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Teaching and Learning Electronic Commerce in a Virtual Economy
Keywords: electronic commerce, ecommerce, virtual economy, problem-centered learning

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Abstract

This paper describes the redesign and implementation of a graduate course in electronic commerce using a pedagogical strategy, problem centered learning, and a "virtual economy," (VE) a simulation of a competitive marketplace for information products and services. The pedagogical, service, research, and technological components of this course are presented and the student experience is briefly described. At the time of this writing, the VE has been operating for three weeks so the discussion of the challenges faced by the students is necessarily brief and preliminary.

Introduction

This paper describes an innovative use of information and communication technologies (ICTs) for instruction in a graduate course in electronic commerce (ecommerce) in the School of Library and Information Science (SLIS) at Indiana University, Bloomington. The approach used in this class involves the design and development of an inquiry-based learning environment for teaching ecommerce. Students have a challenging, novel, technology-focused, and learner-centered educational experience and learn by "doing" ecommerce instead of listening to someone talk about how to do ecommerce. The course is designed around a working, robust, and web-based virtual economy (VE) that provides a powerful learning environment; it can become an integral component of many different graduate and undergraduate classes that focus on ecommerce, and related topics such as marketing, advertising, and commercial web site design. The VE is an environment that can be used to experiment with non-traditional ways of teaching ecommerce. It can also be used as a testbed for conducting research on ecommerce.

The VE is a distributed digital marketplace that simulates a competitive environment for buying and selling information products. Teaching in a VE involves the development, testing, implementation, and use of a secure web-based environment where students experience ecommerce from the ground up. Learning in the VE involves confronting and resolving a series of problems related to starting up and managing a business. Over the course of a semester, students start up, design, and operate Internet businesses (e-businesses) which compete with each other in the VE marketspace. Shoppers in the VE use digital money to purchase information products and services. In the first version of the VE, these shoppers are students in a business school in Scotland; subsequently, they will come from other colleges, high schools, and perhaps the private sector.

Developing the course around the VE has involved pedagogical, service, research, and technical components. The first is pedagogical. The course has been redesigned around the the concept of problem-based learning. This has required the development of new curricular materials (readings, tutorials, and interactive assignments) and an instructional strategy to support the e-business start-up cycle. Rosenbaum has been teaching ecommerce since 1996 SLIS and this was the first such course in the IU system. The current course structure is the basis of the redesign (current syllabus for L561: Electronic Commerce : http://www.slis.indiana.edu/hrosenba/www/L561/syll/syll4.html). The authors plan to develop a version of this course for distributed education and create curricular materials that will allow remote populations, such as students in other universities, high school students in advanced placement classes and people in corporate environments, to participate in the VE.

The second component, service, involves sharing information about the course, its underlying technology and communications infrastructure, pedagogical strategies, and student experiences, with other internested faculty. Information dissemination will take place in workshops, mentoring and consulting sessions, a course web site, and, initially, through the Indiana University Knowledge Base (KB), where a "best practices" section will be created containing information about the course and the VE. The third component, research, involves evaluating the VE as a learning tool and investigating research questions about ecommerce.

The fourth component is technical and consists of the development and expansion of the VE and the computing and communications infrastructure that supports it. A prototype of the VE has been developed using Cold Fusion and Oracle (described below) and is currently being tested. The next step is to scale up the prototype. This work will result in clean, modular, heavily commented application that can be easily modified and reused.

A more detailed description of these components follows.

Pedagogical component

This class promotes innovation in teaching and learning through the use of ICTs. The pedagogical approach used in the VE is based on problem-based learning (Duffy and Cunningham, 1997; Savery and Duffy; 1995) and the development of a situated learning environment (Larsen and McInerney, 2000; Cole and Engestrom, 1993; Lave, and Wenger, 1991; Brown, Collins, and Duguid, 1989). In starting up, designing, and managing an e-business, students face a classic ill-structured problem engages their knowledge, skills, and attitudes over the semester. They are working in small, self-directed teams and are investigating issues involved in the creation of web-based businesses. Although there is a syllabus for the course that provides topical readings, students are responsible for determining what they need to learn in order to develop and manage their Internet businesses. As a consequence, students are drawing upon a range of disciplines to resolve the problems they face. These are some of the essential elements on problem-based learning (Barrows, 1999). The various activities (see below: The student experience in the VE) build upon one another as students experience ecommerce in "Internet time."

Because shoppers visit the VE and purchase products for eight weeks, there are real-world benchmarks against which students' work can be evaluated (sales, repeat customers, traffic reports, and customer feedback). This forces students to apply what they have learned to the basic problem as it evolves over time. Shoppers are not shy about letting store owners know what is working and what is not. This creates "authentic learning" where "students publicly exhibit their learning, and there are often real life standards of quality" (Gordon 1998: 391). This is an improvement over similar attempts to create ecommerce simulations (Dhamija, Heller, and Hoffman, 1999) because the shoppers are external to the class and are not known to the students. The overall experience, including the group work and independent investigations of ecommerce issues should lead to desirable learning outcomes as students "achieve higher levels of comprehension, develop more learning and knowledge-forming skills and more social skills" (Rhem, 1999). What is interesting about this experience is that students will have regular and immediate feedback about their work reflected in daily and weekly sales figures and customer feedback. This is as close to the experience of running a small e-business as students can have in school without having to go into debt or run the risk of bankruptcy. ICTs (in the form of the VE) are being used here to redesign the educational experience to give students a palpable sense of a world that many want to join.

The use of the VE has impact beyond the traditional classroom because of the nature of the problem students are solving. They are experiencing digital entrepreneurship as they carry out many of the activities involved in starting up an e-business. These activities are not often part of the traditional classroom: students write and present business plans; develop and implement ad and marketing campaigns; design, test, and operate web-based storefronts; and develop

methods to handle delivery, order fulfillment, and customer service (Rosenbaum, 2000). In addition, many of these activities happen in "Internet time" and are governed by the flow of business, not a prescribed sequence of classes set out in a syllabus. Students work in small groups in an asynchronous, self-paced and situated learning environment using collaborative workspaces and multiple communication channels to develop their e-businesses. This is a use of ICTs which "can provide tools that replace, augment, or extend the ability to identify, collect, organize, integrate, and generate knowledge…chang[ing] in kind the nature of the teaching-learning enterprise" (Twigg, 1999; 13).

This project will enhance campus and distance education. An important goal is to open up the VE to faculty and students, initially at Indiana University and then on other campuses. Because of its architecture, interested faculty on any campus can participate in the VE, initially by having their students shop and later by having them run stores. Participation can be extended to high school students and learners in corporate environments who can come to the VE as shoppers. For example, eshopping can be part of a unit on ecommerce integrated into an advanced placement economics class. As students learn about ecommerce, they spend virtual money in the VE, shopping for information products that can help them with class assignments. A digital package of materials can be prepared for teachers containing materials for teaching ecommerce, readings, assignments, and detailed information about the VE.

In addition, this project is being used to strengthen national and international partnerships. In a current test of the prototype, student shoppers come from the Napier University Business School in Scotland (Masters students and advanced undergraduates). In later versions of the VE, teams from Napier will operate storefronts and IU students will shop. Another interesting variation is to build teams with members from different institutions so students develop stores working in virtual teams.

The student experience in the VE: Store owners

The first participants in the VE have been divided into two groups: store teams and shoppers. The store teams are small groups of graduate students in Rosenbaum's ecommerce class at Indiana University. Each store team:

1. Has developed and implemented a business plan outlining the product line, describing how the business will operate and forecasting its profitability. This plan was presented to a "venture capitalist" (the instructor) who decided on a level of investment that funds marketing strategies, allows outsourcing of design and build functions, and buys advertising space on the VE portal page.

2. Has designed its store in an iterative process of examining other web sites and prototyping and testing a design that is aesthetically pleasing, usable, allows browsing, and handles transactions. The team has designed content pages (product descriptions, help pages, etc) and used a template page containing a product catalog, transaction procedures, and an order form (all written in Cold Fusion). As stores and shoppers interact, teams are redesigning sections of their stores in response to feedback.

3. Has developed content, which has involved creating products for assignments in the course taken by the student-shoppers. These include annotated bibliographies of and collections of print and/or digital resources, reviews of web sites, newsletters, subscription services, paper editing, and consulting activities. One enterprising group is attempting to carry out a business model based on entertainment; they are trying to generate a revenue stream through the sale of "dares" to be performed by one store team member.

4. Has filled the Oracle database, using a web-based, Cold Fusion-enabled form to add information to their product catalog and customer information database. Teams continue develop and add content as they see what shoppers are purchasing.

5. Has creating advertising and marketing strategies, including banner ads for the VE portal page, sales, and other promotions. Teams bid in a sealed bid email auction for banner placement on the portal page that took place in three rounds over three days. All of the teams have developed a strategy of changing their banners at least weekly. Teams are also experimenting with digital coupons, loss leaders, sales, and rebates.

6. Has set up customer service and loyalty programs with clear policies to protect customer privacy, handle grievances and complaints, and provide technical support. They are also exploring trust-building, using mailing lists, webboards, sales, and discount offerings to build a customer base. The Napier students have turned out to be demanding shoppers and store teams have had to develop strategies to handle customer complaints, requests for refunds and other customer service problems. They have also developed loyalty programs, offering, for example, discounts for repeat business.

7. Is currently managing the business, by monitoring the store's accounts, handling customer service and support, and maintaining inventory. Teams will be responsible for the web pages in their stores. A system administrator is handling technical maintenance of the VE.

The student experience in the VE: Consumers

The shoppers are 75 advanced undergraduates and graduate students in an ecommerce class at Napier University Business School in Edinburgh, Scotland. The teaching team has used the class as an opportunity to explore consumer perceptions and experiences of e-commerce. Data is being gathered in pre-shopping (completed) and post-shopping questionnaires, in student diaries (underway), and in presentations given by pairs of students in class at the end of the shopping period. Each member of the class has agreed to participate in the research exercise, and has completed a consent form. The data will be analysed and findings presented at the conference. Informal feedback at the time of writing (March 2000) indicates that the 'action learning' approach taken in this class is fully endorsed by students, and has led to intense student engagement with the web mall. The url for the Napier class is: http://www.bim.napier.ac.uk/~hazel/index.htm

Timeline for the VE

Week 1: Introduction: Developing a start-up company

Week 2-7: Design, build, and test the site

Week 2: Present business plan and begin content development
Week 3: Database population, evaluation of sites and development of initial prototype
Week 4: Development of advertising and marketing plan
Week 5: Final design online ad auction
Week 6,7: Presentation of customer service and support strategies, testing and redesign (if necessary)

Week 8-15: Operate the storefronts

Service component

One outcome of this class will be an integrated and portable course package that can be used to teach ecommerce at graduate and undergraduate levels. We plan to consult with faculty who use the VE either as a centerpiece of their course (students building and operating storefronts) or as an adjunct to course activities (students shop in the VE). We will offer hands-on workshops initially for Indiana University and Napier Business School faculty where they can learn about the VE software and course design. Participants will be able to build and use storefronts in the VE in short simulations

The details of this class will be made available, initially through an online resource such as the Indiana University Knowledge Base or similar web site. As an addition to the KB, it will provide a best practices model for a digital (no paper), student-centered, problem-based class where students will have an experience that combines problem-solving, teamwork, reading, writing, research, web design, multiple presentations, and hands-on ecommerce. Faculty will be able to access the VE

(guest login) as well as a FAQ, the most current course syllabus, class materials, and tutorials about building, customizing and troubleshooting the VE. There will be examples of student work (the stores and other assignments) the source code (markup) of which can be examined and evaluations from student team members and remote shoppers.

Research component

The VE is also a testbed for research and publication. Two levels of research can be conducted in the VE. First, there are questions about ecommerce that can be investigated in this environment. For example, one critically important issue for successful ecommerce is the building and maintenance of trust between e-businesses and consumers. The following are examples of research questions that can be investigated longitudinally with pre-and post testing:

How is trust is constituted and defined by consumers and retailers in business to consumer ecommerce? How can ecommerce firms develop and maintain trusting relations with consumers?

Different methods of trust building can be used in different stores selling the same basic products and shoppers can be surveyed, interviewed, or assembled into focus groups to gather data about the relative success of these methods.

Second, research will be conducted on the usefulness of the VE as a learning tool in an educational setting. Data will be collected about learning outcomes through surveys, a self-report evaluation instrument, and unobtrusive measures (Dhamija, Heller, and Hoffman, 1999). Surveys will be used to gather data before and after the simulation. During the simulation, shoppers will use a web-based evaluation instrument to assess the storefronts in terms of trustworthiness, credibility of claims, customer service, reliability, and ease of use. Student work will be gathered and examined to assess communication ability and mastery of specific knowledge and skills relevant to the course.

Technical component: The virtual economy

The VE is a password-protected web space where participants conduct business transactions under conditions simulating real-world business-to-consumer ecommerce. A prototype of the VE has been built http://ella.lib.indiana.edu/g/ecstore0/login.cfm (contact primary author for access) using HTML, Cold Fusion, and Oracle. It uses no pre-existing code and is a proprietary design that has been written to be transparent to the participants. No programming knowledge is required for students to set up storefronts or to shop in the VE. The programming is modular, portable and currently runs on a UNIX platform. Cold Fusion has the ability to encrypt the code for the primary functions (product catalogs, shopping cart, and digital bank), so the VE is relatively secure. This architecture will allow the VE to be used easily by ecommerce

(and related) classes throughout the IU system and potentially on other campuses.

The prototype VE has four main components. The first is the VE portal, the entryway to the marketplace. Shoppers register, receive passwords and digital bank accounts, and then browse the storefronts. There are ad banners on the portal page that allow shoppers to click through to the stores. When finished in a store, shoppers return to the portal and explore other stores.

The second component is the storefront. The basic template for each store is a web page with a custom Cold Fusion tag <cf_store> that contains a product catalog, a shopping cart, and a checkout procedure. The catalog is configured to allow the storeowners to use a web-based form to enter two levels of product and service information. The first description contains a sentence or two describing the product and its price, and an image. The description and image are added to a product catalog page where all of the store's products are listed. From this listing, there are links that lead to the second level of product information, a more detailed product description that is on its own page; this page also displays an image and pricing information. After filling her shopping cart, the shopper can check out and invoke the checkout procedure by clicking on the "buy" button. The checkout page displays the products in the shopping cart, quantity totals, individual prices, and the total price. Shoppers can check out, change quantities, remove items from the cart, or can opt out of the entire transaction. Store teams begin with the same basic template and must distinguish themselves through design and product and service offerings.

The third component is a digital bank. When shoppers enter the VE for the first time, they are given a bank account. Each store also has an account in the bank. Shoppers receive a standard amount of digital cash; stores receive amounts of money on the basis of the successful presentation of their business plans. When a shopper makes a purchase, the amount of the purchase is deducted from his or her account and added to the appropriate store's account. Store teams can use their money to purchase advertising space on the portal and to subcontract design and build services. The bank is relatively secure - shoppers and storeowners can check their balances but do not have access to each other's accounts.

The fourth component is the digital product warehouse. Each store has a password-protected storage area on a server where the information products can be uploaded. Each store also has an email account and a webboard that can be used in any way the store team sees fit.

Conclusion

At the time of this writing, when the VE has been open and running for three weeks, early indications are

that the VE has provided a unique and challenging learning experience for both the Indiana University storeowners and the Napier University Business School shoppers. Students are developing very creative strategies for resolving the problems that accompany starting up an Internet business. The VE is providing a challenging, student-centered learning environment where students are experiencing ecommerce in real time.

In the near future, we will be redesigning the VE as a robust application with more sophisticated storefront templates, simpler transaction procedures, better security, more usable reporting functions for store owners and administrators, and stable database back end. It will include a wider range of ecommerce services including a searchable, database driven product catalog that can be used on multiple pages, a searchable customer information database to provide store teams with data for marketing campaigns, a stable live chat facility for customer service, the capability of conducting online auctions, and an online evaluation tool.

The next step is to conduct evaluation research to determine whether this is an effective pedagogical device. The VE will be used in Fall 2000 and Spring 2001 and data will be collected during these semesters. We hope to report the results of this work at AIS 2001.

Acknowledgements

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