SIGNIFICANT SUCCESS FACTORS IN DISTANCE EDUCATION

Peter W. Olson
Utica College
UTICA, NEW YORK, U.S.A.

Abstract

The Internet is a major technological advancement which reshapes not only our society, but also changes how universities operate. To stay competitive, universities need to develop new online delivery methods. This paper describes the results of a survey of students enrolled in an online management course at Renssalaer Polytechnic Institute (N.Y., U.S.A.). Three success factors in online delivery are identified: technology, the instructor and the previous use of the technology by the student. In the future, the instructor will continue to play a central role in education, as a learning catalyst and knowledge navigator for students participating in online education

KEY WORDS: Distance Education, Online Education, Graduate Business Education, Student Profiles, Instructor Profiles.

INTRODUCTION

Online education has generated widespread excitement, both inside and outside higher education. For some, it offers the potential of providing learning opportunities to new audiences; for others, it offers the prospect of fundamentally transforming learning delivery methods and changing the competitive landscape [Poehlein, 1996]. Among institutions with better-defined reasons for embracing online education, the rationale varies, but often falls into one of four broad categories:

1. *Expanding access*. Most states need to expand access to education in order to better meet the education and training needs of their residents and companies. State governments will turn to universities for assistance in reaching this goal. In the past, academic program calendars have not been sufficiently flexible to allow students to meet work and family responsibilities.
2. *Alleviating capacity constraints*. Recently enrollments have increased at many universities, while physical plant capacity remained unchanged. Therefore, some are hoping to leverage the scalability of online education to avoid overwhelming their bricks-and-mortar capacities [Weill and Broadbent, 1998].
3. *Capitalizing on emerging market opportunities*. The public's growing acceptance of the concept and value of lifelong learning has fueled an increased demand for higher education services among people outside the traditional 18-24 years age range. Providing education services and programs to emerging student segments, such as executives seeking further education and working adults, may be more lucrative than serving the traditional markets. By concentrating on or beginning to serve emerging markets, many educational institutions are hoping to generate significant increases in revenues. There are, however, risks associated with this new strategy. These risks will be discussed later in this paper.
4. *Serving as a catalyst for institutional transformation*. Many institutions of higher education are being challenged to adapt rapidly to a decrease in public funding and to an increasingly competitive environment [Whitty et al., 1998]. Distance education can catalyze institutional transformation. There are risks associated with institutional transformation—the most important

risk is inherent in change. Whenever change is rapid, the level of resistance increases. Therefore, change has to be introduced at a slower pace, especially when the change requires adaptation to new technologies [Knowles, 1997; Saltiel & Russo, 2001].

The rapid expansion of the Internet as a potential course delivery platform, the increased interest in lifelong learning, and budget restrictions, have created a significant incentive for universities to develop online programs. The technology is now available and is user-friendly. Universities which do not embrace the new technology will be left behind in their efforts to educate students to compete in a competitive global environment.

To assist universities to make the utmost use of the Internet, it is essential to identify and understand the factors which have an effect on online delivery of education. Re-implementing conventional models borrowed from classroom-based or from distance education which are focused on passive transmission (e.g., one-way transmissions) of information, will lead only to marginal improvements and may well simply escalate costs and turn away potential students.

This paper aims to identify the key success factors of this new paradigm of education based on the study of a Business course which had been offered online for several years at Rensselaer Polytechnic Institute (RPI). The first section of the paper will define the concept of online education. In the second section a review of the literature will identify the key factors influencing the effectiveness of online delivery. The third section will describe the method used to conduct this study. In particular, the features of the course offered online will be detailed. The last section presents findings and a discussion.

DEFINING ONLINE EDUCATION

The rise of the Internet, beginning in the early 1990's, has been accompanied by the publication of many articles on online delivery in the field of education. There has been a concomitant interest in a variety of issues linked to online delivery. Numerous new terms have emerged such as distance learning, computer-based learning, distributed learning, and lifelong learning. It is important to define the concept of online delivery and to explain how it relates to these terms.

Distance learning is probably the oldest and best-known concept. It was originally intended for students disadvantaged by their geographical remoteness from university campuses. The UK's Open University and imitators in countries as different as India, Israel, and Australia have demonstrated, that even without the benefit of the Internet, technology makes it possible to deliver good (and relatively inexpensive) higher education beyond a physical campus. The delivery of course materials and contact with instructors may rely on traditional (e.g., print and telephone) or newer technologies (e.g., electronic communication). Hence, distance learning can be defined as any approach to education delivery that replaces the face-to-face environment of a traditional classroom with separation of instructor from students [Holmberg, 1986].

Computer-based learning was, until fairly recently, limited mainly to technological fields such as mathematics, engineering and design. Now, however, computer laboratories are likely to be frequented by students in linguistics, geography, history and/or business. Computers provide an unparalleled capacity to manage and access large amounts of information, and may present it in a novel and interesting way. Similarly, computer-based education allows students to become active learners rather than mere passive recipients of teaching [Candy et al., 1994]. Computers are not necessarily linked to a network: computer learning can be achieved by standalone computers using a particular software stored on a hard disk, a diskette or CD.

Distributed learning broadly refers to features of a learner-centered environment. A variety of "integrated technologies" provide opportunities for activities and interaction, asynchronously and in real-time mode.

The model is based on blending a choice of technologies with aspects of campus-based delivery and distance education" [Reid, 1999, p. 4]. Two essential aspects, therefore, underpin the concept of distributed learning: first, a heavy reliance on technology, and second, self-directed learning. The latter implies that the learner (or student) assumes responsibility for specifying individual learning needs, goals and outcomes, planning and organizing the learning task, evaluating its worth and constructing meaning from it [Candy et al., 1994, p. 128].

Lifelong learning refers primarily to those forms of learning throughout life that are called for by social and cultural change. The rate of social, technical, economic and other change is so great, at least in

industrialized countries, that few people will hold the same job throughout their lifetime. Similarly, recent research on learning across the lifespan has shown that people are not only capable of, but also actually engage in, continuing learning over their active life and beyond [Tuijnman and van der Kamp, 1992].

Drawing on the concepts previously defined, one can say that online delivery is a form of distributed learning enabled by the Internet. Uses may include the provision of student access to learning resources, the facilitation of communication and collaborative working among and between students and academic staff, the assessment of individual students or groups of students (i.e., cohorts), and the provision of administrative and student support. Online delivery goes beyond traditional computer learning as it makes full use of the Internet and other digital technologies. Online delivery can facilitate distance education by making course material accessible anytime anywhere. It provides substantial advantages over traditional technologies:

- Collaborative tools which offer a rich, shared, virtual workspace in which interactions occur not between an individual and technology, but occur as many, interpersonal communications, among students. The interaction can be synchronous (i.e., in real time) with, for example, a chat forum or video-conferencing, or asynchronous (i.e., delayed, videotaped).
- Interactive tools such as simulations or self-administered quizzes, which allow students to progress at their own pace through required exercises and self-assessments. These collaborative tools are limited since they do not provide for interaction with other students or an instructor. The student interacts only with the technology (e.g., computer software).

KEY FACTORS IN EFFECTIVE ONLINE DELIVERY

EFFECTIVENESS

According to Webster and Hackley (1997) student performance, measured (marks) by faculty, represents a key aspect of teaching effectiveness. Several studies have shown that there is little or no difference in student performance between educational television and face-to-face instruction [Wetzel et al., 1994] or between video instruction and face-to-face instruction [Storck and Sproull, 1995]. Webster and Hackley (1997) further suggested that effectiveness encompasses: student involvement and participation, cognitive engagement, technology self-efficacy (i.e., belief that one is capable of interacting with a given technology), perceived usefulness of the technology employed, and the relative advantage or disadvantage of online delivery.

According to studies conducted by Dillon and Gunawardena (1995) and Leidner and Jarvenpaa (1993), three main variables affect the effectiveness of online delivery:

1. technology
2. instructor characteristics and
3. student characteristics.

TECHNOLOGY

The reliability, quality and medium richness are key technological aspects of effectiveness (Sanders Lopez and Nagelhout, 1995). In particular, the network that is set up should allow for both synchronous and asynchronous exchange; students should have convenient access (e.g., through a remote access) and the network should require minimal time for document exchange. The quality of the interface also plays a crucial role [Trevitt, 1995]. The literature concerning interface design for online delivery ranges from the highly artistic [e.g., Laurel, 1990] to the highly technical [e.g., Blattner and Dannenberg, 1992]. Reeves and Harmon (1993) presented a synthesis of these two tendencies. They identified the following user interface dimensions as being important: ease of use, navigation, cognitive load, mapping, screen design, information presentation, aesthetics, and overall functionality.

The perceived richness of the technology also influences the effectiveness of online delivery. Daft and Lengel [1986] posit that a medium richness allows for both synchronous and asynchronous communication and supports a variety of didactical elements (e.g., text, graphics, audio and video messages). A central part of the medium richness relates to interactivity. McIntyre and Wolff [1998, p. 257] noted that: "One of the powers of interactivity in a Web environment is the capability to engage by providing rapid, compelling interaction and feedback to students." Engagement is also enhanced by

problem-based presentation of educational material. An engaged student is a motivated student [Neorman and Spohrer, 1996].

INSTRUCTOR CHARACTERISTICS

Collis [1995, p. 146] remarked that the instructor plays a central role in the effectiveness of online delivery: "It is not the technology, but the instructional implementation of the technology that determines the effects on learning." Webster and Hackley [1997] suggested that three instructor characteristics influence learning outcomes
1.   attitude towards technology
2.   teaching style and
3.   control of the technology.

Students are more likely to experience positive learning outcomes if their classroom instructor has a positive attitude towards distributed learning and promotes the technology. In a distributed learning environment, students often feel isolated without classroom interaction [Serwatka, 1999]. To overcome this feeling, instructors can provide various office hours and methods of contacts. Most importantly, the instructor should practice interactive teaching styles and encourage student interaction. Students in Internet distance learning courses frequently face technical problems. It is crucial that the instructor is technologically capable and able to perform basic troubleshooting tasks (adding a student at the last minute, modifying students' passwords, changing the course settings, adding course materials). Organization skills go hand in hand with control of technology. Haynes et al. [1997] remarked that an instructor with design capabilities is essential for overall coordination; since development of an online course is labor intensive, both faculty and technical resources must be committed to this task from the start.

STUDENT CHARACTERISTICS

The literature identifies a variety of student characteristics affecting the effectiveness of online delivery. Colley et al. [1994] maintains such variables are: prior experience, having a computer at home, and personality. These variables may produce gender difference towards computers. Reinen and Plomp [1993] found that, in most of the 21 countries they surveyed, males dominated computer usage at school. Computer experience is another gender-related variable [Kay, 1992].

Other demographic characteristics (such as income, age, employment, level of education) also impact the effectiveness of online delivery. The program in which the students are enrolled (e.g., Master of Business Administration, Master of Science in International Business) might play a role. The enrollment interacts with computer experience: students enrolled in Rensselaer Polytechnic Institute's Distance Education Program take all their courses online and are familiar with the technology. Another demographic is the student's country of origin. Leidner and Jarvenpaa [1995] also suggested that students lacking necessary basic skills and self-discipline (e.g., self reliance, independence, self-directedness) might do better in a traditionally delivered mode instruction. The brightest and most motivated students may prefer to learn in an online competitive environment.

WEBCT SOFTWARE TO DEVELOP ONLINE COURSES

WebCT software is an integrated Web publishing environment tailored for the design and development of teaching and learning materials. WebCT can be used to create entire online courses, or to simply publish materials that supplement existing courses. WebCT requires minimal technical expertise on the part of the course developer or student. All content is accessible via a standard Web browser (Netscape, Internet Explorer).

WebCT was developed in the Department of Computer Science at the University of British Columbia, Canada. Rensselaer Polytechnic Institute (RPI) purchased an unlimited license for the software in order to produce online courses. During 2000, the number of online courses being implemented by RPI's Distance Education Program using WebCT grew from less than 50 to more than 100.

The International Business course was one of the earliest courses offered online at RPI's Lally School of Management and Technology. The course was also offered in Canada and Mexico. It part of the

Master of Science in International Business, a challenging and flexible program specifically designed for busy executives. The program featured guided independent study, student-centered learning and maximum use of information and communication technology. Although the course content was available online, a series of two to three intensive one-day seminars were conducted throughout the semester. In a classroom setting the instructor gave an overview of the different topics and students interacted on case studies or students' presentations.

International Business had eleven topics with the following features:
- *Summary* – covering the essential concepts for each topic.
- *PowerPoint Slides* used by the instructor during the intensive seminars could be either viewed or downloaded on the computer.
- *Readings* of a series of relevant articles were available online or through a link to another URL.
- *Examinations* were ten multiple-choice questions. Clicking a button presented the question. WebCT automatically marked student responses as correct or incorrect. Included in each chapter was a multiple-choice quiz.

Other features and tools available to students from the International Business Web page included:
- *Course conferencing system* (i.e., bulletin board) allowed communication among all course participants. WebCT kept track which articles were read by each student and, by default, initially presented only unread articles. The conferencing system could be searched (new and old articles) for content, sender, date of sending, etc.
- *Email.* An electronic mail facility was added allowing one-to-one message transfer among course participants. The messages could be searched in the same manner as the bulletin-board. Emails could be categorized and organized into "threaded" discussions (e.g., answering specific emails).
- *Virtual library.* Several links to the RPI Cole library, online journals and magazines and international organizations were provided for up-to-date information.

RESEARCH METHODOLOGY

Data was collected through an anonymous questionnaire administered to 185 RPI students web-enrolled in International Business during the Fall semester 2002. Forty students were synchronous on-campus, forty students were synchronous off-campus, the remaining 145 students were asynchronous off-campus. The measurement tool of the variables was drawn from Reeves and Harmon [1992] and Webster and Hackley [1997]:
- *Teaching effectiveness.* Since student grades were not available at the time the questionnaire was administered, this dimension was not included in measuring effectiveness. The following dimensions were used: student involvement and participation, cognitive engagement, technology self-efficacy, perceived usefulness of the technology employed, and the relative advantage of online delivery. Seven items were developed using a five-point Likert scale. The student respondents were asked to state the extent of agreement/disagreement with each statement. A teaching effectiveness index was subsequently built by adding the value of the seven items.
- *Level of Technology.* A set of fourteen items was developed using a five-point Likert scale to capture the reliability, quality, and medium richness of the technology. A technology index was subsequently built by adding the value of the fourteen items.
- *Instructor characteristics.* A set of fourteen items was developed using a five-point Likert scale to capture the instructor's attitude towards technology, teaching style, and ability to assist students with the technology questions. An instructor index was subsequently built by adding the value of the fourteen items.
- *Student characteristics.* In addition to a question relating to the student's previous computer experience, the following student demographic variables were analyzed: access to the Internet at home, program of study, country of origin, and gender. All students, synchronous or asynchronous, completed this questionnaire.

RESEARCH FINDINGS

Students indicated their frequency of use of the course's various features on a five-point Likert scale. Responses ranged from 1="not at all" to 5="very frequent" (see Figure 1). The least frequently used feature of the course was the use of videotapes. This may have been because students were able to attend face-to-face lectures and/or view the lectures on the web. Students rated the readings and the virtual library as having medium usage. Rated as frequently used were: the summaries, slides, quizzes and the bulletin board. Of these four, the quizzes rated the highest, and were also the most interactive, since the quiz was graded immediately.

The relationship between these mechanisms for promoting teaching effectiveness and the technology used, proved to be significant; the Pearson correlation (two-tailed) correlation coefficient was 0.563 with a p value of 0.001.

A factor analysis extracted underlying technology factor clusters with a principal component analysis; the factor matrix was rotated using the varimax method. Three factors emerged from the factor analysis. Each factor displays a high level of reliability with Cronbach alpha > 0.7. Overall, the three factors explain 70 per cent of the variance. The results of the factor analysis are summarized in Table 1.

FACTOR 1: EASE OF ACCESS AND NAVIGATION (Table 1)

This factor comprises the first five technology variables and relates to the ease with which the students could access the site and use the software. Through the student tracking facility it was revealed that students took full advantage of the access flexibility offered by WebCT. For example, they logged in at various times during day and night.

FACTOR 2: INTERFACE (Table 1)

This factor comprises four technology variables relating to the visual structure and design of the Internet course. The Web page design was perceived to be appealing and well structured. This ergonomic dimension was particularly important since it was discovered that some students spent up to two hours at a time on the Web site.

FACTOR 3: INTERACTION (Table 1)

This factor comprises the final three technical variables. These relate to the interactive abilities of the WebCT course between all students and the instructor. The technology made it possible to have a truly *virtual* classroom enabling interaction between classmates and the instructor. The interaction dimension is important because discourages using the Internet merely to post lecture notes or assignments.

The relationship between teaching effectiveness and instructor characteristics was tested by a Pearson correlation (two tailed). The Pearson correlation coefficient was 0.594 with a p value of 0.001, a significant relationship. A factor analysis detected the underlying instructor variables as seen in Table 2.

FACTOR 4: ATTITUDES TOWARDS STUDENTS (Table 2)

This factor comprises the first five variables of instructor characteristics. They relate to the instructor's personal approach and teaching manner, and ability to motivate students in a classroom setting. In other words, the instructor showed empathy towards students in face-to-face and in cyberspace settings. This implies, among other things, handling email queries rapidly and solving emerging problems efficiently.

FACTOR 5: INSTRUCTOR TECHNICAL COMPETENCE (Table 2)

This factor comprises four variables relating to the instructor's ability to use and promote Internet technology effectively. The instructor vigorously encouraged technology use and organized a lab session at the first intensive classroom seminar to initiate students. In addition, the instructor was able to handle

the technology and conveyed the message that he believed it to be an effective teaching tool. This dimension suggests that the instructor is not only a knowledge source, but also a knowledge navigator.

FACTOR 6: CLASSROOM INTERACTION (Table 2)

This variable relates to the instructor's ability to encourage students to interact and participate in class and through the Internet. Students received a participation grade for their degree of interaction on the Web site and in the classroom. The WebCT software allows the instructor to monitor the use (e.g., time and amount) of the web course materials by each student. This information can be quantified and/or charted by the instructors. The Internet adds a new level of interactivity as it expands the meaning of office hours or class meeting times.

The relationships between the various demographic variables relating to students and teaching effectiveness were tested with a one-way analysis of variance (ANOVA). The results, presented in Table 3, show that previous use of the WebCT is the only student characteristic influencing teaching effectiveness. Demographic student characteristics such as country of origin and gender were not influencing factors, nor were the type of program being undertaken or access to the Internet at home.

ASSOCIATED RISKS

Lacking proper foundation knowledge can be a key factor for the failure of online courses at many universities [Olson, 2003]. Students who are not properly prepared to operate in a cyber environment and/or who have difficulty with computer communication, have a higher probability of failure. Faculty who are not properly prepared to teach in an online delivery environment may account for be the single most reason for failure [Saltiel & Russo, 2001]. Faculty motivation to teach in the new cyber-learning environment also is an important ingredient for success of a program. Online courses need continually be tested to determine weaknesses. Both faculty and students must have access to technological training (software and hardware).

Lack of technological support for students, and in many cases for the "technologically challenged" faculty, is the second most often identified failure factor [Olson, 2003]. A university should complete risk assessment before deciding to get involved in online distance education. Students will experience poorly designed or failing programs first hand. And this experience may be the deciding factor whether a student continues in an internet based degree program.

CONCLUSION

The Internet represents a major technological advancement, affecting not only societies in general, but also universities in a particular way. Universities have to use the Internet for teaching and develop online delivery methods. This paper identified three key success factors in online delivery: technology, (ease of access and navigation, interface design and level of interaction), the instructor (attitudes towards students, instructor technical competence and classroom interaction), and the students' previous use of the technology.

The findings of this study are limited by the following: students surveyed were from one university - Rensselaer Polytechnic Institute; student grades were not available at the time of data collection and thus could not be included in the students' performance measurement. In considering the reliability of the study results, it must be noted that there was no control group to detect whether the pedagogy and technology used significantly enhanced teaching effectiveness compared with more traditional methods. The course assessment did not test the acquisition of transferable skills in communication and information technology; these skills are often developed through the use of computer-aided learning.

Findings from this study indicate that the Internet can be a powerful tool in higher education by supporting effective programs and exposing students to the power an applicability of computer networks. Instructors need to continually upgrade their technical skills in order to keep pace with technological developments. The study has illustrated that Internet and traditional classroom teaching methods are not mutually exclusive. The computer should be seen as an additional dimension facilitating the instructor's task while benefiting students.

Universities should complete risk assessments before undertaking online distance education. As delivery technologies change, students, faculty and technical support staff must keep abreast of these changes. Peter Drucker stated in <u>Fortune</u> magazine on April 14, 1997, that "many of the universities today are dinosaurs, their 'brick and mortar' will be replaced by new [cyber] learning environments…. and four out of five universities that start a distance education program will abandon it five years after their commencement" (p.47). Drucker's prediction that many universities will abandon "expensive" distance education programs has come true.

Interaction between students and instructors is very important in online delivery. The role of the instructor will change from being the intellect-on-stage and the mentor, to also being a learning catalyst. The instructor's ability to motivate students to become self-learners is crucial. Use of the Internet can assist the instructor by providing information to students. As Inayatullah [1999] suggested, the instructor can then play the more important role of asking questions and engaging the student at many different levels.

Further research in this area, to gain further insights, including other disciplines in other countries, as well as a replication of this study, are necessary.

FIGURE 1
MEAN SCORES OF STUDENT USAGE OF WEBCT FEATURES

1=not at all; 2=not much; 3=sometimes; 4=frequent; 5=very frequent
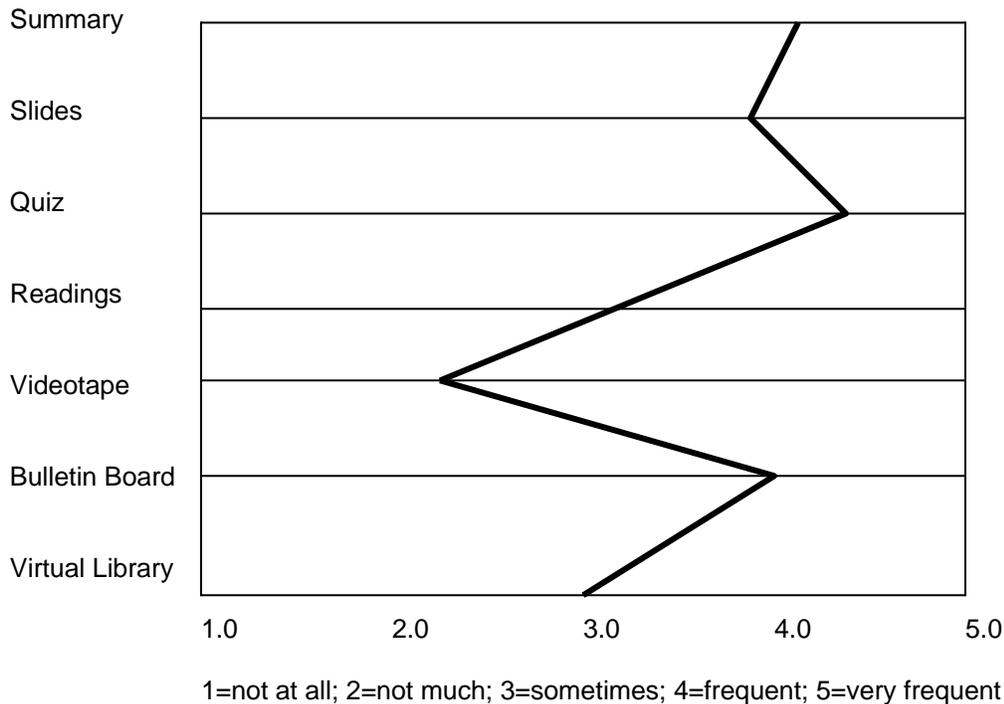
TABLE 1
FACTOR ANALYSIS OF TECHNOLOGY

Items	Factor 1	Factor 2	Factor 3
Easy access to the Web site	0.640		
Did not experience problems while browsing	0.809		
Browsing speed was satisfactory	0.837		
Overall, the Web site was easy to use	0.743		
Web site was easy to navigate	0.586	0.677	

Information was well structured and presented	0.838	
The screen design satisfactory	0.750	
Web site contained useful features	0.797	
Web site gave direct and timely feedback		0.792
Interaction with classmates through the Web		0.796
Interaction with the instructor was easy		0.690
Percentage of variance explained	44.420	16.619	9.287
Cumulative percentage of variance explained	44.420	61.039	70.326
Cronbach alpha	0.863	0.879	0.713

TABLE 2
FACTOR ANALYSIS OF INSTRUCTOR CHARACTERISTICS

Items	Factor 4	Factor 5	Factor 6
Instructor was enthusiastic about teaching the course	0.694		
Instructor's style of presentation was interesting	0.846		
Instructor was friendly towards individual students	0.897		
Instructor had a genuine interest in students	0.845		
Students were encouraged to seek advice/help	0.683	0.621	
Instructor encouraged student interaction		0.828	
Instructor handled the Web technology effectively		0.827	
Instructor explained how to use the Web site		0.809	
Students were encouraged to ask questions/receive answers			0.647
Students were encouraged to participate in class			0.818
On-campus seminars were useful			0.660
Percentage of variance explained	29.547	23.703	17.075
Cumulative percentage of variance explained	29.547	53.250	70.326
Cronbach alpha	0.889	0.837	0.684

TABLE 3
STUDENT CHARACTERISTICS

Items	F Value	Significance
Program of Study	0.298	0.827
Internet access from Home	0.009	0.924
Previous experience with WebCT software	5.612	0.001
Gender	1.755	0.192
International Business students vs. others	0.313	0.579
Country of origin	0.070	0.976

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