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Implementation Strategies for a Graduate E-Commerce Curriculum

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Abstract

This paper examines the strategies used in the implementation of DePaul University's pioneering master's degree in E-Commerce Technology. These strategies emphasize curriculum development, technical support, faculty staffing, marketing, industry partnership, and organization support. The lessons learned from DePaul's implementation experience during this first year will offer other schools unique insights for introducing their e-commerce curriculum.

Background

In September 1999, DePaul University's School of Computer Science, Telecommunications, and Information Systems (CTI) launched a pioneering M.S. degree program in E-Commerce Technology. This new curriculum was built on a dual emphasis of e-business strategies and applications of Internet-based technology. The entire curriculum, including a wide range of new courses, was successfully implemented by June 2000. This paper examines the implementation strategies and lessons learned during the first year.

DePaul University in Chicago is not alone in offering e-commerce programs. Claremont University in California, Carnegie Mellon University in Pittsburgh, Creighton University in Omaha, and National University in San Diego all offer such master's degrees (Memishi, 1999). In addition, a broad spectrum of schools offers certificates or concentrations in this area. Other institutions, including Stanford, Harvard, and University of Chicago, opted to include e-commerce coverage in their traditional curriculum instead of creating a separate e-commerce programs (Memishi, 1999).

The growing number of e-commerce degrees is solidly based upon the growth of e-commerce. According to Forrester Research Inc., Internet business reached \$43 billion in 1998, and will grow to approximately \$109 billion by the end of 1999 and \$1.3 trillion in 2003 (Frook and Karpinski, 1999). Forrester Research predicts that US business-to-business (B2B) e-commerce will hit \$2.7 trillion in 2004. New models of e-marketplaces for conducting B2B e-commerce through auctions, aggregators, bid systems, and exchange, will capture 53% of the business trade (February 7, 2000). The market

research firm International Data Corporation has projected that Internet-based transactions will be valued at more than two million dollars per minute in 2003, and over five million dollars per minute in 2005 (Needle, 1999).

The rapid growth of e-commerce has resulted in an increased demand for e-commerce IT professionals. According to Christian & Timbers Inc., an executive recruiting firm, during 1996 the demand for Internet software developers almost tripled, while the demand for Internet executives already doubled ("Price of Popularity," 1997). The upward trend is still continuing. A recent article in *InformationWeek* predicts that "Internet skills will be highly sought after;" and quotes RHI Consulting, an IT staffing firm, as saying that Web developers would see some of the largest gains in base compensation of all IT workers in 1999 (McGee, 1999). *Computerworld* includes Manager of Internet/Intranet Technology, with a salary range of \$80,000 to \$120,000, as one of its seven highest-demand IT positions (LaPlante, 1998). *Computerworld's* jobs survey indicates that "skills related to network and Internet technology remain hot: 40% of hiring managers are looking for people with a background in the Web programming language, HTML, followed by Internet development (38%), Windows NT Server (37%), Java (35%) and TCP/IP (32%)" (Fryer, 1999).

The Curriculum

DePaul's M.S. in E-Commerce Technology program differs from other e-commerce programs in several ways. It emphasizes a tight integration of business strategies and technology solutions throughout the curriculum. The curriculum offers significant technical depth. It has a strong emphasis on hands-on experience and market orientation. These unique characteristics reflect the strength of the School of CTI, its faculty, and the goals of this new program. The School of CTI is a technically oriented graduate school, embracing both technology and business applications of new technology. Its faculty is multi-disciplined, representing a wide spectrum of academic training and industry expertise (Knight, et. al., 1999).

This program is intended to prepare graduate students to lead e-business applications development in large

corporations, consulting firms, or their own entrepreneurial endeavors. The curriculum prepares students to develop a capacity for integrating business strategies, process, development tools, and technology in the dynamically changing environment of the new economy.

Curriculum Principles

Five underlying principles guided the development of this curriculum (Knight and Chan, 2000):

1. To expose students to a broad and ever changing mix of technologies, programming languages, and tools. Rationale: The Internet has few dominant technologies, and those that do appear to be dominant today may change tomorrow.
2. To build in program flexibility for rapid adaptation to future changes in either technologies or industry norms. Rationale: E-commerce as a discipline is in a constant state of evolution. One of the major curriculum challenges is to anticipate what students will need to know when they graduate two years hence. This requires the active use of feedback loops throughout the e-commerce curriculum development model.
3. To emphasize practicums and application development for real clients in an authentic e-commerce environment. Rationale: E-commerce, by its very nature must be an applied curriculum.
4. To anticipate industry needs and forge a long-term partnership with e-commerce leaders. Rationale: Business contacts are crucial for keeping the program in sync with a rapidly changing environment.
5. To emphasize the integration of business strategies, development methodology, and technologies throughout the curriculum. Rationale: E-commerce stimulates the integration of various technology solutions while bridging strategy formulation and solution development.

Curriculum Structure

The curriculum is organized into three phases:

The *Prerequisite Phase* requires students to demonstrate competency in six areas:

- analysis and design technique
- client side web application development (HTML, DHTML, JavaScript, FrontPage)
- server side web application development (ASP, VBScript, and Homesite)
- object oriented programming (C++)

- data analysis and statistics (SAS) and
- Java application programming.

The *Core Knowledge Phase* emphasizes a common foundation in:

- database systems (Oracle)
- distributed systems (various protocols and client/server architecture) and
- strategies for consumer e-commerce and Website engineering process

The *Advanced Phase* provides breadth and depth in six required courses and four electives:

- usability issues for e-commerce
- advanced web information system (Intranets, web mining, and business engineering)
- B2B e-business systems and supply chain management
- security for e-commerce
- distributed systems practicum (Java and Corba) and
- e-commerce management

Students can take electives from a wide range of courses offered at CTI, including:

- Enterprise Resource Planning
- datawarehousing and datamining
- groupware and virtual collaboration
- legal aspects of e-commerce
- database design and
- Internet multimedia

Implementation Strategies

Six sets of strategies have helped to accelerate the implementation of this pioneering program.

1. Curriculum Development and Phasing

The E-Commerce Technology curriculum calls for the creation of eight new courses. At the time of launching this program, other universities did not yet offer most of these courses. Therefore, a significant amount of innovative curriculum development work took place during the first year. The initial plan was to phase in both the curriculum and eight new courses over two years. These courses were open to both E-Commerce Technology (ECT) majors and students in the M.S. in Information Systems/E-Commerce (EC) concentration. Many students transferred to ECT program and E-Commerce concentrations. By May 2000, there were 250 ECT majors and more than 100 students in the IS/EC concentration. A large number of them desired to graduate in June 2000 with this new degree or concentration. Therefore, high student demand necessitated an accelerated implementation timetable. Accordingly, several strategies were taken:

Start with consumer oriented e-commerce.

Students were introduced to the landscape of e-commerce through the lens of consumer-oriented e-commerce and Website engineering process. Students relate to consumer oriented e-commerce more readily than to a conceptual overview of the digital economy, or other areas of e-commerce. This approach helps to motivate students to acquire development skills and link business strategies with technical solutions early on in the program.

Emphasize integration of strategy and technology.

All the new e-commerce courses emphasize relevant business models, processes, technologies, and hands-on experiences. Students, therefore, are exposed to various development tools, programming languages, and technology platforms that support a given segment of e-business models. For example, the B2B extranet course covers in an integrated manner the virtual supply chain, global logistics management, XML applications, virtual private network, architecture (NetCommerce and Broadvision), database, and messaging software (IBM MQSeries). This allows students to apply conceptual framework to business process redesign and the development of technical solutions for logistic management. Students in the Advanced Web Information Systems course learn how Web mining tools can be used to derive business intelligence for developing a better customer relationship management program as well as enterprise portal.

Select Microsoft technology platform.

The emphasis on integration of strategy and technology requires the consideration of technology choices. Microsoft was chosen as the platform. Among numerous and ever-changing technology and tools, therefore, Microsoft FrontPage, Access, ASP, and IIS were chosen as the preferred development tool, database, server side scripting tool, and server platform. The advantages are many. Microsoft suite is already bundled, interoperable, inexpensive, and easy to learn and maintain. Building on this foundation, additional tools and technology were offered.

Assign a coordinator for each course. Each new course was assigned a faculty member to coordinate its development. This helped to ensure consistency across multiple offerings of the same course and the appropriate sequence of courses. There was a great deal of collaboration and sharing of course materials and lecture notes among the faculty who participated in this program. This teamwork facilitated accelerated implementation.

2. Technical resources and support

Technical resources required to support the first year of the e-commerce program included six servers, two laboratory/classrooms, student breakout rooms, and a

plethora of new software. All of the items described below were in addition to already existing university and CTI resources, including approximately 120 existing student stations in three separate student computer labs.

Servers. The servers currently in use are Pentium III 600-megahertz machines, each with 128 megabytes of RAM. Initially having individual classes on their own servers was thought to minimize potential disruptions that occurred when students took the server down unintentionally. However the servers proved more stable than expected during the fall quarter and multiple courses smoothly shared the same server during the winter quarter. Plans are now underway to replace the current configuration with four more powerful servers. Having fewer servers will simplify maintenance for the technical staff.

Computer Laboratory/Classroom. The e-commerce technology student computer laboratory houses forty 333 megahertz Pentium II laptops, each with 96 megabytes of RAM. Laptops were chosen because of the need to retrofit an existing space with the student stations. The computers are arranged in a configuration designed to support either an open student lab or a classroom environment. When used as a classroom, three linked SVGA projectors simultaneously display any combination of instructor computer/video output, secondary computer video output, VCR output, and/or document camera video output. For instance, professors are able to simultaneously show a Web page in Internet Explorer and Netscape on two of the screens while also showing the code that generated the output on the third screen.

Twenty-first Century Boardroom. A second, smaller classroom, named the "twenty-first century boardroom," houses sixteen full-sized 600-megahertz computers, each with 128 megabytes of RAM. This room is designed to facilitate group decision-making processes using GroupSystems GDSS software, (the same three-screen video projection system described above) and also the sixteen individual computers sunken into the boardroom table. Both ISDN and IP video conferencing are available. This room is used for small seminars and group work, and is used by information systems and e-commerce students.

Group breakout rooms. Three small breakout rooms for team projects each house a single PC, with room for a group of up to six or seven students to work around a table. Both IS and e-commerce students use these rooms.

Server Software. Most of the servers are running Windows 2000, with one SQL server, and one running Brio software. Brio is a widely used commercial package studied in the intranet class.

Student lab and classroom software. The computers in the classroom and the student lab use the Windows NT operating system. A variety of development software is used, including Visual Studio, Office 2000 (including FrontPage), Allaire's HomeSite, and Macromedia's DreamWeaver. All the computers have both Internet Explorer and Netscape Navigator as well as basic support utilities, such as zip and FTP programs. PhotoShop is available on a limited number of machines, as is Net.Commerce DB2. The latter is IBM's package for supporting business-to-business e-commerce solutions, and is used in the extranet course. Additional graphics software is being planned, including MacroMedia's Flash, as well as additional copies of PhotoShop. Initial planning underestimated both the need for graphics support software and the costliness of some packages like PhotoShop.

Technical support. As a result of this program, the full time technical support staff within the school was increased from one person to three people. In addition, a corps of student lab assistants helped to keep the labs functional and the servers in shape.

3. Faculty Staffing Strategies

The large number of new courses and the size of student demand required a multi-pronged approach to staffing. Three new IS faculty hired in the fall of 1999 provided support for the program, one teaching entirely e-commerce, one teaching half e-commerce and half IS, and one teaching entirely IS. The new IS faculty members with the movement of some IS students to the new e-commerce program enabled two existing IS faculty to teach entirely in the e-commerce program. In addition to recruiting part-time instructors from the industry, a number of computer science faculty members engaged themselves in faculty development to teach in the e-commerce program. This process was met with limited success. For the next school year, additional CS faculty members have been appointed to teach some of the more technical e-commerce courses, and a more formal faculty development program is being planned. CS faculty bring tremendous technical skill to e-commerce courses but are generally not accustomed to working with business application problems, nor in the more collaborative, team-oriented atmosphere that permeates IS classrooms. These deficiencies will be addressed with informal seminars for CS faculty interested in teaching technical e-commerce classes.

4. Marketing and Promotion

The new program was announced through a university press release, special student mailings, and at the AMCIS 1999 conference in Milwaukee. Additionally, the school promoted the new program through a series of ads in the

Chicago Tribune and through many activities sponsored by its alumni association. As a pioneering program, the E-Commerce Technology program attracted extensive media attention. Several publications featured the program, including *Chicago Tribune*, *Crain's Chicago Business* (Baeb, 1999), and *Electronic Commerce World* (Memishi, 1999). The school's web site also served as an effective means for promotion. Media coverage directed many industry partners to contact the school for potential partnership.

5. Industry Participation

This curriculum was developed with significant input from industry partners, particularly members of e-commerce professional service firms in the Chicago area. These firms are at the forefront of e-business solution implementation. They are motivated to work closely with universities because of their recruitment needs. A roundtable with these representatives was held in December 1999 to discuss changing business models, development methodology, and projections of future demands. Such an exchange helped to keep the program in sync with the market place and technological change. Future roundtable meetings will focus on companies' needs for e-business transformation. Industry partnerships will also be formed to provide student internship opportunities and career placement.

6. Organization Support

The dean of the school provided strong support, particularly in the provision of technical resources. Additionally, many members of the faculty and staff actively participated in this new program. New advising materials were developed to meet high student demand. The school's Intranet system provided online resources and self-services for prospective and current students. Special orientation sessions were provided to prepare faculty and staff advisors to respond to student inquiries.

Next Steps

As of May 2000, the program in e-commerce has received very favorable responses. Early feedback from students and industry confirmed that the curriculum meets market needs and is on the right course. Three studies are being considered to evaluate the implementation of this new curriculum. An e-mail student questionnaire will be created to assess student feedback about individual courses and the curriculum. Select June graduates will be invited to participate in a focus group session. Industry partners and employers will also be contacted for their feedback.

Lessons Learned and Recommendations

For universities contemplating an e-commerce degree program, there are many significant challenges to overcome. Several lessons learned from DePaul's experience and subsequent recommendations are highlighted below:

1. Demand far exceeded expectations.

Perhaps the greatest lesson learned from the implementation of this e-commerce program was that demand for any such e-commerce program is likely to surpass projections. This causes a strain in two major areas: staffing and technical support. To help alleviate the pressure, a plan should be developed for an orderly phasing-in of the curriculum.

2. Proactive faculty development is critical.

Staffing strategies should be developed early and should include maximization of industry contacts, with an eye toward recruitment of potential part-time instructors. Faculty development of internal professors from other areas to teach e-commerce may work if sufficient care is taken to pair them with courses that play to their strengths and to bring their course content expectations in line with the curriculum. Industry professionals are most suitable to teach leading edge courses due to the complexity of both technology and the best practices. Sufficient resources should be provided to enable faculty to learn new topics through industry conferences, workshops, and books.

3. Technical support means more than software and technology.

E-Commerce programs require special server and software support, which are not easily met by general lab support provided by a university's academic computing departments (Dhamija, et. al., 1999). A strong technical support staff with substantial up-front investment in hardware and software is also crucial to an e-commerce program's success. E-commerce programs cannot be built by adding only a few software packages to existing technical resources. While the full-featured laboratory set-ups described here are not crucial, the addition of new servers, extensive new software and the technical staff to support both are critical.

4. Continuous curriculum alignment is necessary.

A major challenge in the introduction of an e-commerce program is the development of curriculum and

courses. The dynamic nature of e-commerce and Internet technology makes it especially challenging to implement this innovative curriculum. Furthermore, the accelerated pace of implementation requires careful coordination. Alignment of course content should take place at the end of each term to ensure the proper sequence and minimal overlap among related courses.

5. A culture for innovation is a pre-condition.

The introduction of an innovative program requires a culture of openness and willingness to take risks. So much uncertainty exists about the technology and business models that the challenge of building a new curriculum demands strong leadership support and an environment of faculty collaboration. The rigid departmental boundaries and bureaucratic curriculum approval process need to be addressed before a coherent e-commerce curriculum can be introduced.

7. Speed is an essential strategy.

The implementation of an e-commerce program mirrors the way in which e-commerce initiatives are launched in the market space. Speed is an essential strategy. Students are motivated to finish the program early to enter the marketplace upon completion. The ever-changing technology calls for continuous update of tools and solutions. All these forces demand a faster pace of program delivery and a more responsive process for curriculum and course development. A school's agility to meet market needs and demands due to technology changes is a key critical factor for success.

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