E-Commerce Curriculum: After the Fall

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ABSTRACT

The fall of the dot-com has had a chilling effect on university-level e-commerce programs. Increasingly, academics and practitioners are asking just what constitutes an effective e-commerce program. This research analyzes courses offered by technically oriented e-commerce degree programs at the master's and bachelor's levels. By distilling patterns of courses that are common across multiple schools, it is possible to identify both those courses that are essential to such programs and those that provide breadth or enrichment. This research may serve as a guide for schools seeking to institute or update their technical e-commerce curricula, by providing a concise listing of the types of courses other institutions consider essential, important, or desirable in similar programs. Further, it provides a guide for schools seeking to institute or update their business-oriented e-commerce curricula, by identifying the most essential technical aspects.

INTRODUCTION

During 2001, an estimated 384 dot-coms filed for bankruptcy or ceased operations and approximately 98,500 people were laid off from dot-coms (Florian, 2001). The resultant tight job market in e-commerce has lead to an enrollment decline in e-commerce programs. The School of Information Science at Claremont Graduate University in California, reported a drop in enrollment and the Illinois Institute of Technology (IIT) suspended future admissions in fall, 2001, when its master's e-commerce program dipped to 10 students from 29 in the prior year (Svetcov, 2001). Examination of the IIT Website (Illinois Institute of Technology) in September 2002, indicates that its master's program in e-commerce has been replaced by a certificate program. As universities struggle to determine the future of their e-commerce curricula, one issue that they inevitable address is the soundness and strength of their curriculum.

No consensus has been reached among universities concerning the content of e-commerce curricula. No model curriculum has been developed, and little research has been done that specifically addresses e-commerce curriculum content. Ge and Sun (2000) outlined the components in an electronic commerce system that should be addressed in a computer science curriculum based upon certified IBM Net.Commerce material. At a minimum, these included electronic catalog, secure Web server, graphical user interface, e-commerce engine, communication management systems, and database management systems. They recommended supplementing traditional computer science technical components such as programming languages, software engineering and operating systems with markup languages, cryptography, human-computer interaction, networking, and the ability to learn independently, and the ability to adapt and to create. They also recommended hands-on projects for learning the practical aspects of e-commerce and blending and balancing business skills with the technical training.

In another work addressing e-commerce curricula, Durlabhji and Fusilier (2002) analyzed 67 e-commerce programs in graduate business schools. Less than 50% or 31 programs required at least one technical class. The ratio of total nontechnical e-commerce courses offered to technical e-commerce courses was 2.5 to 1. The article supposes that this could be due to either of two scenarios. The first is that after careful analysis and debate, the conclusion is that this is the content that students need. The second is that the majority of faculty are not prepared to teach technical e-commerce courses; therefore the program would not emphasize this material.

GOALS AND ORIENTATION OF THIS RESEARCH

The primary goal of this research is to analyze courses offered by technically oriented e-commerce degree programs at the bachelor's and master's levels. By distilling patterns of courses that are common across a broad range of schools, it is possible to identify both those courses that are essential to such programs and those that provide breadth or enrichment. Considering only one institution's curricula may overstate the importance of a particular niche specialty, such as cryptography or accounting system development, perhaps corresponding to local employer requirements, faculty research interests, or university tradition. By looking across a board range of universities, it is possible to distill what e-commerce faculty as a whole consider most important.

As Durlabhji and Fusilier (2002) found, some schools' e-commerce programs have a decided business emphasis. Further, while business-oriented curricula gain some measure of stability from the standards of business accrediting associations and the long tradition of business degrees, more technologically oriented curricula display far greater variance. To avoid comparing fundamentally dissimilar programs, this research considers only the curricula of more technically oriented programs, defined here as those that weigh technology at least equally with business.

For technically oriented e-commerce programs, the results of this research may serve as a guide for curriculum updates, by providing a concise listing of the types of courses other institutions consider essential, important, or desirable in similar programs. While e-commerce curricula that are primarily business oriented are outside the scope of this research, the research nonetheless has the potential to provide assistance for institutions seeking to introduce or update business-oriented e-commerce curricula, by identifying those courses that technical programs hold as most important. It is reasonable to believe that those courses that are found in all, or almost all, technical e-commerce degrees are so essential to the field that some coverage of these topics also should be included in business-oriented e-commerce programs.

METHODOLOGY

E-commerce degree programs included in the study were identified via use of the Open Directory project. The Open Directory Project describes itself as "the most comprehensive human edited directory of the Web, compiled by a vast global community of volunteer editors," hosted and administered as a "noncommercial entity" by Netscape (Open Directory information, 2002). While the Open Directory list of e-commerce degree granting institutions is not comprehensive, it was the largest list available at the time of the research, with links to 49 undergraduate and graduate e-commerce programs (Open Directory e-commerce programs, 2002).

Twenty-one (44%) of the e-commerce programs listed in the Open Directory met the requirement of being a more technically oriented e-commerce degree. For reasons described earlier, programs with a primary business emphasis were excluded. This included 11 (22%) MBA and 11 (22%) other business school programs. Six programs in the "other" category (12%) were excluded: two certificate (non-degree) programs, one associate's degree program, one seminar, one program where no information was available on the institution's Website, and one Spanish language Website without an English version.

While the Open Directory was used to identify the programs to be studied, actual data on the programs themselves came from their universities' Web sites, visited between July 27, 2002 and August 30, 2002. Courses were recorded by the course name as it appeared on the curriculum Website. As might be expected, course content and subject emphasis within related courses varied between schools, resulting in overlapping topics. For purposes of comparison, course descriptions were considered when such information was available. Each course was categorized solely by its primary focus, on which the majority of class time was likely spent. Courses that were materially the same were considered equivalent regardless of the course title. Courses that overlapped but had significant distinctive content were considered separately. As a practical matter, courses were recorded without distinction between required and elective status.

## DISCUSSION OF RESULTS: GRADUATE

The Open Directory (2002) listing of e-commerce master's degree programs included twelve schools offering technical e-commerce programs. Seven of these schools were in the USA, two in Australia, and one each in Canada, Ireland, and the United Kingdom.

Analysis of the Websites of these twelve graduate schools yielded a list of 101 courses. This in itself is an interesting result. Since 101 is many times the number of courses required to achieve a graduate degree, the sheer number of offerings indicates substantial curriculum variation across programs.

Category 1: Essential Courses

The 101 courses were divided into four segments, based upon their prevalence in the programs studied. The first segment, Essential Courses, is included in 75% or more of the programs studied, as shown in Figure 1. The one course that is common across all of these technical e-commerce programs is not a course in programming for the Web, or a course that deals with HTML, XML, or any of the other programming-oriented technologies. Instead, it is a networking course. This seems only logical since the Internet, which is the infrastructure supporting the World Wide Web, is the foundation for all e-commerce. One conclusion of this study, then, is that all e-commerce degree programs, whether technical or business-oriented, should include a networking course, with emphasis upon Internet technology.

Figure 1. Percent of Institutions Studied Offering Course in Graduate Program
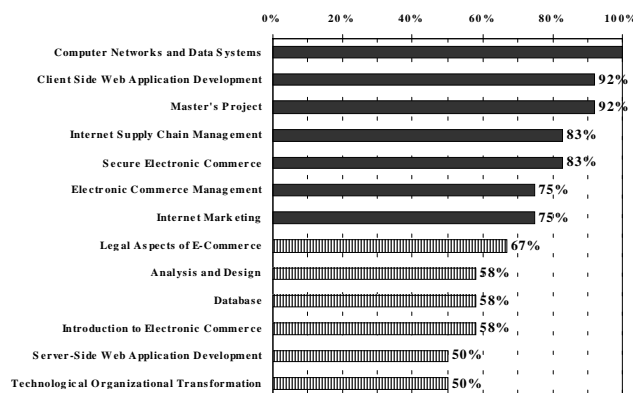
Another noteworthy result is that there are an equal number of business-oriented courses and technically-oriented courses in the Essential Courses list. Thus, where Durlabhji and Fusilier (2002) found that less than half of all graduate business school e-commerce degrees included even one technical courses, it appears that technical school e-commerce degrees are far more likely to integrate business into their curricula. This is consistent with the integrated nature of e-commerce itself, which is widely recognized as a key area where technology and business meld. The specific content of Essential Courses is also enlightening because it offers insight into the core of what is today considered important in e-commerce: supply chain management, security, and marketing. Every e-commerce program, technical and business-oriented, should include in-depth coverage of these three topics. This course emphasis is closely aligned with Feeny's list (2001) of three "e-opportunity" areas: e-operations, e-marketing, and e-service. The final component of the Essential Courses list is the Master's Project. The Master's Project, or practicum, emphasizes the application and integration of e-commerce concepts and skills to address a real-world problem.

Category 2: Supporting Courses

The second segment, Supporting Courses, is included in 50% to 74% of the programs studied, as shown in Figure 1. Interestingly, the study of databases and the development of server-side applications, which underlie all business transactions, are included in only half of the programs studied. While client-side programming is an Essential Course, offered by almost all schools, it is insufficient for implementing anything beyond the most rudimentary interactive Websites. Client-side programming can be used to perform validity checks on data entered through a Website, but that information cannot be processed without connecting to a much more sophisticated back-end operation. Electronic supply chain applications and online retailing, for example, both require centralized databases and server-side programming. These two courses should be considered Essential Courses by any e-commerce curriculum whose goal is to produce Web information system developers.

Two of the Supporting Courses, the legal aspects of e-commerce and the organizational transformation/change management course, while not traditional technical topics, are nonetheless important elements of an e-commerce curriculum. Professionals charged with development and management of e-commerce systems must be cognizant of the legal environment in which their systems operate, as well as the potential of e-commerce technology to drastically change the fundamental structure of an organization. Overall, the Supporting Courses: legal aspects, analysis and design, database, server-side development, and organization transformation/change management, are each important aspects of rigorous technically oriented programs. Knowledge in these areas is essential to the development and management of high quality e-commerce systems.

Category 3: Breadth Courses

The third segment, Breadth Courses, is included in 25% to 49% of the programs studied. These courses may represent emerging technologies, a university or faculty research interest, or a topic of regional business significance. Breadth Courses have the potential to provide the e-commerce student with a well-rounded background, add a plethora of technical skills from which to choose, and offer the student an opportunity to pursue individual topics of interest. These courses include data analysis and statistical software, data warehousing and data mining, design / strategies for Internet commerce, evaluating human-computer interaction, programming in Java I, project management, business application development in Java, customer relationship management, economics of information and networks, intelligent information retrieval, internet multimedia, local area networks, mobile commerce, business strategy, decision support and executive information systems, enterprise resource planning, groupware and virtual collaboration, information technology consulting, programming in Java II, research seminar, topics in e-commerce, and usability issues for electronic commerce.

Category 4: Enrichment Courses

The fourth segment, Enrichment Courses, is included in less than 25% of the graduate programs studied. These courses can be used to

Figure 2. Percent of Institutions Studied Offering Course in Undergraduate Program
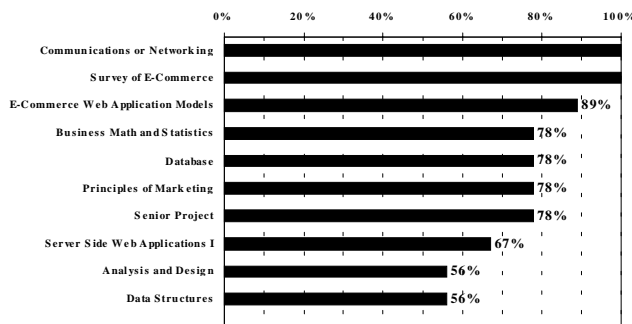
augment a strong program. Notably, many of these Enrichment Courses are in the business, rather than the technical arena, and include such topics as finance, managing human resources, accounting, and competitive strategy. The technical enrichment courses include electronic payment systems, geographical information systems, interoperability, and Web mining for business intelligence.

DISCUSSION OF RESULTS: UNDERGRADUATE

The Open Directory (2002) listing of e-commerce bachelor's degree programs included nine schools offering technical e-commerce programs. Five of these schools are in the USA, two in Australia, and one each in the United Kingdom and Canada. Analysis of the Websites of these nine undergraduate schools yielded a list of 43 courses. These courses may be divided into three segments, based upon prevalence in the programs studied. The first segment, Essential Courses, those included in 56% or more of the programs studied, are shown in Figure 2.

Category 1: Essential Courses

Only two of the ten Essential Courses, are common to all undergraduate e-commerce programs: communications and networking, and survey of e-commerce. The presence of the communications and networking in all undergraduate programs is consistent with the findings of the graduate curriculum analysis and adds weight to the argument that an understanding of the concepts behind the Internet, intranets, and extranets is a crucial ingredient in all e-commerce programs. Predictably, each undergraduate program includes an introductory or survey course in e-commerce.

Of the remaining essential courses, four are heavily technically oriented: two courses address database technology, and two courses address Web applications. Two courses are heavily business oriented: business math and statistics, and principles of marketing. Another two combine business and technology: analysis and design, which teaches students to translate business requirements into system design, and the senior project, which gives students an opportunity to integrate business and technology in a comprehensive hands-on project.

These results suggest that e-commerce undergraduate programs have a strong technical orientation and that e-commerce business specialization tends to emerge at the graduate level. This conclusion is supported by the absence of business-only undergraduate e-commerce program listings in the Open Directory (2002). In contrast to the graduate programs listed, where eleven MBA and ten graduate business-only programs were excluded from this study, all nine undergraduate e-business programs contained a strong technical component and were included in this research.

Category 2: Supporting Courses

The second segment, Supporting Courses, is included in 22% to 44% of the programs studied. At the Supporting Course level, the distribution between business and technology courses becomes more balanced. Ten courses are technically oriented and have a strong applica-

tion development emphasis: software project development, programming in Java I and II, server side applications II, client side Web applications, computer graphics, computer security, graphic design, mobile commerce, and data analysis and statistical software. At the undergraduate level, business oriented courses include industrial and organizational psychology, legal issues of e-business, introduction to IT management, entrepreneurship, and finance and electronic bill payment. Public speaking, technical writing, discrete mathematics, and small group communications, while important business skills, may easily be seen as foundation elements in any undergraduate program.

Category 3: Enrichment Courses

The third segment, Enrichment Courses, is included in less than 12% of the programs studied. Enrichment courses are overwhelmingly technical. Ten of thirteen courses are technically oriented. Two courses have a business focus: competitive strategy, and writing in the professions and, the current issues course may have a business or technical flavor depending on the specific issue. Each Enrichment Course represents a course offered by only one undergraduate e-commerce program. Enrichment courses, such as current issues, emerging technologies, and topics in e-commerce technology, offer students an opportunity to pursue topics of current or individual interest, while other courses, such as the human computer interface series, tend to reflect the characteristics of the institution.

FUTURE RESEARCH

This study is limited by the number of e-commerce degree programs considered. While there is no comprehensive list available of all such programs and the Open Directory listing is the most comprehensive available, nonetheless, one obvious area for future research is to expand the study to include more universities offering technical e-commerce degrees. In addition, business school e-commerce degrees could be studied separately and compared with technical degrees. Additional areas for future research include exploring the variables that influence e-commerce curricula choices, and attempting to identify patterns in e-commerce curricula based upon such variables as location, local industry, size of university, and sponsoring department.

CONCLUSION

This research has shown that it is possible to identify essential courses, as well as those that provide breadth or enrichment, in more technically oriented e-commerce degree programs, by studying the e-commerce curricula of representative institutions. Patterns that emerge may be useful both to those universities wanting to implement or update technical e-commerce curricula, and to those universities wanting to include technical aspects in their business-oriented programs.

Table 1. Essential Graduate and Undergraduate Courses.

	Graduate	Undergraduate
Essential at Both Levels		
Networking	Essential	Essential
Project Course	Essential	Essential
Internet Marketing	Essential	Essential
Essential at Graduate Level		
Client Side Application Development	Essential	Breadth
Internet Supply Chain Mgt	Essential	N/A
Secure Electronic Commerce	Essential	Breadth
E-Commerce Management	Essential	Enrichment
Essential at Undergraduate Level		
Survey of E-Commerce	Supporting	Essential
E-Commerce Web Application Models	N/A	Essential
Business Math and Statistics	N/A	Essential
Database	Supporting	Essential
Server Side Web Applications I	Supporting	Essential
Analysis and Design	Supporting	Essential
Data Structures	N/A	Essential

Those courses that are found in the majority of technical e-commerce degrees likely are so essential to the field that some coverage of these topics should also be included in business-oriented e-commerce programs. Essential graduate and undergraduate courses are shown side-by-side in Table 1. As this table shows, three courses might be designated foundational, since they are required by virtually all e-commerce curricula, graduate and undergraduate. While this study looked only at more technically oriented programs, these three courses arguably should be included in more business-oriented programs as well. These common courses include a networking class with emphasis upon Internet technologies, an Internet marketing class, and a senior or master's project class.

While a few courses are common across undergraduate and graduate curricula, some topics are handled differently at different levels. At the undergraduate level, most institutions offer a survey course on e-commerce business application models, but at the graduate level, this same need is met through a series of courses on specific application areas, such as supply chain management. This approach is consistent with the observation that the programs studied at the undergraduate level tend to be more technical, with a proportionately decreased emphasis on business elements. In fact, this study did not identify a single business-oriented undergraduate e-commerce program in the Open Directory listing (2002). Overall, undergraduate level programs appear to be directed toward preparing students for positions as Web developers, while graduate level programs appear to be directed toward preparing students to hold higher-level positions requiring the integration of technology and business principles.

Such emphasis upon higher-level integration across fields is not common in technical subjects. For example, as a student progresses in physics, chemistry, mathematics, or computer science, he or she normally is expected to become increasing immersed in specific technical details. However, in the management sciences, as a student progresses,

his or her skills tend to broaden as much as deepen. Like Information Systems, e-commerce is on the border, linking management sciences with traditional technical fields.

Many have suggested that e-commerce degree programs will eventually fade away, absorbed into existing Information Systems and business degrees. However, it is at least conceivable that today's e-commerce degree programs instead will evolve into the IS programs of tomorrow. E-commerce degree programs, if they succeed in closely linking technical content with business and management principles, may form the basis for the Information Systems degrees of the future.

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