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# AN OVERVIEW OF TEACHING AN E-COMMERCE TECHNOLOGY COURSE

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## Abstract

*While many universities have been developing programs or courses on e-commerce, a course that addresses various technical issues related to the development of an e-commerce system becomes necessary. Such a course should also provide a hands-on opportunity to students through the development of real-life e-commerce systems. In this paper, we outline a developmental methodology, as well as the tools and the technology required, to develop an application within a semester-long course on e-commerce technology.*

## Introduction

In recent years, a number of universities have been developing curricula in the area of electronic commerce or e-commerce (King, Frank & Platt, 2001). In most cases, a e-commerce curriculum contains a course on introductory e-commerce, which typically covers topics in areas such as Internet technology, electronic marketing, e-commerce models, electronic payments, and security (King et al., 2002). Although the introductory course answers *what* is an e-commerce, it does not answer *how* to develop an e-commerce system. Thus, a course on e-commerce technology should follow an introductory course. Such a course should not only address various technological issues related to e-commerce systems, but it also should provide a hands-on opportunity to students that focuses on real-life e-commerce systems development.

Two approaches could be used to provide a practical experience for students: (i) by applying tools and technologies of e-commerce through a set of homework, and (ii) the structured development of an e-commerce system using necessary tools and technologies. Bloss (2001) and Tikekar & Wilson (2001) approached the first methodology, while teaching e-commerce courses in a computer science curriculum. Bloss (2001) also mentions the need of a project-based e-commerce course that combines both business and technical knowledge. In an MIS (Management Information Systems) or e-commerce program, business and technology find a common ground, where applying the second methodology is most appropriate to provide a hands-on experience. Employers of the e-commerce world also desire people who possess knowledge of both business and technology (Tobias, 2000).

In a preceding paper (Rob and Saleem, 2001), we have described various technical and management issues that need to be resolved before an e-commerce application can be developed. Following this procedure, a faculty member can create an environment where students can develop true e-commerce applications without the support from the computing facility. In this paper, we outline a methodology that a group of students can follow to develop an e-commerce system in an e-commerce technology course.

## Knowledge Areas of E-Commerce Technology

In order to understand fully how an e-commerce system works, some fundamental knowledge must be acquired. This generally spans the areas of networking, database, systems development methodology, and programming. Thus, before embarking into an e-commerce technology course, students need to acquire some knowledge of technology by taking one or more courses in each of the above subject areas.

In order to develop an e-commerce system, application of knowledge in several technical areas is necessary:

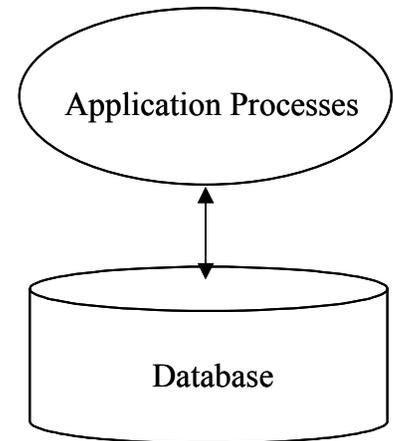
- Set up the infrastructure.
- Model the e-commerce system.
- Apply a systems development methodology.
- Use a programming environment.
- Use specific tools and techniques.

The infrastructure must be in place before any of the other knowledge can be applied to develop an e-commerce system. It includes setting up the necessary network, hardware, and software, which in turn, include the local area network, the Internet connection, the necessary computers, network operating system, Web server, database server, and administrative tools. As was mentioned before, Rob and Saleem (2001) describes in detail the setup of the infrastructure and the management of the development of an e-commerce application. The other components are described in the following.

## Modeling an E-Commerce System

An e-commerce system can be considered as consisting of three major parts or components: user interface, business logic, and datastore. The user interface enables the user to interact with the application, the business logic contains rules specifically designed for a particular business, and finally the datastore contains data for the business and those of business transactions. The datastore is typically a relational database designed to accommodate the need of the business. When developing an application with the current technology, the user interface and the business logic are inseparable, and as such, they make up what we can term as application processes. Hence, an e-commerce system consists of a set of application processes and a database (see figure 1). Some of these processes are initiated through user-interactions, while others are invoked by yet another process. Most of these processes are developed and maintained by a merchant, while others work as interfaces to third party systems. The following are some generic application processes:

- Electronic catalog display
- Catalog browsing
- Shopping cart
- Checkout
- Payment
- Payment Processing
- Receipt
- Shipment Processing



**Figure 1. Application View of an E-Commerce System**

Each of these processes may require several sub-processes to complete a business cycle. The methodology of development of each of these processes may vary from merchant to merchant, but in general, most of these processes require development of several interrelated Web pages that interact with the database. It should be clear that for e-businesses, which require real-time payment and shipment processing, there are interactions between the computers of the merchant, financial institutions, and shipping companies. In order to reduce the complexity and the cost, often a merchant performs these two processes manually via the traditional methods of telephone calls and bank-card terminals. Thus for practical reasons, the project development in a semester-long course requires the assumption that the students will develop only the business processes that are typically maintained by a merchant.

The nature of business of a merchant dictates the business-logic to be implemented in each process or sub-process. Consequently, it is important to start the e-commerce project with a business model of the system. The model should describe the major processes and sub-processes in a simplistic language and in a graphical manner, so that all parties (both the students and the faculty member) involved with the project can easily comprehend the material. Creating these processes requires the knowledge of tools and technologies and a systematic developmental methodology. These are discussed in the following.

## Application Development Methodology

To develop a successful e-commerce system, one should apply a structured methodology of systems development, which is difficult to apply in a semester-long course. An alternative approach is to use Rapid Application Development Methodology, where specifically the prototyping methodology is most applicable. In applying this method, we divide the project-development life cycle into several phases, in which each phase contains one or more tasks, a timeline, and finally, a presentation. The tasks and the timelines are organized in such a way that they complement the lecture topics covered in the class. Students are guided through the tasks by identifying expectations through presentations. Each presentation is considered as a milestone for the completion of a project-development phase. The output of each presentation is also posted on a course Web site. A typical, semester-long, project-development life cycle goes through the following schedule:

Phase	Task	Time	Presentations
Project Initiation	Formation of Project group	1 week	
	Identify business problem	1 week	Describe the problem and proposed solution
Systems Analysis & Design	Develop application architecture	4 weeks	Describe the application architecture
Systems Development	Coding and database development	8 weeks	
Closing	Develop documentation	2 weeks	Present the live system

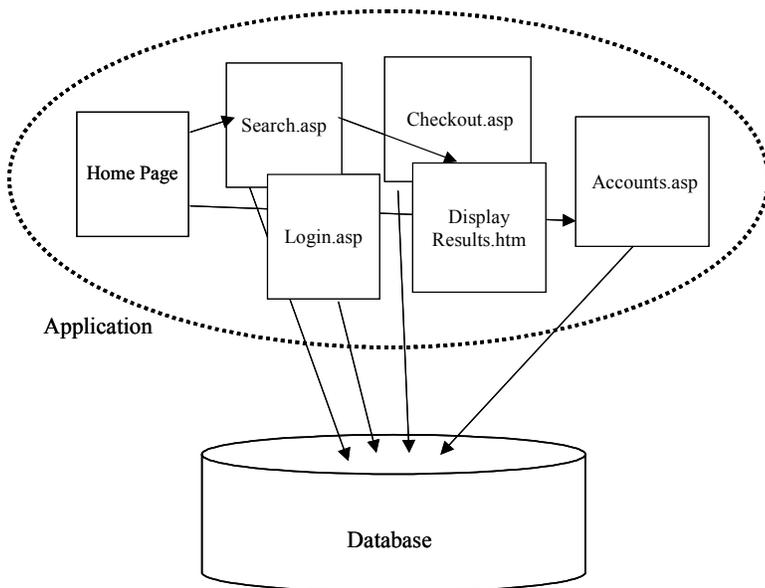


Figure 2. Application Architecture of an E-Commerce System

As seen, students go through stages of forming groups, identifying a business problem, developing a system architecture, coding and database development, and finally generating a document for the system. To manage the presentations of various groups, a schedule is necessary to identify each student-group and the time of presentation in each phase. In identifying the business problem, each group finds its own problem and makes a presentation and a proposed solution of that problem. This initiates the project. Students then make the second presentation on application architecture. It involves identifying and describing all application processes and sub-processes of the system and designing the database. Figure 2 illustrates a part of this presentation. It illustrates the interaction between the Web pages that represent the application processes. It also shows the communication of the Web pages with the database. A description of the functionality of each of these Web pages is an essential part of the presentation. The design of the database involves identification of all tables, their attributes, and relationships between the tables.

During the next phase, students spend their time in developing the system, which mainly includes database development, programming, and testing. Note that there is a longer timeframe for the systems development phase, and there is no formal presentation required. Students in this phase typically interact with the instructor for various developmental and management issues, which include activities such as:

- Creating folders for each student group in the Web server
- Providing security permission to one or more group members in the group folder

- Providing FTP permission to the group folder for accessing outside of the network
- Developing a home page for all group projects for the semester
- Developing a home page for each group project
- Resolving any programming and database-related issues of each project.

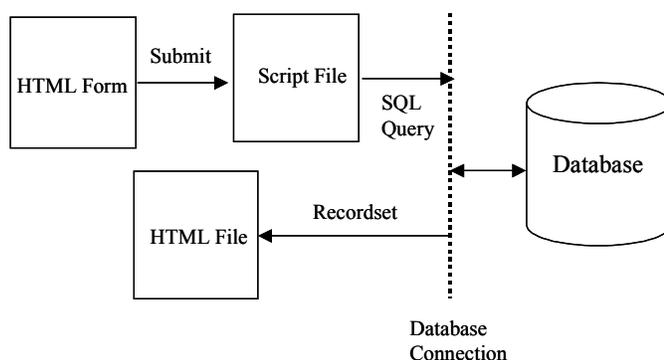
In developing the application, students utilize different tools and technologies, and apply programming methods that are typically discussed in lecture topics. These are discussed in a separate section below. The project is closed by the third and final presentation, in which case students submit project documentation and present their live e-commerce systems. The documentation may contain either outlined expectations, or it can contain all the output generated during the project development in an organized manner.

## E-commerce Programming, Tools and Technologies

### Programming Knowledge

Development of an e-commerce system requires programming knowledge, especially programming dynamic Web pages that communicate with the database. This requires programming knowledge for both the client-side (browser) processing and server-side (Web server) processing. It is also crucial to understand the programming environment and technology. ASP (Active Server Pages) and JSP (Java Server Pages) are two leading programming environments for developing server-side Web pages that interact with the databases. These are developed by Microsoft and Sun Microsystems, respectively. Both require writing program codes embedded in HTML, however ASP uses scripting languages like VBScript and JavaScript, whereas JSP uses Java programming.

There are also specific requirements of the Web server software, operating system, and tools to develop and deploy Web applications. For example, ASP uses ODBC (Open Database Connectivity) while JSP uses JDBC (Java Database Connectivity) as a connection mechanism to communicate with a database. Learning client-side programming and server-side programming requires substantial investment of time which could be the subject matter of the e-commerce technology course. A detailed discussion of Web programming is beyond the scope of this paper, however an e-commerce application typically requires development of multiple Web pages that typically communicate with the database through a connection mechanism. See Figures 2 and 3. Kalata (2001) provides a good overview of client- and server-side scripts using VBScripts and JavaScripts, which can be used in an e-commerce technology course to teach Web programming.



**Figure 3. A Typical Steps of an E-Commerce Application Processing**

### Programming Tools

There are many software tools that can be utilized to develop dynamic Web pages. Notepad is a text editor that is commonly used to develop a Web page, however it requires a significant investment of time for large and dynamic web pages. Popular editors that help expedite Web programming include EditPlus, FrontPage, and Dreamweaver. Microsoft Visual InterDev is a software tool that is suitable for the development dynamic Web pages using the ASP technology.

### Database System

An e-commerce system requires a database for storing data for a merchant. Typically, it encompasses information on products, shoppers, shopping carts, orders, order status, payment, and shipping. For a classroom environment, the most common approach is to start with a relational database such as Microsoft Access database, which is readily available and does not require any management overhead. The preferred method is to use a network database such as Microsoft SQL Server or Oracle, however these requires management of the users (Rob and Saleem, 2001). Moving from Access to any of the network databases does not require any major change in code, except it requires a small change of code for the database connection.

## Results

Students worked in groups and developed several wonderful live e-commerce systems that included dynamic Web pages for catalogs, search capabilities, marketing materials, shopping carts, customer accounts, and etc. The projects included a library checkout system, book order system, teaching assistant sign-in system, fruit ordering system, music and video purchasing system, and an auto auction system. Live demonstrations of these systems can be found in the author's Web site, <http://b3308-bpa.cl.uh.edu/isam5931/Course/Projects.htm>.

## Conclusion

In conclusion, we have justified the necessity of an e-commerce technology course, which not only should address various technical issues related to e-commerce systems, but also provide opportunity for students to develop real-life e-commerce systems. Implementation of an e-commerce systems development project in this course can provide knowledge for both the business and technology issues of e-commerce. We have outlined a developmental methodology that can be followed to develop an e-commerce system within a semester long course. Brief discussions on the necessary tools and technologies are also provided.

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