

# A Course in E-commerce Architecture

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## Abstract

This paper describes a course that provides Computer Information Systems students with a basic foundation in the business, technical and risk aspects of e-commerce architecture. The reasons for offering such a course are presented. The goals of the course and its basic structure are discussed. Instructional methods such as case studies, class debates and papers are used to expand the student's understanding of issues and methods used in e-commerce. Students who successfully complete the course are prepared to develop, support and provide advice on e-commerce applications.

Keywords: e-commerce, m-commerce, Web development, application architecture, World Wide Web, Internet

## 1. PURPOSE OF COURSE

The meteoric rise of e-commerce has caught many in the academic community by surprise. Corporations are struggling to find competent workers with e-commerce skills and experience. A study done by The Economist Intelligence Unit and IBM shows that executives now see management problems and skill development as more significant obstacles to e-commerce conversion and development than technology challenges. More than 50% of those executives cite a lack of employees with e-business skills as a major obstacle to e-commerce implementation (Economist Intelligence Unit 2000).

Our faculty saw this need and in August of 1999 started the process of developing a new degree option, with all new courses, to address the needs of industry and business for workers trained in Web and e-commerce skills. Three needs, or tracks were identified: Web developer, Web programmer and Web administrator.

Web developers would have the ability to analyze, design and develop robust, complex Web-based applications using state-of-the-art Web tools and languages such as HTML, XML and JavaScript. Web programmers would have the ability to analyze, design and develop e-commerce and Web-based applications using programming languages such as C++ and COBOL, GUI-based application tools, such as PowerBuilder or ORACLE\*Forms. These applications can have some browser-based interface, but often would incorporate database access, use client/server techniques and run as multi-tiered architecture applications. Web administrators would administrate Web server, operating

system and database management software, performing installation, tuning, and customization tasks.

Each track has a set of skills unique to that track. However, each track also has skills that overlap. A common foundation of core concepts of e-commerce can be identified that should be part of each track. Knowledge in aspects such as basic e-commerce business fundamentals, technical issues such as client/server, multi-tiered architecture and database programming techniques, and risks and risk management issues such as security and privacy should be presented early in the student's development so they can be put to good use in other e-commerce and Web-based courses.

Early courses in e-commerce heavily slanted toward marketing and business concerns. Students of these courses see only the applicability of e-commerce to business opportunities. Our students certainly need exposure to that. They should know, for example, the various general business models used in e-commerce today. However, since we are trying to graduate students with technical skills, we want to balance the business/marketing aspect with technical aspects of e-commerce. The needs of the developer are different than that of the needs of a marketer or business manager. The business manager needs to know only that encryption is available and what service it provides. The developer needs to know how it works and how and when to use it in an e-commerce application.

On the other hand, most current programming courses focus solely on techniques of using a programming language or development tool. Students of these courses

see only the mechanics of the language or tool. They don't always see the potential of a language or tool for or marketing applications. What's needed is a course to tie these skills together. So, a student working on an e-commerce solution would have the skills to determine where a programming language might be best used, or where a Web page might be best used, or where a database might be best used.

## 2. COURSE ORGANIZATION

The course is a lecture only course, organized around three areas: business/marketing, technology, risk management. Each area can be emphasized more or less at the discretion of the instructor. A research paper is assigned in which the student will browse the Web, select a moderately complex Web site that incorporates such abilities as making purchases and providing customer support, and then critique the web site focusing on the three areas: marketing, technology and risk management.

Throughout the course, case studies will be used to present real world examples of the successes or failures of e-commerce implementations, focusing on marketing, technology, or risk issues.

To emphasize the various differing opinions on some of the risks inherent in e-commerce, the class is divided into two groups, prepares for and engages in a debate on an issue of risk, such as privacy. Each group is given one side of the resolution and the rules of engagement for the debate: opening statements, rebuttals, and Q&A sessions. One such topic might be encryption: whether we should be more scared of government having universal decryption ability or more scared of those criminals using encryption for crime. Another topic might be privacy: whether businesses should be able to collect all kinds of information on people such as buying habits, medical records, or site visit information unless the individual explicitly forbids permission, or whether the business must first get person's permission before collecting anything.

## 3. COURSE GOALS

The goals of the course are to provide basic knowledge in e-business/marketing skills, provide basic technological and e-commerce based application development skills, and provide knowledge of associated risks and risk management. The course is designed as a foundation course, providing fundamental concepts, definitions and techniques associated with e-commerce. After finishing the course, a student should be able to confidently offer advice to the business manager on marketing issues, to developers on technical issues and to both on issues such as security, privacy and ethics concerning e-commerce and the Web.

## 4. BUSINESS/MARKETING

business

Doing Business over the Internet raises new and different types of challenges. Skilled Information Systems professionals should have knowledge of basic marketing and business concepts and techniques.

The course presents different e-commerce business models including, but not limited to, one to one selling, business to business commerce, EDI, and general retail. Techniques are presented such as the Electronic Shopping test, which is a method for checking three criteria: product characteristics, familiarity and confidence, and consumer attributes, to see if a particular product or service is a good candidate for e-commerce (De Kare-Silver 1999), or maintenance, operations and repairs, or MRO, which serves as the basis for much business to business commerce (Maddox 1998)

Students will learn to ask several key questions, such as How does it fit with our strategy? and How will we measure the success? The answers aid in determining whether e-commerce is the right solution for a particular business opportunity (Treese 1998). Advertising techniques, such as screen location, price, effectiveness measurements and cost-effectiveness are studied. Students learn about marketing techniques such as the four P's of marketing: product, pricing, place and promotion (Greenstein 2000) and personalizing using collaborative filtering, rules-based filtering and keywords (Maddox 1998).

## 5. TECHNOLOGY

Although the marketing and business concerns are important parts of e-commerce, we are, after all, training students for careers in Computer Information Systems. The main purpose of the course is to build a foundation in e-commerce concepts and techniques for Information Systems students. Therefore, more emphasis should be spent on the technological concepts and techniques than on marketing and risks.

Several Web topologies, such as client/server and multi-tiered architectures are studied. At the application level, students are exposed to good system design considerations for front-end systems, such as application speed, color, effective layout and use of graphics. Some human/computer interface design issues are presented. General application systems such as order processing, tax and distribution systems and types of payment systems (e-cash and credit cards) are introduced.

Students survey the types of software available for system development. Various servers, languages, tools and database software are presented. Basic fundamentals of how software such as Web browsers, Web servers, HTML, forms, active server pages (ASP), JAVA server pages (JSP), dynamic HTML and XML are presented.

Other topics include web page interactivity issues, push/pull technology and cryptography. Some of these topics can be covered in more depth in other courses, such as Web development or database programming courses.

Internet service providers (ISP) offer a wide range of services of which students should be aware. The course spends time on examining the array of services available from ISPs. Topics include make or buy considerations and outsourcing.

Finally, students study ways to obtain feedback concerning the effectiveness or performance of their applications. Monitoring techniques such as logs, traces, tools and other feedback mechanisms are presented. Several metrics have been developed to aid in providing feedback concerning the effectiveness of e-commerce applications. McKeown's measures of efficiency are one possible list of metrics. It explains how to calculate metrics such as awareness, attractability, contact, conversion, and retention using numbers available from web server log data (McKeown 1997).

## 6. RISKS

The last of the three general areas of the course, identified as risks, covers issues such as security, privacy and encryption. Students study the risks of unsecured systems for risks such as theft, break-ins, customer impersonation, denial of service, sabotage, and viruses. Techniques for risk management, such as disaster recovery plans, internal controls, access controls, ssl and firewalls are introduced.

Security from an e-commerce standpoint can be organized into three general areas: secure file/info transfers, secure transactions and secure networks (Minoli 1998). Minoli lists several goals that should be foremost when considering security: privacy, integrity, authentication and availability (Minoli 1998). Students study several types of security threats and solutions to those threats. A survey of tools and policies that address those threats are presented. Third party assurances, such as Verisign, Better Business Bureau and International Computer Security Association are studied.

Another issue associated with risk is property rights. Students are introduced to trademarks, patents and copyrights. Various scenarios are used in class discussions to demonstrate how property rights affect e-commerce.

Privacy concerns are moving into the public eye as the methods of, and purposes for information gathering used by some e-commerce businesses are exposed to the public eye. Students gain an appreciation for privacy by studying issues such as monitoring and tracking people, collecting and selling information, and the use of cookies. Encryption is revisited again, this time on issues

such as key management, key escrow and the clipper chip. Class discussions and a class debate are used to broaden student's awareness of privacy issues and points of view.

## 7. CONCLUSION

The three-way approach used in this course provides a solid foundation in e-commerce issues, concepts and fundamentals. This foundation pays dividends in subsequent courses in the form of increased awareness of e-commerce issues. The research project, class discussion and class debate provide an awareness of security and privacy issues. The result is a highly employable Information Systems professional who is ready to provide advice and contribute to e-commerce information systems solutions.

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