communities. By grouping organisations into trading communities we are able to quarantine each industry and examine it in isolation. Figure 1, highlights a small selection of industries that are currently being developed into electronic trading communities within the DETC. Each organisation within an industry is selected to provide a realistic insight how electronic commerce could be performed within the industry. Importantly, this could involve the development of an organisation's electronic commerce system within the particular industry or the development of a wide range of organisations within an industry highlighting the value chain found within the particular industry.

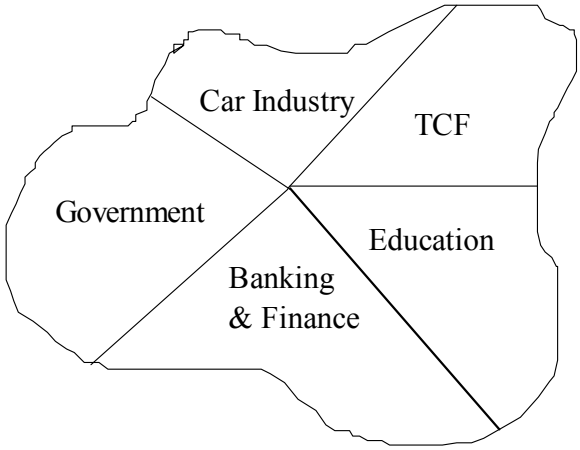

Figure 1: Industries within the Deakin Electronic Trading Community

This approach provides us with two distinct advantages in the development of the DETC. First, it provides the means to qualitatively and quantitatively examine and test the pedagogical design approaches employed in each trading community and establish how students learn and interact in the virtual environment implemented for the particular industry. Second, it provides a simple mechanism to develop each of the industries independently of each other. This allows a wide range of groups to become active members in the development of the DETC. This level of development could range from a groups of students developing a new industry through to the collaborative effort of another university developing an industry for their overall educational objectives in electronic commerce and then making it available to all the shareholders of the DETC.

Principle Concepts of the Deakin Electronic Trading Community

The principal concept of the DETC is to interactively demonstrate the principles and practices of electronic commerce within a controllable development environment for the students. The DETC will not only be able to measure and control many of the basic mechanisms of the technology, but also the principles and practices of electronic commerce that are not currently available in other electronic commerce systems due to the proprietary nature of these systems (Joyce 2000).

Central to the concept of the DETC is the development of an educational tour through the DETC (Mousley 1995). The students follow the guided tour through the DETC where they will experience particular facets of electronic commerce. By guiding the students through the DETC we are able to tailor the way the students interact and focus them onto a particular view of electronic commerce. The DETC provides the computing platform and environment to illustrate particular issues in electronic commerce. The DETC will provide students with an environment that will demonstrate to them the principles, mechanisms, and practices of electronic commerce utilising the Internet and WWW. The major advantage of this approach is that it can be tailored to illustrate the issues of electronic commerce in a very practical sense. This approach will reinforce these issues by showing their relevance in the field of electronic commerce. Importantly, it provides an extremely flexible means of assisting students in developing their knowledge of the policies and mechanisms of electronic commerce, which are currently not available in electronic commerce systems.

Objectives of the Deakin Electronic Trading Community as Teaching and Learning Environment

The objective of the DETC is to provide a test-bed that is effective, timely and flexible in teaching the basics of electronic commerce. Effective, in DETC allows us to demonstrate the issues, policies and mechanisms of electronic commerce to the students. Timely, in the ability of the DETC to be changed quickly to keep up to date in the fast changing area of information technology and electronic commerce. Importantly, flexible in providing teaching and learning strategies that can be incorporated into the DETC making it accessible by students studying in on-campus and off-campus modes. By developing the DETC as a controlled development environment we are able to take a cross section of electronic commerce applications and study particular issues in electronic commerce. In essence, the DETC will simulate a real business trading community in real time and following established business processes.

The DETC provides a common thread for students undertaking the study of electronic commerce. As students progress through the major they will use the DETC in different ways for each unit. The advantage of this approach is the students are not required to relearn a new environment for each unit. In addition, this approach provides a dynamic approach to the delivery of the electronic commerce education in a flexible teaching and learning mode. The objective of the DETC from the students prospective is that it will help students understand the principles, mechanisms, and practice a number of forms of electronic commerce; provide students an interactive environment that is adaptable to changing business practice; and enable students to identify both theoretical and practical approaches to electronic commerce. The objective from the prospective of the DETC, it is to provide an on-line flexible teaching and learning model in the delivery of a range of units in electronic commerce; and provide a method to evaluate the effectiveness of the pedagogical approach used in an electronic teaching environment.

Instructional Mechanisms of the Deakin Electronic Trading Community

In any teaching environment, especially in an electronic teaching environment, suitable understanding of the student's progress is extremely important. In the more conventional teaching methods of lectures and tutorials feedback to the student can be provided in a more timely manner. Conversely, the interaction within these teaching modes provides the lecturer and tutor with an indication of the overall learning processes of the students. Similarly, in this teaching mode the student can be provided with learning direction provided by the tutor or lecturer. This direction will allow the student to aim their energies in understanding the core body of knowledge that the lecture or tutorial is attempting to convey.

The development of the DETC has presented a number of basic problems that needed to be solved for this implementation to be successful. However, underlying these problems there were to basic need elements. First, the student needs to be supported within the DETC by providing a common set of tools and navigational aids. Second, the lecturer developing the tours for the student required educational management framework and tools to allow the lecturer to direct the student to the important elements of the electronic commerce system that should be discovered.

To solve the first problem our early approach in the development of the DETC was to develop a common set of navigation and constructive tools. These provide the student and lecturer to view of the DETC allowing the student and lecturer to use a common vocabulary and view when describing and following a tour within the DETC. The second problem became more acute as the project progressed and the expertise of the lecturers using the DETC increased. This was more of a management issue in providing a tool that would help in the development of a tour with the DETC while reducing the need to becoming intermit with the low-level operation (i.e., code) of the DETC. Finally, there was a need to understand the interaction the student was having with the DETC.

Portholes in the Deakin Electronic Trading Community

A central advantage of the Deakin Electronic Trading Community is to provide students with a particular view of an issue in electronic commerce. In the DETC we refer to these as *porthole* views. The porthole enables the student to examine a particular facet of electronic commerce that the subject requires and allows the student to interact with it. Importantly, portholes can be constructed at various levels. Indeed, based on the subject material being discussed some porthole views will show the high level interactions (or policy of electronic commerce) between organisations within the DETC. Consider the audit trail of payments within an EDI transaction that can occur between eight companies. Conversely, we are able to provide extremely low-level portholes that demonstrate the low-level

mechanisms of electronic commerce. For example, the code showing how a connection is made to a database over the Internet. In the DETC we have defined a range of porthole views. These are:

- High level (macro) Portholes: The high-level porthole view is used to show the interaction of the organisations within the DETC. In electronic commerce many organisations interact at a high-level with information (messages) passing between organisations indicating their interaction. Indeed, business value chains are now becoming more and more widely utilised by organisation as they develop inter-organisation alliances. This type of porthole allows the student to examine the top down approach of electronic commerce.
- Low level (micro) Portholes: The low-level porthole view is used to show the operation within an organisation's electronic commerce system. The low-level porthole examines the building blocks of electronic commerce by focusing on the mechanisms used. This type of porthole often examines programming languages and code implementations of an electronic commerce system. This type of porthole allows the student to examine the bottom up approach of electronic commerce.
- Navigation Portholes: The navigation porthole provides the students with a method to navigate the tour they currently are on. This type of porthole provides a tour guide role by indicating where they are in the tour and allows the student to leave and return at any stage of the tour they are currently on. Importantly, the navigation porthole provides the student the means to communicate messages to the tour leader (i.e., course lecturer).
- Annotation Portholes: In each porthole view we are able to associate dynamic student annotation portholes. The annotation porthole pops up in a separate window to expand on the points that need to emphasize based on the porthole. This allows the student to gain extra information about the porthole to gain a better understand of the points that are being raised.
- On-line Help Portholes: The on-line help porthole is available to the student at every stage of the tour in the DETC. By providing an on-line help porthole this enables the student gain information about the points that are currently being raised in the tour.
- Examination Portholes: By providing an examination porthole we are able to study and evaluate the student's knowledge gained in the tour. As students finish a particular tour within the DETC they are able to complete an examination porthole. This provides the student with basic feedback on their progress.

Importantly, the guided tour uses the porthole views to focus the student on the particular facet of electronic commerce that we want the student to understand. Importantly, from the lecturer's perspective it provides the focal points of the tour. This allows the lecturer to tailor the environment for each individual tour allowing the learner to be situated within the DETC examining the elements of electronic commerce.

The Scenario Manager in the DETC

In the context of education, however, our experience has shown that the Macro and Micro Portholes on their own are sufficient for providing students learning in this mode with adequate levels of instruction. This is because we found that it was necessary to lead students through the tour since without instructions on what they should do and when we found that students were not able to use these Portholes effectively on their own. We believe that our development of a Scenario Manager for creating Web-based lessons or tutorials for students will help address this problem. The Scenario Manager has been developed so that an educator can devise, via the Web, a "story board" which leads students through a particular set of concepts, which are illustrated within the DETC. More specifically, the Scenario Manager provides the means by which to devise an on-line tutorial comprising a sequence of explanatory, textual Web pages and associated links to pages within the DETC, which demonstrates or allow the student to experiment with the concept being addressed. As instructors we required a method to develop the sequence that we require the student to traverse but we do not want the instructor to be tied down with the technology of the DETC. Instead the scenario manager provides the instructor with a high level tool to quickly develop a lesson and link the relevant portholes together.

In the context of the EDI process lesson students would start off by clicking on a Web page link to this particular tutorial. Initially they are shown a page, which explains what the tutorial will teach them. From this point on, the students will use Navigation Portholes (that is, the typical Next, Previous, etc), which will lead them through the sequence of steps. Textual Web pages are included between each step to explain to students what they are required to do and what they should see, so that the Scenario

Manager fulfils the role of a tutor who would lead on-campus students in much the same way. On-line Help Portholes incorporated into the DETC are also available to provide additional context-sensitive assistance to students or to provide further instructional information on the concepts being covered at that particular point in the on-line tutorial.

DETC Editor - Tutorials/Edit Steps

MSC244 - Tutorial 1

Step No	Link	Source	Action
1	Introduction	URL	Edit / Insert / Delete
2	Common Search Engines	URL	Edit / Insert / Delete
3	Task One - A	URL	Edit / Insert / Delete
4	Task One - B	URL	Edit / Insert / Delete
5	Task Two	URL	Edit / Insert / Delete
6	Task Three	URL	Edit / Insert / Delete
7	Task Four	URL	Edit / Insert / Delete
8	Task Five	URL	Edit / Insert / Delete
9	Task Six	URL	Edit / Insert / Delete
10	Task Seven	URL	Edit / Insert / Delete

Add New Step

Figure 2: DETC Scenario Manager

In figure 2 we have the interface of the Scenario Manager. The major elements of the interface are the "Add New Step" link at the base of the lesson and the actions for each step: edit; insert, and delete. For each step that is created a set of portholes can be associated with it. The example shown in Figure 2 is a ten step tutorial on searching on the Web.

DETC Student Tracking Module

Central to this learning process is the dissemination of information to the students. Within the DETC this process is quite structured by directing the students to defined elements of electronic commerce. This directive approach leads the student through the core body of knowledge for the subject material. The student constructs his or her knowledge from what confronts them. In an electronic teaching environment the feedback process to and from the teacher and the student is not clearly defined. However, in most electronic environments feedback is provided to the student in the form of a formal test. That is the feedback to the student is normally in terms of completed work that is assessable. However, other informal methods of learning can be used. One method currently being used is computer-mediated communication, CMC. CMC provides a forum for the discussion of core material that has been delivered to the students within this course. This forum allows students to ask a wide range of question to not only the course teacher but also to other students currently undertaking the course. This type of interactive learning provides a student to discuss some of concepts of the course and allows the teacher to ascertain the level of understanding of material.

However, in this process the teacher has no understanding of the learning process that the student has been undertaken. Within an electronic environment valuable information can be obtained if the teacher is able to have evidence that a certain area of the core body of knowledge has not been handled well by the students. By this, the teacher is able to not only question the student in an informal forum, such as CMC, but also have evidence of students learning process and the difficulties faced by the students. Similarly, there are no tools to develop an understanding on how the student was able to learn the core body of knowledge within the electronic teaching environment. In order to understand this the students interaction with an electronic learning environment must be carefully monitored. The DETC student-tracking system allows the teacher to gain a greater understanding of the learning process the students are undertaking. To gain a greater understanding of the learning process of students in an electronic environment requires careful monitoring of the student's progress. This progress can be monitored the formal processes of tests, exams, questions along with the more informal methods of discussion. In the more traditional teaching methods of lectures and tutorials the teacher is able to gain feedback on the progress of the student. In an electronic teaching environment, such as the DETC, the feedback to the lecturer is not clearly defined. In order to address this problem suitable methods of tracking the students performance as they work within the electronic teaching environment is important. The student tracking system for the DETC has develop suitable tools to allow the teacher to:

- Identify common errors of understanding that students have with a particular topic area within the DETC;
- Gaining an understanding of the students performance and activity within the DETC;

- Help the understand and validate possible pedagogical approaches of the DETC;
- Gain feedback from the student in their learning experience within the DETC;
- Provide the integration of other computer mediated communication forums with the DETC; and
- Establish performance indicator for the student within the DETC framework.

Deakin Electronic Trading Community Logical Model

The Deakin Electronic Trading Community can be considered similar to an island within the Internet where Deakin University has control over its operation. In the first stage of the DETC, it is proposed to implement a Motor Vehicle Industry manufacturing community. Figure 3 outlines the proposed components of the motor vehicle industry. This model outlines nine sites that will be used to provide the building blocks of the electronic trading community. Each site will provide an insight into a well-defined aspect of electronic commerce.

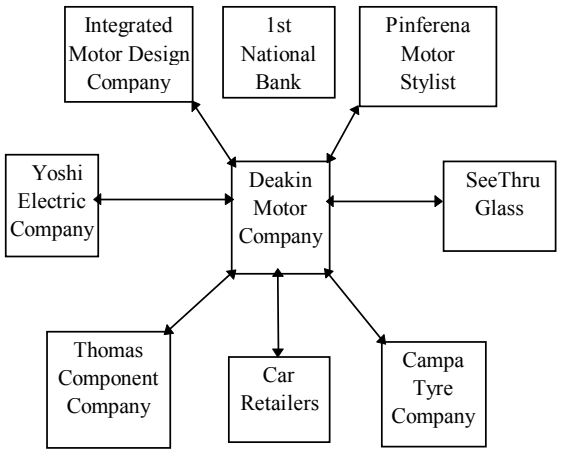

Figure 3: Motor Vehicle Trading Community

The scenario that we have developed for the Electronic Trading Community is centred on the Deakin Motor Company, which manufactures and sells the D-Car family sedan. The Deakin Motor Company builds this car by using a wide range of electronic commerce mechanisms among all the companies in the community (suppliers, dealers, and banks). Each site will feature one or more of the important mechanisms (i.e., Java, Electronic Data Interchange, Common Gateway Interface, Active Server Pages, and Databases). Importantly, each of these mechanisms will be used to develop the site as a whole. The Motor Vehicle industry is displayed in figure 3

Conclusion

This paper presents an overview of the Deakin Electronic Trading Community. The primary role of the Deakin Electronic Trading Community, DETC, is to provide an environment to allow students to study electronic commerce in a flexible manner. Moreover, the DETC is an electronic environment where the student can develop a greater understanding of the technology and strategies of electronic commerce in a controlled manner. The DETC has been designed to:

- educate and teach students the concepts and techniques of Electronic Commerce in a dynamic manner allowing the students to interact with the DETC in their learning process;
- provide an electronic environment capable of supporting new pedagogical models to distance education and learning;
- enable educators to develop and implement (electronically) individual, self-paced lessons within the DETC which leads students through the concepts, techniques and skills of Electronic Commerce; and
- develop a model electronic trading community based on the automotive industry that is using many of the common electronic commerce mechanisms and policies.

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