

CORE WEB TECHNOLOGIES FOR NEW E-COMMERCE EMPLOYEES

WILLIAM L. LOMERSON
Northwestern State University
Natchitoches, Louisiana 71497

CHRISTOPHER G. JONES
Utah Valley State College
Orem, Utah 84058

PAUL H. SCHWAGER
East Carolina University
Greenville, North Carolina 27858

ABSTRACT

Realizing that the Internet has changed the way business is conducted, many business schools have designed, or are in the process of designing, electronic commerce (e-commerce) courses, course sequences, or an entire e-commerce curriculum. More often than not this coursework includes topical coverage of web technologies. In the highly volatile e-commerce marketplace, identifying the core electronic business (e-business) technology for inclusion into the technical curricular component can be a real challenge. To assist Information Technology (IT) educators with e-commerce program design, this research examines the importance, content, and extent of the technology component of e-commerce coursework from the Information Systems (IS) professional's perspective. This research presents a brief overview of e-commerce technology and utilizes a survey, based on this overview to garner insights from IS professionals at leading e-commerce firms. The opinions of IS professionals from the Interactive 500 are examined and summarized. Implications for the technology component of e-commerce education are presented, as well as directions for future research.

Key words: Electronic commerce, e-commerce curriculum, e-commerce technologies, IS education, IS professionals.

INTRODUCTION

E-business/e-commerce curricula, both independent majors and tracks within other majors, are being offered with increasing frequency in academic institutions (4, 8, 16). Course work varies ranging from e-business models to e-commerce marketing. One topic that appears to be underemphasized in these programs is e-commerce infrastructure, specifically the technical complexity of designing and implementing multi-tier client server environments essential to the operation and support of a dynamically interactive web site (19, 12). In a recent employer survey of entry-level IS job skills, Cappel reported that technical knowledge of e-commerce among new hires was significantly less than expected (3).

In a highly volatile e-commerce marketplace, identifying the core e-business technology for inclusion into the technical curricular component can be a real challenge. In general, the literature tends to corroborate the under emphasis of e-commerce infrastructure in IS curricula (3, 12). What is needed is additional research to isolate those individual Internet technologies requiring additional course coverage in e-business curricula.

The purpose of this paper is to focus on the technology issues embedded in the pedagogy of an e-commerce curriculum rather than the issues related to the rationale behind, or the structure of, an e-commerce/e-business curriculum. We begin our paper with a discussion of the importance of the technical

foundation for an e-commerce component in an Information Systems curriculum. After that, we then briefly outline a typical multi-tier web environment and the predominant technical options for each tier. Next we present details of survey research based on a three-tier model that examined individual web technologies from an IS professional's perspective. We conclude with a discussion of the implications of our survey findings, the limitations of the current study, and suggestions for future research.

THE ISSUE OF A TECHNICAL FOUNDATION

The Internet quickly changed the face of education with 25% of U.S. Masters of Business Administration (MBA) programs offering an e-commerce major by Spring of 2001 (13). Unfortunately, the rapid run-up in web-based enterprise was followed all too quickly by the dot com bust. This sudden market reversal has beleaguered academics as they were faced with the realization that e-commerce was now a part of the business landscape, content coverage as mandated by IS model curriculum (9) was on the horizon, and yet e-commerce was no longer viewed with the enthusiasm from students that it received in previous years. As a result, colleges and universities have struggled to determine the proper way to implement the fundamentals of e-commerce into the curriculum (1, 11). While some schools have scaled back their e-commerce efforts, or reframed them within more traditional disciplines, many schools continue to press forward with new or revised e-commerce initiatives (1).

In addition to the impact of e-commerce on fundamental business practices, academics have also struggled with a frightening plenitude of e-commerce technologies and the question of pedagogically appropriate depth of coverage for any given technology (8, 16). Corporate Human Resource Managers have cited the need for IS graduates to have more e-commerce training and then complain that by the time the training is offered in colleges and universities it is six months behind the latest technology (14). Curriculum issues are coming to the forefront as educators try to balance the technical skills with the business skills. No longer are Computer Science majors sticking exclusively to programming and Business majors sticking to business plans. Many schools are integrating the two disciplines to create employees who can add value to their organizations. Students in business schools are often involved in using technology to create solutions to business needs (20). While this appears simple on the surface, teaching the latest technology along with sound business practices is a difficult problem. Some schools are creating a "skills"-based curriculum to address a business demand (7), while others are integrating technology into existing curriculum (1). As Northwestern professor Tom Collinger states: "If you fall in love with the technology or with a particular application of the technology, it may blind you to

the fundamental framework which is guiding it" (11).

Examining the issue from a marketing perspective, Mitchell and Strauss (17) identified the major requirements of an e-commerce curriculum from the academic and practitioner perspectives. In their study they determined that the elements of a three-tier model are necessary components of an e-commerce curriculum, but they did not examine the specific technologies and balance needed. Their identification of the autonomous nature of the technological aspects of an e-commerce curriculum establishes the basis for the objectives of our research.

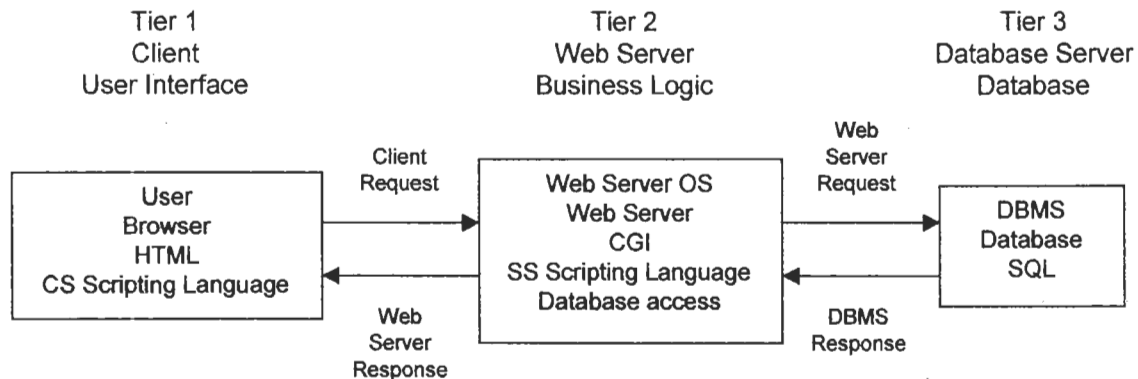
THREE TIER MODEL OF E-COMMERCE TECHNOLOGY

As businesses evolve into fully integrated e-commerce organizations, organizational web sites built from static web pages are generally superseded by dynamic content. Today's customers, suppliers, partners and employees have become accustomed to personalized web responses customized to each

request. Web applications that provide up-to-the-minute information are generally implemented as three-tier distributed applications. The user interface is often referred to as Tier 1 and is typically implemented on the client computer using a web browser. Tier 2 addresses business logic and is implemented on a server. The server manages web requests and the underlying business application. Tier 3 handles data storage and retrieval and normally is controlled by a database management system (6).

A conceptual model of the dynamic environment described above is shown in Figure 1 (adapted from (19)). Each component of the model interacts with the other components to enable real-time processing and responses to requests for information. Each of the three components and the associated primary technologies will be examined in the following sections. The definitions used to explain these technologies have been adapted from Webopedia (21), an online resource for definitions and operational explanations of Web technologies.

FIGURE 1
Three-tier Distributed Web Application



Tier 1: Client Side

The processing on the client side mediates the user's contact with a web site. The primary program on the client is the browser, which handles the data input from the user, including Uniform Resource Locator (URL) requests and transaction data, along with communication tasks to the server. Interaction with the server is accomplished through hyperlinks that submit requests for a different URL and forms that collect information from the user and submit it to the server for processing. The primary client-side technologies are described in Table 1.

Tier 2: Server Side

The web server receives requests from the client for information stored on the server or accessed by programs running on the server. The primary program on the web site is the web-server application. This program manages and responds to each request from every client, which can be as many as several thousand concurrent requests. For static pages, the web server locates and retrieves the requested page and then sends it back to the requesting client. For requests that include data and

dynamic information, special computer languages are used to receive the client request from the Internet, process the submitted data, build the appropriate response, and return the dynamically created page to the requesting client. The primary server-side technologies are described in Table 2.

Tier 3: Database

The Database Management System (DBMS), often on its own server, receives requests from the web server for information stored within its database. The requested data is collected and returned to the web server. These requests are generally formulated using Structured Query Language (SQL) in conjunction with special program commands available in the language of the requesting program. One of the benefits of high-level server side languages is that they contain built-in data access features that make the data easy to obtain and readily available for processing to meet the client's request. General technologies enabling data access across multiple tiers include Internet-enabled operating systems and web server software. Primary database and general support technologies are described in Table 3.

TABLE 1
Primary Client Side Technologies

Topic	Description
CSS	Short for <i>Cascading Style Sheets</i> . Refers to a feature in HTML that provides more control over how web pages are displayed in the browser.
DHTML	Short for <i>Dynamic HyperText Markup Language</i> . Refers to HTML extensions that enable a client Web page to react to user input without having to send requests to the Web server. Both Microsoft and Netscape have competing DHTML proposals.
ECMA-262 (JavaScript)	A universal client-side (CS) scripting language developed by the World Wide Web Consortium (W3C) to enable Web authors to design web pages that can interact with the HTML source code and create dynamic content. The two primary, although incomplete, implementations of this language are JavaScript, created by Netscape, and Jscript, created by Microsoft.
GUI Web Design Tools	Software to facilitate web page authoring and layout. Uses a visual programming model with a palette of Web-enabled Graphical User Interface (GUI) components. Common commercial design tools include Macromedia Dreamweaver, Adobe GoLive, and Microsoft FrontPage.
HTML	Short for <i>HyperText Markup Language</i> , the authoring language used to create documents on the World Wide Web. This language is interpreted by the browser which creates the text and graphics seen displayed on the computer monitor.
Java Servlets	A small Java program that runs on a web server. Java Servlets are a popular alternative to CGI scripts. Servlets are often invoked by Java applets that run on the client browser.
Web Browser	A software application used to locate and display Web pages. The two most popular browsers are Netscape Navigator and Microsoft Internet Explorer. Browsers can run scripts on the client that enhance the interaction with the user.
Web Site Design	Refers to the artistic and production processes involved in the development, organization, and layout of the graphical, multimedia, and textual elements of a web site including the Home Page and web site navigation.
XML	Short for <i>eXtensible Markup Language</i> , a new specification developed by the W3C that allows Web authors to create their own customized tags, enabling the definition, transmission, validation, and interpretation of data between applications and between organizations.

SURVEY DEVELOPMENT

In selecting the items to be included as topics for the e-commerce technology questionnaire, we used the objectives set out in the preparation guides for the Certified Internet Webmaster (CIW) certification exam (2) and the i-Net+ certification exam (10) augmented by our own experience in teaching, researching and consulting on e-commerce issues. The individual technology survey items were described in Tables 1 – 3. A copy of the web survey instrument can be found in the Appendix. Specifically we sought answers to the following research questions:

- Q1. What is the current usage level of key e-commerce technologies in leading e-businesses? Are some individual or major categories of e-commerce technologies used more frequently than others?
- Q2. What knowledge levels of key e-commerce technologies do leading e-businesses expect of new hires? Is knowledge of some individual or major categories of e-commerce technologies more important than others?
- Q3. Is there a difference between the current usage level of a given key e-commerce technology and the corresponding expected knowledge level for new hires for that same technology? Stated as a null hypothesis: *There is no statistically significant difference between workplace usage and expected knowledge level for new hires for any given e-commerce technology or technology subscale.*
- Q4. Is there a difference in the expected knowledge level for new hires for a given e-commerce technology based on the primary web server platform in use? Stated as a null hypothesis: *Regardless of whether the primary web server platform is Apache or IIS, there is no statistically*

significant difference in expected knowledge levels for new hires for any given e-commerce technology or technology subscale.

Research questions 1 and 2 were addressed using descriptive statistics. Inferential statistical analysis using *t*-tests and ANOVA were used to address null hypotheses 3 and 4.

Because we wished to collect the opinions of IS professionals in companies actively using Internet Commerce, we decided to use a web-based survey to reach our target population. O'Malley, et al. (18) identified the typical shortcomings of web-based surveys as the lack of technology capability and technical literacy of the respondents. Given the computer literacy levels of our target population as e-commerce experts and the high technology nature of the companies for which they worked, we believe that respondent technical capability and literacy concerns were adequately addressed.

The target population was the e-commerce technical contacts at the Interactive 500 companies. The companies on this list were selected and ranked by *eWeek* magazine (formerly *Interactive Week*) based upon the extent and corporate impact of their e-commerce activities (15). An email inviting the target recipient to participate in the survey was distributed to the technical contact listed in the domain registration information of each company. A series of three follow up requests was sent for a total of four email contacts per target recipient. Of the 500 email addresses, 77 were found to be undeliverable due to outdated information. In all, requests were successfully electronically delivered to 423 recipients. Fifty-two responses were received. After removing duplicates and blanks, 48 usable responses were tabulated, yielding a response rate of 11.3% (48/423).

TABLE 2
Primary Server Side Technologies

Topic	Description
Server-side High Level Languages	These are server-side (SS) scripting languages embedded within HTML pages so that the programmer can switch between HTML and the scripting language and avoid having to manually generate the HTML code. The CGI interaction is built into these scripting languages so the code is much less complicated. These languages have built-in capabilities to facilitate interacting with a wide variety of databases. ASP, JSP, PHP, and ColdFusion are examples of these languages.
Active Server Pages (ASP)	A server-side HTML embedded scripting language used to create dynamic Web pages. In an HTML document, ASP script (usually VB Script) is enclosed within special ASP tags. Because ASP is embedded within tags, the author can jump between HTML and ASP instead of having to rely on heavy amounts of code to output HTML. ASP can perform any task any CGI program can do using built-in features, but its strength lies in its compatibility with many types of databases. ASP is a proprietary programming environment that only runs on Microsoft's Internet Information Server with an NT/Windows 2000/XP operating system.
ColdFusion	A proprietary product that includes a web server application and a development toolset designed to integrate databases and Web pages. ColdFusion Web pages include tags written in ColdFusion Markup Language (CFML) that simplify integration with databases and avoid the use of more complex languages like Java to create translating programs. While ColdFusion is a proprietary product, it runs on both major web server operating system families.
Java Server Pages (JSP)	A platform-independent server-side technology developed by Sun as an extension to the Java servlet technology. Originally created as an alternative to Microsoft's Active Server Pages, JSPs have dynamic scripting capability that works with HTML code. Using JSP, web developers can separate the web page logic from the static elements of the page. Microsoft has recently responded to JSP by releasing ASP.NET.
PHP	Short for <i>Hypertext PreProcessor</i> , a server-side, HTML embedded scripting language used to create dynamic Web pages. Like ASP, PHP script is enclosed within special PHP tags. PHP is an open source programming environment that is usually run on Apache web servers with a Unix/Linux operating system.
VBScript	A subset of Microsoft's Visual Basic language used as a host client-side language to design web pages that can interact with the HTML source code and create dynamic content. Similar to Javascript. Often associated with Active Server Pages.
Server-Side Low Level Languages	Programming languages that run on the web server outside the web server application. Developers must program code that conforms to the CGI specifications in order to receive data from the web server application and return manually constructed web pages to it. PERL and Java are examples of these languages.
C++	A popular general purpose object-oriented programming language developed at Bell Labs in the 1980s. C++ and its predecessor, C, are often used for CGI scripts.
Java	Java is a general purpose programming language with a number of features that make the language well suited for use on the World Wide Web. Small Java applications are called Java applets and can be downloaded from a Web server and run on a computer by a Java-compatible Web browser, such as Netscape Navigator or Microsoft Internet Explorer. Java is also used for writing scripts that use the CGI protocol.
Perl	Short for <i>Practical Extraction and Report Language</i> , Perl is a programming language developed by Larry Wall, especially designed for processing text. Because of its strong text processing abilities, Perl has become one of the most popular languages for writing scripts that use the CGI protocol.
Visual Basic	A general purpose programming language (based on the original BASIC language) coupled with a visual developed environment. VB (Visual Basic) was developed by Microsoft in the early 1990s to enable visual programming from a palette of GUI controls. VBScript, a subset of Visual Basic, is often used as a host language for ASP programming.

RESULTS AND ANALYSIS

Respondent Demographics

Key characteristics gathered for each respondent included job title, industry, and company size based on annual revenues. The great majority of respondents ($n = 48$) held positions as either managers (33.3%) or executives (26.7%). Just under 18 percent (17.7%) were system administrators, 15.6% were developers, and the remaining 6.7% had other IS positions.

Survey respondents hailed from a variety of industries. Communications (33.3%) was the most widely represented. Business Services, Internet Services, and Software and Systems

Accounting, and Consulting were tied for second place with 7.1% each. Advertising, Healthcare Services, Retail, and Transportation accounted for approximately five percent (4.8%) each. The remaining respondents were spread over such industries as application systems, e-commerce services, electronics, financial services, hosting services, information services, IT products, real estate, recruiting services, ticket services, and travel services.

Just over 40 percent (42.8%) of respondents were associated with large companies (greater than \$1 billion in annual revenues) and another 42.8% worked for small companies (less than \$250 million in annual revenues). Fourteen percent (14.3%) responded from medium-sized companies (between \$250 million and \$1 billion in annual revenues).

TABLE 3
Primary Database and General Support Technologies

Topic	Description
ActiveX Data Objects (ADO)	Microsoft's high-level interface for accessing different types of data including relational databases, web pages, spreadsheets, and other types of documents. ActiveX Data Objects (ADO) are designed to provide a consistent way of accessing data regardless of how the data are structured. Recently, Microsoft has introduced ADO.NET, an enhanced version of ADO that supports accessing data without a continuous connection to a database.
Database	A collection of information organized, stored, and accessed in such a way that a user's request can quickly retrieve desired pieces of data.
Database Server	A computer connected to a network that is a dedicated host for a DBMS.
DBMS	Short for <i>Database Management System (DBMS)</i> , an application that accesses information from a database. This is a collection of programs that enable entering, organizing, and selecting data in a database.
ODBC	Short for Open DataBase Connectivity. ODBC was developed by Microsoft to enable data access from any application, regardless of which DBMS handles the data. To achieve data independence, a database driver is required between the application and the DBMS to translate data requests.
SQL	Short for <i>Structured Query Language</i> , a standardized query language for requesting information from a database. It is supported by most DBMSs and is independent of whether the DBMS is hosted on a PC, workstation, minicomputer, or mainframe.
Web Server (Unix/Linux) (Windows 2000/XP)	A computer connected to the Internet (or a compatible network) with an installed Web server application. Every Web server has an Internet Protocol (IP) address and possibly a domain name. The two most popular operating system families for web servers are Unix/Linux and Windows NT/2000/XP.
Web Server Software (Apache) (Microsoft IIS)	A software application on a web server that delivers (<i>serves up</i>) Web pages requested by a client. There are many Web server software applications, including public domain software from NCSA and Apache, and commercial packages from Microsoft such as Internet Information Server (IIS), Netscape, and others.

Research Question 1: Current Usage Levels of E-Commerce Technologies

To determine the current usage level of various e-commerce technologies, survey participants were asked to rate eight client-side, nine server-side, and seven general support technologies using a seven-point Likert scale (Not Used (0) to Extensively Used (6)). Table 4 summarizes the ratings for each of the 24 individual technologies and for each of the three major subcategories. Mean usage levels are ordered from highest to lowest within each of three e-commerce technology subcategories.

Of the three subscales, our respondents rated General Support Technologies as the most used ($M = 4.02$, $SD = 0.90$) followed by Client-side Technologies ($M = 3.76$, $SD = 1.14$). Both General Support and Client-side Technologies enjoyed usage levels considerably greater than "moderate use" (3.0 on the Likert scale). Server-side Technologies, on the other hand, were rated less than moderate use ($M = 2.62$, $SD = 1.05$).

For the Client-side subscale, the top three individual technologies were HyperText Markup Language (HTML) ($M = 5.19$, $SD = 1.39$), Web Site Design ($M = 4.66$, $SD = 1.52$), and Javascript ($M = 4.32$, $SD = 1.56$). Least used was Dynamic HyperText Markup Language (DHTML) ($M = 2.81$, $SD = 1.70$). Java ($M = 3.24$, $SD = 2.33$), Java Server Pages (JSP) ($M = 3.11$, $SD = 2.46$), and Active Server Pages (ASP) ($M = 3.04$, $SD = 2.38$) were the top three Server-side technologies. ColdFusion ($M = 1.72$, $SD = 2.14$), the least used Server-side technology, was rated midway between "not used" and "moderately used."

For General Support Technologies, SQL ($M = 5.42$, $SD = 1.14$), Windows 2000/XP ($M = 4.50$, $SD = 1.64$), and Unix/Linux ($M = 4.26$, $SD = 1.98$) were rated the highest. ActiveX Data Objects (ADO) ($M = 2.33$, $SD = 2.07$) had the lowest usage level. Ignoring subscale categorization, SQL,

HTML, and Web Site Design were rated as the most used e-commerce technologies. ADO, Visual Basic, and ColdFusion were the least used.

Research Question 2: Expected Knowledge Levels of E-Commerce Technologies

To determine how important knowledge of each of the 24 e-commerce technologies was for new IS employees, regardless of academic preparation level, survey participants were asked to gauge importance using a seven-point Likert scale (Not Important (0) to Extremely Important (6)). Table 5 summarizes the response for each technology. Mean expected knowledge levels are ordered from highest to lowest within each of the three e-commerce subscales.

Of the three e-commerce subcategories, our respondents expected new hires to have the greatest knowledge of General Support Technologies ($M = 3.76$, $SD = 0.89$), followed by Client-side technologies ($M = 3.54$, $SD = 1.11$). Entry-level knowledge of Server-side technologies ($M = 2.74$, $SD = 1.09$) was considered least important. As can be seen, at the aggregate level, the ordering of subcategory knowledge expectations mirrored industry usage levels for the three e-commerce subscales.

At the individual technology level, HTML ($M = 4.77$, $SD = 1.55$), Web Site Design ($M = 4.29$, $SD = 1.49$), and eXtensible Markup Language (XML) ($M = 3.89$, $SD = 1.84$) were rated as the most important Client-side technologies with which the new IS employee should be familiar. The knowledge ranking of HTML and Web Site Design corresponded exactly to the usage level ranking for these technologies. XML, however, which was ranked fifth in usage, emerged as the third most important Client-side technology to know.

TABLE 4
Current Usage Levels of Key E-commerce Technologies

E-commerce Technologies	Rank	<i>M</i>	<i>SD</i>
Client-side			
HTML	1	5.19	1.39
Web Site Design	2	4.66	1.52
JavaScript	3	4.32	1.56
CSS	4	4.09	1.86
XML	5	3.91	1.94
GUI Web Design Tools	6	3.43	1.91
Java Servlets	7	3.07	2.43
DHTML	8	2.81	1.70
Client-side Technologies Subscale		3.76	1.14
Server-side			
Java	1	3.24	2.33
Java Server Pages (JSP)	2	3.11	2.46
Active Server Pages (ASP)	3	3.04	2.38
Perl	4	2.93	2.23
C++	5	2.63	1.93
VBScript	6	2.56	2.25
PHP	7	2.35	2.05
Visual Basic	8	2.14	1.95
ColdFusion	9	1.72	2.14
Server-side Technologies Subscale		2.62	1.05
General Support			
SQL	1	5.42	1.14
Windows 2000/XP	2	4.50	1.64
Unix/Linux	3	4.26	1.98
Apache Server	4	3.96	2.20
Open Database Connectivity (ODBC)	5	3.91	1.83
Microsoft IIS	6	3.78	2.16
ActiveX Data Objects (ADO)	7	2.33	2.07
General Support Technologies Subscale		4.02	0.90

Note. Mean usage level (*M*) based on a seven-point Likert scale ranging from 0 (Not Used) to 6 (Extensively Used). Subsample size (*n*) ranged from 42 to 47 because some respondents did not answer the questionnaire completely, leaving blank one or more usage level rating questions.

For the Server-side subscale, the top three individual technologies were Java ($M = 3.45$, $SD = 2.01$), Active Server Pages ($M = 3.14$, $SD = 2.22$), and Java Server Pages ($M = 3.00$, $SD = 2.16$). Least important, in terms of knowledge levels, was ColdFusion ($M = 1.90$, $SD = 2.07$). For both usage and knowledge ratings, Java ranked first. Java Server Pages and Active Server Pages were once again, in the second and third place categories. In terms of knowledge importance, however, ASP which was ranked third in usage, moved into second place. JSP, which was ranked second in usage, dropped to third in the knowledge ranking.

For General Support Technologies, SQL ($M = 5.05$, $SD = 1.23$), Unix/Linux ($M = 4.14$, $SD = 1.96$), and Windows 2000/XP ($M = 4.02$, $SD = 1.78$) were rated the highest. ActiveX Data Objects ($M = 2.40$, $SD = 2.91$), consistent with earlier usage level ratings, was ranked the lowest in terms of expected knowledge levels. Of all 24 e-commerce technologies, SQL was top ranked for both knowledge and usage levels. Although Windows 2000/XP was used more in practice according to the survey, IS employers expected new hires to have more knowledge of Unix/Linux than Windows. Platform dependency issues are examined in the discussion of results that follows.

Research Question 3: Analytical Comparison of E-commerce Usage and Knowledge Levels

The null hypothesis for research question 3 states: There is no statistically significant difference between workplace usage and expected knowledge level for new hires for any given e-commerce technology or technology subscale.

To determine if the level of e-commerce technology usage differed from the knowledge level expected of new hires, a series of pairwise *t*-tests was conducted (Table 6). Mean usage (based on a seven-point Likert scale) was compared to mean knowledge levels (also based on a seven-point scale) for each of the 24 e-commerce technologies and for the three subscale aggregates. For the most part, usage levels exceeded knowledge expectations for the corresponding technology or technology subscale. At an α of .05, the following usage differences over knowledge expectations were statistically significant, arranged from highest *t*-value to lowest: (a) Microsoft Internet Information Server ($t(42) = 3.50$, $p = 0.001$), (b) HTML ($t(44) = 2.94$, $p = 0.16$), (c) Cascading Style Sheets ($t(43) = 3.47$, $p = 0.001$), (d) JavaScript ($t(45) = 2.48$, $p = 0.17$), (e) Windows 2000/XP ($t(44) = 2.77$, $p = 0.008$), (f) Web Site Design ($t(45) = 2.71$, $p = 0.009$), and, (g) SQL ($t(43) = 2.50$, $p = 0.016$). Of the

three e-commerce subscales, only the difference in usage and knowledge levels for General Support Technologies was significant ($t(44) = 2.77, p = 0.008$). Interestingly, significant differences in usage and knowledge were concentrated in the top

used e-commerce technologies. For all five of the most used technologies, usage was significantly higher than expected knowledge levels of new hires for the same technology.

TABLE 5
Expected Knowledge Levels of E-business New Hires

E-commerce Technologies	Rank	M	SD
Client-side			
HTML	1	4.77	1.55
Web Site Design	2	4.29	1.49
JavaScript	3	3.89	1.84
CSS	4	3.89	1.56
XML	5	3.70	1.67
GUI Web Design Tools	6	3.16	2.07
Java Servlets	7	3.11	1.96
DHTML	8	2.64	1.64
Client-side Technologies Subscale		3.54	3.11
Server-side			
Java	1	3.45	2.01
Active Server Pages (ASP)	2	3.14	2.22
Java Server Pages (JSP)	3	3.00	2.16
Perl	4	2.79	1.90
PHP	5	2.67	2.07
C++	6	2.65	1.69
VBScript	7	2.45	2.11
Visual Basic	8	2.31	1.76
ColdFusion	9	1.90	2.07
Server-side Technologies Subscale		2.74	1.09
General Support			
SQL	1	5.05	1.23
Unix/Linus	2	4.14	1.96
Windows 2000/XP	3	4.02	1.78
Apache Server	4	3.73	2.00
Open Database Connectivity (ODBC)	5	3.68	1.55
Microsoft IIS	6	3.31	1.97
ActiveX Data Objects (ADO)	7	2.40	1.91
General Support Technologies Subscale		3.76	0.89

Note: Mean usage level (M) based on a seven-point Likert scale ranging from 0 (Not Used) to 6 (Extensively Used). Subsample size (n) ranged from 39 to 45 because some respondents did not answer the questionnaire completely, leaving blank one or more knowledge level rating questions.

Research Question 4: Analysis of Web Server Platform Choice on E-business Technology Knowledge Expectations

The null hypothesis for research question 4 states: *Regardless of whether the primary web server platform is Apache or IIS, there is no statistically significant difference in expected knowledge levels for new hires for any given e-commerce technology or technology subscale.*

To determine whether the mean expected knowledge level for new hires for a given e-commerce technology varied by web server platform choice, one-way ANOVA was used. The independent variable, the web server factor, included three levels: Apache only, Microsoft Internet Information Server (IIS) only, and both Apache and IIS. Respondents were grouped into one of the three categories based on web server usage levels, with a score of four or higher indicating primary usage of a specific web server.

The dependent variables were the mean expected

knowledge levels for new hires for the various e-commerce technologies. Table 7 lists the *F*-values and identifies those mean comparisons that were statistically significant. To assist in interpreting the results of the statistical tests, technologies were grouped according to the three e-commerce technology subcategories. Because of the large number of statistical tests involved (81), there is a possibility that the results presented in Table 7 may be subject to Type I errors. For all significant *F*-values highlighted in Table 7 with homogenous variances, multiple comparison tests were performed using Tukey HSD; for heterogeneous variances, multiple comparisons were performed with Dunnett's *C*.

Of the three e-commerce subcategories, only the mean expected knowledge level for General Support varied in the aggregate by web server platform ($F(2,38) = 3.90, p = 0.029$). Organizations that use both Apache and IIS as web servers expect new hires to have higher knowledge levels of general support technologies than those organizations that rely solely on Apache or IIS. At the individual technology level, expected

knowledge for Unix/Linux ($F(2,38) = 4.28, p = 0.021$), Apache Server ($F(2,38) = 20.52, p = 0.000$), Microsoft IIS ($F(2,36) = 24.47, p = 0.000$), and ActiveX Data Objects (ADO) ($F(2,37) = 4.43, p = 0.019$) varied significantly by web server platform. As might be expected, organizations that use IIS only do not expect new hires to know as much about Unix/Linux or Apache Server as those organizations that use Apache only. Organizations that use Apache only, on the other hand, do not expect new hires to know as much about IIS or ADO.

On the server side, expected knowledge for Active Server Pages ($F(2,38) = 4.03, p = 0.026$), Practical Extraction and Report Language (Perl) ($F(2,37) = 3.28, p = 0.049$), VBScript ($F(2,37) = 3.60, p = 0.037$), and Visual Basic ($F(2,33) = 4.63, p = 0.017$) varied significantly by web server type. Organizations that use IIS only, expect new hires to know more about ASP, VBScript, and Visual Basic—all Microsoft web technologies—than they do about Perl.

TABLE 6
Difference Between Current Usage Levels of Key E-commerce Technologies and Expected Knowledge Levels of E-business New Hires

E-commerce Technologies	Current Usage		Expected Knowledge		Paired Differences		n	t
	M	SD	M	SD	M	SD		
SQL	5.42	1.16	5.05	1.23	0.37	0.98	43	2.50*
HTML	5.36	1.22	4.77	1.55	0.59	1.34	44	2.94*
Web Site Design	4.73	1.45	4.29	1.49	0.44	1.10	45	2.71*
Windows 2000/XP	4.48	1.66	4.02	1.79	0.45	1.09	44	2.77*
JavaScript	4.38	1.51	3.89	1.56	0.49	1.33	45	2.48*
Unix/Linux	4.34	1.92	4.14	1.96	0.20	1.05	44	1.30
CSS	4.26	1.77	3.70	1.67	0.56	1.05	43	3.47*
Apache Server	4.07	2.16	3.73	2.00	0.34	1.24	44	1.83
XML	3.98	1.94	3.89	1.84	0.09	1.29	45	0.46
Microsoft IIS	3.93	2.07	3.31	1.97	0.62	1.15	42	3.50*
Open Database Connectivity (ODBC)	3.86	1.85	3.65	1.56	0.21	1.37	43	1.00
GUI Web Design Tools	3.49	1.91	3.11	1.96	0.38	1.37	45	1.85
Java	3.27	2.32	3.45	2.01	-0.18	1.42	44	-0.85
Java Servlets	3.26	2.39	3.16	2.07	0.09	1.36	43	0.45
Active Server Pages (ASP)	3.07	2.38	3.14	2.22	-0.07	1.19	44	-0.38
Java Server Pages (JSP)	3.07	2.47	3.00	2.16	0.07	1.36	45	0.33
Perl	3.02	2.19	2.79	1.90	0.23	1.62	43	0.94
DHTML	2.86	1.65	2.64	1.64	0.22	1.22	44	1.24
C++	2.55	1.84	2.65	1.69	-0.10	1.01	40	-0.63
VBScript	2.55	2.27	2.45	2.11	0.10	0.88	42	0.70
PHP	2.48	2.03	2.67	2.07	-0.18	1.11	42	-1.11
ActiveX Data Objects (ADO)	2.41	2.06	2.41	1.91	0.00	0.70	42	0.00
Visual Basic	2.18	1.90	2.31	1.76	-0.13	0.95	39	-0.84
ColdFusion	1.76	2.13	1.90	2.07	-0.14	1.20	42	-0.77
General Support Technologies Subscale	4.04	0.92	3.76	0.89	0.28	0.66	44	2.77*
Client-side Technologies Subscale	3.81	1.09	3.54	1.12	0.27	0.97	45	1.87
Server-side Technologies Subscale	2.57	1.00	2.74	1.09	-0.17	0.85	45	-1.32

Note: Number of pairs ranged from 39 to 45 because some respondents did not answer the questionnaire completely, leaving blank one or more usage or knowledge level rating questions.

* $p < .05$ based on pairwise t -tests

Interestingly, expected knowledge levels of client-side technology did not vary significantly based on web server platform. It appears that most client-side e-commerce technologies span the dominant server platforms. The closest thing to an exception would be Java Servlets with somewhat lower (but not statistically significantly lower) knowledge expectations for new hires in a Microsoft IIS only environment.

DISCUSSION

The purpose of the survey research was to assess usage levels of and knowledge expectations for key e-commerce technologies. Descriptive and inferential analyses of the survey data yield the following conclusions regarding the research

questions posed.

Question 1: Current Usage of E-commerce Technologies

According to IS professionals engaged in e-commerce infrastructure design and development, General Support technologies ($M = 4.04$) are used in their organizations more extensively than Client-side and Server-side technologies. By far the most frequently used individual e-commerce technology is Structured Query Language ($M = 5.42$, on a scale of 0 to 6). HTML is not far behind ($M = 5.19$). Other technologies rated in the "extensively used" band (4.0 or higher) include Web Site Design, Windows 2000/XP, JavaScript, Unix/Linux, and Cascading Style Sheets. Least used e-commerce technologies

are ColdFusion and Visual Basic. On the Server, rival technology Java Server Pages narrowly edges out Active Server Pages.

Question 2: Importance of E-commerce Technologies for New Hires

When asked to provide a knowledge importance rating for individual e-commerce technologies, IS professionals expect

new hires to have knowledge levels that track but are somewhat less than actual workplace usage. General Support Technologies ($M = 3.76$) are considered most important, followed closely by Client-side ($M = 3.54$). Server-side technologies are a distant third ($M = 2.74$). Individual technology importance also tracks actual usage. SQL ($M = 5.05$), HTML ($M = 4.77$), and Web Site Design ($M = 4.29$) rate as the most important individual Internet technologies. Least important, in terms of new hire knowledge levels, are ColdFusion and Visual Basic.

TABLE 7
Analysis of Variance for Expected Knowledge Levels of E-business New Hires by Web Server Platform

E-Commerce Technologies	M	SD	M	SD	M	SD	df	F
Client-side	4.77	1.36	4.90	1.66	4.72	1.64	(2,38)	0.04
HTML	3.79	1.63	4.40	1.35	4.56	1.46	(2,39)	1.10
Web Site Design	3.71	1.49	4.00	1.56	3.78	1.63	(2,39)	0.10
JavaScript	3.50	1.38	3.70	1.83	4.00	1.57	(2,37)	0.37
CSS	3.64	2.02	3.50	2.01	4.17	1.58	(2,39)	0.53
XML	3.14	1.66	2.60	1.65	3.17	2.33	(2,39)	0.30
GUI Web Design Tools	3.15	2.12	1.78	1.79	3.44	1.92	(2,37)	2.26
Java Servlets	2.62	1.56	2.40	1.84	3.17	1.43	(2,38)	0.90
DHTML								
Client-side Tech. Subscale	3.45	1.07	3.26	1.08	3.74	1.17	(2,39)	0.66
Server-side								
Java	3.77	1.59	2.30	2.06	3.83	1.98	(2,38)	2.42
Java Server Pages (JSP)	3.00	2.32	2.20	1.99	2.94	1.98	(2,39)	0.51
Active Server Pages (ASP)	1.85	1.77	3.30	2.75	3.94	1.77	(2,38)	4.03*
Perl	3.00	1.53	1.80	1.75	3.59	1.91	(2,37)	3.28*
C++	2.85	1.68	1.86	1.77	3.00	1.66	(2,34)	1.19
VBScript	1.31	1.60	3.40	2.59	2.82	1.85	(2,37)	3.60*
PHP	3.77	1.69	2.00	2.06	2.59	2.09	(2,36)	2.43
Visual Basic	1.17	1.27	3.17	2.04	2.78	1.67	(2,33)	4.63*
ColdFusion	1.54	1.66	2.33	2.24	1.82	2.20	(2,36)	0.40
Server-side Tech. Subscale	2.63	1.00	2.59	1.33	3.06	1.04	(2,39)	0.87
General Support								
SQL	5.21	1.19	5.38	0.92	5.06	0.87	(2,37)	0.30
Windows 2000/XP	3.07	1.59	4.56	2.07	4.44	1.65	(2,38)	3.08
Unix/Linux	4.71	1.49	2.67	2.18	4.50	1.72	(2,38)	4.28*
Apache Server	4.57	1.28	1.44	1.51	4.72	1.27	(2,38)	20.52*
Open Database Connectivity (ODBC)	3.50	1.61	3.67	1.66	4.00	1.19	(2,38)	0.49
Microsoft IIS	1.33	1.30	4.89	1.36	4.17	1.25	(2,36)	24.47*
ActiveX Data Objects (ADO)	1.31	1.25	3.44	2.19	2.78	1.87	(2,37)	4.43*
General Support Tech. Subscale	3.50	0.79	3.65	0.91	4.22	0.66	(2,38)	3.90*

Note: The number of respondents in each comparison varies because some respondents did not answer the questionnaire completely, leaving blank one or more usage or knowledge ratings.

* $p < .05$ based on ANOVA

Question 3: New Hire Knowledge Gap

For e-commerce technologies employed extensively in practice, there is a gap between what IS professionals expect of new hires and technology usage. On average, entry-level IS employees are expected to know somewhat less about any given highly used technology than those currently using the technology in the workplace. This is a welcome finding. Rather than viewing the education gap as a criticism of collegiate information systems instruction, we view the difference in usage levels and expected knowledge as a realization that today's

Information Systems curricula only provides students with a general foundation. Once on the job, new hires will need to bridge the gap between practice and incoming knowledge levels through training specific to a given organization's e-commerce infrastructure. Perhaps this can best be illustrated by a comment offered by one survey respondent:

From an IT perspective, site design is not as important as knowing HTML. We use graphic artists to design the sites, but in order to build content dynamically, knowledge of HTML is a must because we must conform to the design submitted by the designers. One

thing we look for is FLEXIBILITY. We wear many hats and may need to change technologies in order to satisfy a client. Being able to pick up another technology and run with it is vital. While most of our clients use IIS/ASP, we have many clients that insist on Apache/PHP. Having a solid background is more important than the specific technology implemented.

From this anecdotal evidence, it would appear that IS employers are realistic enough that they are willing to accept lower knowledge levels of new hires as long as that knowledge is grounded in fundamentals. Where the knowledge gap appears to be unbridgeable is when the theoretical foundation is missing. In this case, employers are justifiably critical, as indicated by the comments of two additional respondents:

Many new hires as well as some current staff have no concept of what these technologies are doing to provide their services. Not even from a conceptual level. I cannot even imagine trying to make a decision on what technology/tool to use to provide a solution without at least a fundamental understanding of what and how the given technology operates.

E-commerce is not a discipline in and of itself; it is merely an application area with much surrounding hype. Students who are well grounded in hardware and software architectures are very valuable. Students should realize that a web page is merely the tip of the iceberg with respect to a web based application. Students who can whip out a web page with no understanding of the massive support that must be provided by back end systems are a waste of time to interview.

Question 4: E-commerce Technologies and Web Platforms

Not surprisingly, knowledge expectations of new hires varies significantly based on web platform in use. Organizations that serve web pages using on Apache only or IIS only tend to require new hires to have higher knowledge levels of associated technologies. Apache users expect new e-commerce hires to be more familiar with Unix/Linux, Apache Server, and Perl than do their IIS counterparts. IIS users, on the other hand, expect new hires to know more about ASP, VBScript, Visual Basic, Microsoft IIS, and ADO than they do about related Apache technologies.

LIMITATIONS OF STUDY

This study was undertaken to explore usage levels and new hire skill sets for core e-commerce technologies and was based on a survey of IS professionals working for leading e-commerce firms. Our web survey response rate of 11.3%, even after repeated email requests, was typical for email surveys but lower than desired and may not be representative of the population as a whole. Notwithstanding this limitation, we believe IS professionals participating in the survey provided valuable insight into the e-commerce practices and expectations for new employees.

In our survey instrument, we did not distinguish new hires based on academic preparation levels. It is possible that the survey results regarding expected knowledge levels would be different had we differentiated between new hires with no to little college education, an undergraduate education, or a graduate education. Future revisions to the survey instrument should clarify to the respondent the academic background of the new hire under consideration.

Our research to date has provided a foundational context

for understanding the relative importance of core technologies undergirding the three tiers of web development. Many questions remain regarding e-commerce curriculum design. For example, this research provided little support for curricular emphasis on Visual Basic and ADO as key e-commerce technologies. Microsoft, recognizing the limitations of VB and ADO as web development products, has completely revamped both technologies under the umbrella .NET initiative (5). The survey instrument did not separate Microsoft's Visual Basic .NET from Visual Basic nor ADO .NET from ADO. It is unclear whether respondents lumped VB .NET in with Visual Basic or ADO .NET in with ADO when completing the survey. Future research should include revisions to the survey instrument to include Visual Basic .NET and ADO .NET as separate e-commerce technologies to be evaluated.

CONCLUSION AND FUTURE DIRECTIONS

The bewildering array of competing Internet technologies makes e-commerce curricula formulation a formidable task. This research suggests that IS educators designing the technology component of an e-commerce curriculum should focus their efforts on teaching the theoretical foundations of e-commerce application development and deployment, paying particular attention to general support technologies such as SQL, Windows2000/XP, Unix/Linux and web servers. Client-side coursework should emphasize HTML, Web Site Design, XML, JavaScript, and Cascading Style Sheets. On the Server, students need a background in Java and exposure to either ASP or JSP. The choice of the specific server-side and general support technologies, such as ASP or JSP, should be determined based on regional service area needs. For those geographic regions using primarily Microsoft web technology, curricular coverage of ASP is indicated along with ADO. For those where Apache web server has the dominant market share, JSP would be a better choice coupled with Unix/Linux content and Perl language coverage. Course emphasis on proprietary technologies that are not considered de facto standards, such as ColdFusion, should be reduced due to a relative lack of employer support.

The study presented in this paper examined core e-commerce technologies from the perspective on IS professionals working in e-commerce settings. In a previous study, we examined e-commerce technologies from an IS educators perspective. Our future research plans include a statistical analysis to determine if there is a significant difference between the instructional emphases assigned key e-commerce technologies in academic IS programs and current usage levels or knowledge expectations for new hires. In addition, we are currently engaged in a survey of IS educators regarding their plans to implement the newly required IS2002.2 E-business Strategy, Architecture and Design course (9).

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APPENDIX Survey Questionnaire

Client Side Technologies												
Topic	Use in Your Organization						Importance for a New e-Commerce Hire					
	Not Used		Moderately Used		Extensively Used		Not Important		Moderately Important		Extremely Important	
HTML	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
GUI Web Design Tools	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Web Site Design	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
JavaScript	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
DHTML	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
XML	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
CSS	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Java Servlets	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other(1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input style="width: 100%;" type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other(2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input style="width: 100%;" type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Server Side Technologies												
Topic	Use in Your Organization						Importance for a New e-Commerce Hire					
	Not Used		Moderately Used		Extensively Used		Not Important		Moderately Important		Extremely Important	
Active Server Pages	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
PHP	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cold Fusion	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Java Server Pages	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Perl	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Java	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
VBScript	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Visual Basic	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
C++	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other(3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input style="width: 100%;" type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other(4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input style="width: 100%;" type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

General Support Technologies												
Topic	Use in Your Organization						Importance for a New e-Commerce Hire					
	Not Used		Moderately Used		Extensively Used		Not Important		Moderately Important		Extremely Important	
Microsoft IIS	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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Windows 2000/XP	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Unix/Linux	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
SQL	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
ActiveX Data Objects	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
ODBC	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other(5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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Other(6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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Please enter your position title:

Please provide us with any additional thoughts you might have on this project: