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VIRTUAL CLASSROOM CHARACTERISTICS AND STUDENT SATISFACTION WITH INTERNET-BASED MBA COURSES

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Delivery of distance education via the Internet is moving rapidly from an undiscovered frontier to a village with initial settlements to a community of competing institutions. About two thirds of the 3,200 accredited 4-year colleges and graduate schools in the United States offer courses via the Internet (Clarke, 1999). Business schools have taken the lead in extending this emerging trend to degree programs. Approximately 20 AACSB-accredited U.S. schools are expected to provide entirely online MBA programs by the end of 1999 (Kwartler, 1998). With the expectation that nearly half of all corporate training will be conducted online at the beginning of the 21st century (Herther, 1997), the potential market for Internet-based management training seminars, courses, and degree programs is tremendous. The acceleration of this trend is due to a variety of factors such as technological advances in both course software and computing capacity (Alavi, Yoo, & Vogel, 1997; Dede, 1991; Holland, 1996), increasing numbers of people with Internet access (Burrows, McWilliams, & Hof, 1998; Kraut, Scherlis, Mukhopadhyay, Manning, & Kiesler, 1996), competitive pressures from external stakeholders and alternative sources of education (Dede, 1990; Kedia & Harveston, 1998; Moore, 1997; Rahm & Reed, 1997), positive experiences of early adopters (Clarke, 1999; Greco, 1999; Ellram & Easton, 1999), and declining MBA enrollments (MacLellan & Dobson, 1997). These forces can be expected to

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continue to influence the development of such courses and programs for the foreseeable future.

In spite of this initial enthusiasm, there still are prevailing concerns about Internet-based courses and programs. Some of these concerns include time and labor intensiveness to both develop and take the courses, lack of face-to-face interaction, and questions about their quality relative to traditional classroom-based courses (Dumont, 1996; Grossman, 1999; Neumann, 1998). Combine these concerns with the limited research on Internet-based courses in management education (Ellram & Easton, 1999), and the contention that we may be racing to adopt educational techniques without fully understanding them may be justified (Grossman, 1999). These concerns prompt a fundamental question that management educators need to address: What factors must be present to produce effective Internet-based courses?

This article is an initial step toward answering this question. Most of the research to this point on Internet-based courses in management education has been either macrotheoretical approaches to delivery (Leidner & Jarvenpaa, 1995; White, Rea, McHaney, & Sanchez, 1998), anecdotal examples (Ellram & Easton, 1999; Taylor, 1996), or atheoretical empirical studies (Arbaugh, 1998; Hiltz & Wellman, 1997). The article examines factors related to student satisfaction with Internet-based courses based on technological media and student characteristics with the hope that it can help instructors and administrators as they attempt to muddle through Internet-based MBA course and program development. The study focuses on graduate management education because researchers in distance education and computer-mediated communication (CMC) contend that professional degrees with relatively mature students is the market for whom Internet-based courses and programs should be developed initially (Brandon & Hollingshead, 1999; Hiltz, 1993; Rahm & Reed, 1997). The remainder of this article is divided into three sections. First, the information technology and distance education literatures are reviewed to develop a theoretical foundation for the study. Next, the results of testing the hypotheses using a multicourse, multidiscipline, multi-instructor study at a midwestern U.S. university are discussed. Finally, the findings are used to identify future challenges and frontiers for management researchers, educators, and business schools.

Theoretical Development

THE TECHNOLOGY ACCEPTANCE MODEL (TAM)

Given the relative newness of Internet-based education, theoretical perspectives of technology adoption seem particularly appropriate for

predicting satisfaction with Internet-based courses. The TAM suggests that beliefs and attitudes toward a technology are the primary determinants of whether the technology will be adopted (Davis, 1989; Davis, Bagozzi, & Warshaw, 1989). The two prominent variables in this model are the perceived usefulness of a technology and the perceived ease of use of a technology. In the TAM, beliefs that a technology is useful and easy to use influence the users' attitudes toward the technology and thereby their decision to adopt the technology. This model has become well accepted in the information technology literature and has been found to be a valid predictor of the use of computer software (Bagozzi, Davis, & Warshaw, 1992), e-mail (Gefen & Straub, 1997), and the World Wide Web (Atkinson & Kydd, 1997).

In the context of Internet-based courses, this suggests that perceived usefulness and the ease of use of the delivery medium (course Web site, software, etc.) will enhance students' attitudes toward their course experience and, therefore, make them more likely to take other Internet-based courses in the future. When attempting to test the TAM variables, it is important to identify specifically the medium in question. Initially, Internet-based courses were developed by individual instructors using electronic bulletin boards and HTML (Dumont, 1996). As the medium has developed, a number of firms now are developing Internet-based course software to reduce the detailed technical knowledge requirements for faculty and to provide a common look and feel to courses as schools seek to develop online degree programs. Although the software packages do provide a common look and feel across courses, they often use differing approaches and structures so that the same course could be a substantially different experience depending on the software package. Therefore, usefulness and ease of use of the medium are being driven increasingly by course software packages. Thus,

Hypothesis 1: Perceived usefulness of the course software will be positively associated with student satisfaction with an Internet-based course.

Hypothesis 2: Perceived ease of use of the course software will be positively associated with student satisfaction with an Internet-based course.

However, although perceptions of usefulness and ease of use are important in considering adoption of new information technology, the software is only one part of the Internet-based course environment. Media richness (Daft & Lengel, 1986) and social presence theories (Rice, 1984; Sproul & Kiesler, 1991) suggest that recreating the classroom learning environment to fit the Internet in its present format would be rather difficult. The relatively low richness of text-based media (which is presently the primary media of choice for Internet-based courses) and the elimination of nonverbal cues

would make accomplishing interdependent, ambiguous tasks such as case discussions and group projects particularly challenging. As a result, interaction that does take place would tend to be more task oriented than interaction in face-to-face settings (Hiltz, Johnson, & Turoff, 1986; Strauss, 1996). However, the flexibility inherent in Internet-based delivery methods may provide an opportunity for navigating around these barriers.

FLEXIBILITY AND ITS ROLE IN INTERNET-BASED EDUCATION

An emerging perspective within CMC research, developed in part from social information processing theory (Chidambaram, 1996; Walther, 1992), suggests that rather than inhibiting interaction and social bonding, the flexibility inherent in CMC vehicles such as Internet-based courses may help groups to reach levels of relational intimacy comparable to face-to-face groups, albeit over a longer time period. According to this perspective, flexibility in the course comes as a result of the medium being both place and time independent, allowing course conversations to continue over time in the midst of interruptions (Harasim, 1990; Leidner & Jarvenpaa, 1995). Rather than being inhibited by low media richness and social cues, CMC actually may enhance communication because students are provided the opportunity to be more reflective and thoughtful in their discussion rather than having to compete to be recognized as is the case in physical classrooms (Dede, 1990; Finley, 1992; Harasim, 1990). As a result, the Internet-based "classroom" can become a "virtual learning space" (Leidner & Jarvenpaa, 1995) where dynamic interaction supported by collaborative learning structures produces enhanced conceptual thinking based on the cultivation of multiple points of view (Brandon & Hollingshead, 1999; Leidner & Jarvenpaa, 1995).

The time and place independence available through CMC media allows students to have a high degree of flexibility in when and where they participate in Internet-based courses. This flexibility is particularly attractive for graduate management education. The typical consumers of graduate management education, managers or aspiring managers, have had to manage increasing levels of conflict among their jobs, family, and work-related travel throughout the 1990s (Clarke, 1999; Dumont, 1996; Greco, 1999). Given the recent decline in MBA enrollments (MacLellan & Dobson, 1997), the flexibility of Internet-based courses may attract a competent type of student with a wide variety of experiences who otherwise might not partake in graduate management education (Ellram & Easton, 1999; Taylor, 1996), thereby increasing the opportunity for enhanced course participation and collaborative learning within that course setting. This potential impact provided by time and place flexibility leads to the following hypothesis:

Hypothesis 3: Perceived flexibility will be positively associated with student satisfaction with an Internet-based course.

CMC AND THE VIRTUAL CLASSROOM

Although the flexibility of the Internet-based course may allow for enhanced conceptual thinking with broader student participation, the actual process of this interaction can be cumbersome. One of the primary features of this learning environment is the need for comparatively high levels of interaction among all class participants. Prior studies of CMC, in general, and Internet-based courses, in particular, suggest greater volume and more equal student participation in class discussions than in traditional classrooms (Bailey & Coltar, 1994; Boston, 1992; Hiltz, 1986; Strauss, 1996). However, more participation does not always mean a positive classroom experience. Strauss found that although student groups in computer-mediated discussions participated more and more equally, they generally enjoyed the process less than students in face-to-face groups. Also, this interaction tends to be less efficient because initially it is more difficult to exchange information and develop social ties (Hightower & Sayeed, 1995; Warkentin, Sayeed, & Hightower, 1997). These difficulties can be compounded by the relatively short longevity of the course and has been suggested as a possible cause for the relatively high attrition rates associated with Internet-based courses (Ellram & Easton, 1999; Ridley & Sammour, 1994). These points suggest the following hypothesis:

Hypothesis 4: Perceived interaction difficulty will be negatively associated with student satisfaction with an Internet-based course.

In spite of the possible difficulty associated with interaction in Internet-based courses, information technology and communication theorists suggest that fitting the medium to the appropriate learning model can help to enhance interaction within the Internet-based course. Theoretical work by Leidner and Jarvenpaa (1995) implies that a collaborative learning model would be best suited for an Internet-based MBA course because of the asynchronous nature of the medium and the relatively high level of prior business experience of the students. Other researchers have suggested that instructors need to learn a different set of teaching skills for transitioning into this role of discussion facilitator and manager (Berge, 1995; Brandon & Hollingshead, 1999), which includes, in part, intentional efforts at achieving verbal immediacy (Freitas, Myers, & Avtgis, 1998; Gorham, 1988) and use of a more conversational style in online comments to help enhance student participation and discussion (Ahearn, Peck, & Laycock, 1992). These findings suggest

that instructors of these courses need to place a high level of emphasis on interaction within the course and develop methods to facilitate interaction. Therefore,

Hypothesis 5: Perceived instructor emphasis on interaction will be positively associated with student satisfaction with an Internet-based course.

STUDENT CHARACTERISTICS

Student usage. Prior studies have shown that computing experience is a strong predictor of attitudes toward computers, computer usage (Colley, Gale, & Harris, 1994; Dyck & Smither, 1994; Thompson, Higgins, & Howell, 1994; Whitley, 1996, 1997), and Internet usage (Atkinson & Kydd, 1997; Kraut et al., 1996). In an Internet-based course environment, this experience has been associated with spending more time in the course, logging on to the course site more frequently, and being more likely to take additional courses via the medium in the future (Hiltz, 1994; Ridley & Sammour, 1994). This implies that people who spend more time on the Internet-based course are more likely to be satisfied with the experience. Extending these findings to the specific application of a course Web site yields the following hypothesis:

Hypothesis 6: Course Web site usage will be positively associated with student satisfaction with an Internet-based course.

Gender. Although empirical study of gender effects on Internet-based communication is a relatively new research stream, there is anecdotal and theoretical evidence that suggests that men and women conceptualize and use the medium differently. Prior researchers have argued that men see cyberspace, in general, and Internet-based education, in particular, as a way to provide education to the masses more quickly and at less cost. This research suggests that men also communicate via the medium in a competitive mode, either elevating their own status or lowering that of others. On the other hand, it has been suggested that women see cyberspace as a means to develop increased collaboration and support networks for increasing learning and communication of the entire group (Brunner, 1991; Canada & Bruscha, 1991; Gefen & Straub, 1997; Herring, 1996). Initial evidence from Internet-based courses suggests that women may participate more in class discussions due in part to their being shut out of traditional classroom discussions more often than men (Althaus, 1997). Arbaugh (1998) found that women had consistently higher participation in class discussions than men in an asynchronous Internet-based MBA course. Combining these initial findings with the theoretical perspectives suggests the following hypothesis:

Hypothesis 7: Perceived satisfaction with Internet-based courses will be higher for women than for men.

Methods

The five courses used in this study were conducted by the MBA program of a Midwestern U.S. university between summer of 1998 and spring of 1999. Four different instructors taught the courses, with one instructor teaching two of the courses. The combined attrition rate for these courses was less than 3% (3 of 114 enrollees), which is substantially less than rates typically reported for Internet-based courses (Ellram & Easton, 1999). Descriptions of the courses, the format in which they were conducted, and student response rates are provided below.

COURSE DESCRIPTIONS

Course 1 was an MBA functional core course in managerial accounting. This course had an opening orientation on-site meeting at the beginning and a wrap-up on-site meeting at the end. Between these meetings, the course was conducted asynchronously over an 8-week period. Of 25 students, 21 (84%) enrolled in the course participated in the study. Course 2 was an MBA elective in investment management. The first half of this course was conducted in a traditional classroom, and the second half was conducted asynchronously with a single wrap-up on-site meeting at the end of the course. Thirteen of 14 (93%) students participated in the study. Course 3 was an MBA foundation course titled "Management and the Computer." The course provides an overview of how computer systems are used in organizations. This was the only course of the four to have no physical meetings; the entire course was conducted asynchronously. Eleven of 25 (44%) students agreed to be in the study. Courses 4 and 5 were an MBA management core course titled "Professional Skills." In this course, students are exposed to concepts and techniques to enhance their skills in time management, stress management, oral and written communication, critical and creative thinking, and team building. Like Course 1, these course sections also had on-site orientation and wrap-up meetings, but each section was conducted over a 12-week period. All 20 (100%) participants in Course 4 and 23 of 24 (96%) participants in Course 5 were included in the study.

For Courses 1, 2, 4, and 5, students completed the survey during the courses' on-site wrap up meeting. Because Course 3 participants did not meet physically, they were sent an electronic copy of the survey, followed up with a version in the mail in case they did not receive the message or were unable to

open the file attachment. Overall, 88 of 108 (81%) students taking these five Internet-based courses participated in the study. Five of the study's subjects took two of the courses included in the study. No subject took more than two courses.

INTERNET COURSE SOFTWARE AND PEDAGOGY DESCRIPTION

Each course in the study was administered via its respective Web site using Lotus LearningSpace software. Although the combination of e-mail, Web pages, and newsgroups has been used in classroom settings (Dumont, 1996; Partee, 1996), LearningSpace provides the advantage of offering all of these features within a single platform, thereby increasing communication coordination and convenience for both students and faculty. Derived from the Lotus Notes platform, LearningSpace uses five sectors to simulate the classroom experience: (a) Schedule, (b) MediaCenter, (c) CourseRoom, (d) Profiles, and (e) Assessment Manager. The Schedule sector served as a "Table of Contents" for the course. The instructor placed the course overview, course schedules, and class assignments in this sector. The MediaCenter was a shared knowledge base that stored articles, book chapters, abstracts and summaries, and multimedia presentations. Items such as lecture notes, discussion questions, and the course syllabus were placed in the MediaCenter sector. The CourseRoom is an interactive environment that allows participants to work in teams and discuss course material with the entire class. Class discussion was held in the CourseRoom. The CourseRoom had features that enabled students and the instructor to make their comments open to the entire class, private to a group, or private to an individual. Although the courses in this study were conducted asynchronously, the CourseRoom allows dialogue to be conducted online, asynchronously, or in a combination of these approaches. This sector allows for collaborative learning, which other researchers have suggested to be highly appropriate for Internet-based education (Alavi et al., 1997; Leidner & Jarvenpaa, 1993, 1995). The Profiles sector contained participant descriptions that included contact information, prior education, work experience, and personal information. The Assessment Manager sector is used to develop and administer examinations, but it was used only in Course 2.

INSTRUCTOR PERCEPTIONS OF STUDENT PERFORMANCE

There was some variance in instructor perceptions of student performance in these courses. The instructor for Course 1 reported that although there were some challenges for students learning a new technology in addition to

having to complete a course within a compressed schedule (8 weeks instead of the typical 14-week semester), the quality of their work was comparable to that produced by students in traditional classroom courses. The conclusions of the instructor for Course 2 varied depending on the type of assignment. For quizzes and exams, the work was similar to that of classroom courses, but for assignments requiring application of material, student performance was poorer. However, the instructor was not sure whether this performance could be attributed to the lack of opportunity for real-time interaction, the compressed schedule for the course, or a combination of these two factors.

Students in Course 3 performed at a level lower than or equal to their classroom counterparts. A possible reason for this performance was the relatively low level of class participation and interaction demonstrated by the students. The instructor for Courses 4 and 5 had classroom-based sections of this course running concurrently with the Internet-based sections; therefore, the instructor was able to make direct comparisons. Student performance for both Internet-based courses was comparable to the classroom-based courses, with the Internet-based students doing better on written assignments. Student interaction within the course was much higher in Course 5 than Course 4.

MEASURES

Unless otherwise mentioned, each of the items was measured using 7-point Likert-type scales, ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). The items for these scales can be seen in Table 1.

Perceived usefulness and perceived ease of use of course software. Perceived usefulness and ease of use of LearningSpace were measured using the four items for each construct adapted from prior studies of the TAM (Davis, 1989; Davis et al., 1989). Factor analysis for these items identified the two variables, with four items loading on perceived usefulness and four items loading on perceived ease of use. The lowest factor loadings were .82 for perceived usefulness and .76 for perceived ease of use, with eigenvalues of 4.80 and 1.36, respectively.¹

Perceived flexibility, interaction difficulty, and instructor emphasis on interaction. Because valid and reliable instruments to assess student attitudes about Internet-based courses were somewhat limited (Dillon & Walsh, 1992), the measures for these items were developed by adapting theoretical perspectives on these dimensions in videoconferencing formats (Dillon, Hengst, & Zoller, 1991; Sherwood, Armstrong, & Bond, 1994; Thach & Murphy, 1995) to the Internet-based environment. Perceived flexibility was

TABLE 1
Scale Items Used in the Study

Perceived usefulness and ease of use	<p>Using LearningSpace would enhance my effectiveness in the MBA program.</p> <p>Using LearningSpace would improve my performance in the MBA program.</p> <p>I would find LearningSpace useful in the MBA program.</p> <p>Using LearningSpace in the MBA program would enhance my productivity.</p> <p>It would be easy for me to become skillful at using LearningSpace.</p> <p>Learning to operate LearningSpace would be easy for me.</p> <p>I would find it easy to get LearningSpace to do what I want it to do.</p> <p>I would find LearningSpace easy to use.</p>
Perceived flexibility	<p>Taking this class via the Internet allowed me to arrange my work for the class more effectively.</p> <p>The advantages of taking this class via the Internet outweighed any disadvantages.</p> <p>Taking this class via the Internet allowed me to spend more time on non-work-related activities.</p> <p>There were no serious disadvantages to taking this class via the Internet.</p> <p>Taking this class via the Internet allowed me to arrange my work schedule more effectively.</p> <p>Taking this class via the Internet saved me a lot of time commuting to class.</p> <p>Taking this class via the Internet allowed me to take a class I would otherwise have to miss.</p> <p>Taking this class via the Internet should allow me to finish my degree more quickly.</p>
Perceived course interaction	<p>Student-to-student interaction was more difficult than in other MBA courses.</p> <p>Class discussions were more difficult to participate in than other MBA courses.</p> <p>I learned more from my fellow students in this class than in other MBA courses.</p> <p>The instructor frequently attempted to elicit student interaction.</p> <p>Interacting with other students and the instructor using LearningSpace became more natural as the course progressed.</p> <p>I felt that the quality of class discussions was high throughout the course.</p> <p>It was easy to follow class discussions.</p> <p>Classroom dynamics were not much different than in other MBA courses.</p> <p>Once we became familiar with LearningSpace, it had very little impact on the class.</p> <p>Student-to-instructor interaction was more difficult than in other MBA courses.</p>
Perceived student satisfaction	<p>I am satisfied with my decision to take this course via the Internet.</p> <p>If I had an opportunity to take another course via the Internet, I would gladly do so.</p> <p>My choice to take this course via the Internet was a wise one.</p> <p>I was very satisfied with this course.</p> <p>I feel that this course served my needs well.</p> <p>Conducting the course via the Internet improved the quality of the course compared to other MBA courses.</p> <p>I will take as many courses via the Internet as I can.</p> <p>The quality of the course compared favorably to my other MBA courses.</p> <p>I feel the quality of the course I took was largely unaffected by conducting it via the Internet.</p> <p>I was disappointed with the way this course worked out (reverse coded).</p> <p>If I had it to do over, I would not take this course via the Internet (reverse coded).</p> <p>Conducting the course via the Internet made it more difficult than other MBA courses I have taken (reverse coded).</p>

measured with an eight-item scale, focusing on the course's format, allowing the students to take courses they would not otherwise have been able to take and their ability to arrange their involvement in the course around work, family, and travel. Factor analysis identified two variables: (a) course flexibility, or the ability to arrange the work of the individual course around other activities, and (b) program flexibility, or the ability to arrange the course to serve a student's needs to complete the entire degree program. Six items loaded on course flexibility, with the lowest loading item at .52 and the other five at .70 or higher. Two items loaded on program flexibility with a minimum loading of .91. Eigenvalues were 3.91 for course flexibility and 1.47 for program flexibility.

The interaction variables were measured in two ways. First, a factor analysis of 10 items that measured ease of interaction, student-student and student-instructor interaction, and quality of interaction identified two variables: (a) interaction difficulty, which focused on the difficulty of generating, participating in, and following class discussions, and (b) instructor emphasis on interaction, which focused on classroom dynamics and the instructor's efforts to generate interaction. Six items loaded on interaction difficulty at .47 or higher; seven items loaded on instructor emphasis on interaction at .49 or higher. Eigenvalues were 4.15 for interaction difficulty and 1.24 for instructor emphasis. Second, this factor analysis was supplemented by reports from all of the instructors on their perceptions of interaction within their respective courses.

Student characteristics. Course Web site usage was measured by the number of days a week the student logged on to the Web site during the course. Gender was measured using dummy coding (women = 1, men = 0).

Student satisfaction with taking the course via the Internet. Satisfaction with course activities often has been included as a dependent variable in studies of distance education, CMC- and Internet-based courses (Alavi et al., 1997; Alavi, Wheeler, & Valacich, 1995; Chidambaram, 1996; Gallupe et al., 1992; Strauss, 1996; Warkentin et al., 1997; Yellen, Winniford, & Sanford, 1995). Given the newness of the use of the educational medium, student satisfaction with Internet-based courses is likely to determine whether the student takes subsequent courses in this format or with the same education provider. If students are dissatisfied with Internet-based courses, they likely will stop taking them, which would have serious implications for their continued viability as an educational medium. The increased numbers of business schools offering these courses is making a provider's educational options available to students that would have been unimaginable just a few years ago

unless the student moved to the provider's location. In this environment, if students are unsatisfied with one Internet-based degree program, they can transfer to another or conceivably take courses from a variety of providers and transfer those credits to the institution from which they most want to get their MBA degree.

In this study, student satisfaction was measured using a 12-item scale that focused on their satisfaction with the course taking it via the Internet, their perception of its quality, and their likelihood of taking future courses via the Internet. Factor analysis identified one variable that was called student satisfaction, with an eigenvalue of 8.17 and a minimum item loading of .62, with 11 of the 12 items loading at .75 or higher.

Results

Table 2 presents the means, standard deviations, correlations, and inter-item reliabilities for each of the variables. Table 3 presents the results of a regression analysis testing the hypotheses in this study. The regression analysis is supplemented with comments from the instructors and students on the variables where available, and a comparison of the means of the study's variables is presented in Table 4. This comparison also allows for the discussion of instructor perceptions for each of the courses.

Hypotheses 1 and 2 predict that perceived usefulness and ease of use of the course software would be positively associated with student satisfaction with an Internet-based course. Perceived usefulness was positively associated with student satisfaction (see Table 3). Thus, Hypothesis 1 is supported. There were significant differences between the courses in ratings of perceived ease of use of the software, with students in Course 2 rating it higher than students in Courses 3, 4, and 5, and Course 1 receiving a higher rating than Course 5 (see Table 4). Interviews with students in Courses 4 and 5 revealed that they did find the course Web site difficult to navigate. However, perceived ease of use was not significantly associated with student satisfaction (see Table 3). Therefore, Hypothesis 2 is not supported.

Hypothesis 3 states that perceived flexibility would be positively associated with student satisfaction with an Internet-based course. The two variables emerging from a factor analysis of the perceived flexibility items, course flexibility and program flexibility, were included in the regression model. Comments from students in Courses 4 and 5 suggested that the flexibility provided by offering the course via the Internet was one of the primary positive aspects of the course. This may explain why scores were significantly higher on these variables for Courses 4 and 5 than for some of the other

TABLE 2
Descriptive Statistics, Correlations,
and Scale Reliabilities Among Study Variables

Variable	M	SD	1	2	3	4	5	6	7	8
1. Usefulness	3.51	1.40	(.92)							
2. Ease of use	4.70	1.17	.00	(.87)						
3. Course flexibility	4.96	1.33	.34	.07	(.86)					
4. Program flexibility	4.52	1.89	.12	.04	.00	(.88)				
5. Interaction difficulty	4.40	1.17	-.40	.06	-.37	-.19	(.83)			
6. Instructor emphasis	4.28	0.96	.32	.21	.58	.11	.00	(.77)		
7. Course Web site usage	4.11	1.66	.20	.04	.03	-.10	-.11	.09	???	
8. Student satisfaction	4.86	1.58	.52	.10	.79	.22	-.49	.66	.12	(.96)

NOTE: All variables except course Web site usage were measured using 7-point scales, from 1 (*strongly disagree*) to 7 (*strongly agree*). Course Web site usage was measured by number of days in a week the student logged on to the site. Scale reliabilities are shown along the diagonal. Correlations above .21 are significant at the $p < .05$ level.

TABLE 3
Results of Regression Analysis

<i>Independent Variable</i>	<i>Dependent Variable: Student Satisfaction</i>	
	b	t
Usefulness	.14	2.30*
Ease of use	.00	-0.02
Course flexibility	.46	6.57***
Program flexibility	.13	2.60**
Interaction difficulty	-.24	-3.81***
Instructor emphasis on interaction	.33	4.75***
Student use of course Web site	.03	0.96
Gender	-.07	-0.61
Adjusted R^2	.78	
$F(df\ 8, 78)$	41.07***	

NOTE: Standardized coefficients are reported. One subject was omitted due to missing data. * $p < .05$. ** $p < .01$. *** $p < .001$.

courses (see Table 4). Both course and program flexibility were positively associated with student satisfaction (see Table 3), supporting Hypothesis 3.

Hypothesis 4 states that perceived interaction difficulty would be negatively associated with student satisfaction with an Internet-based course.

TABLE 4
Comparison of Means of Study Variables Between Courses

Variable	Course					Results of t tests*
	1	2	3	4	5	
Usefulness	0.10	-0.28	0.08	0.24	-0.05	4 > 2
Ease of use	0.32	0.44	-0.21	-0.14	-0.37	1, 2 > 5 2 > 3, 4
Course flexibility	-0.41	0.05	-0.40	0.37	0.05	4 > 1, 3
Program flexibility	-0.49	0.20	-0.01	-0.09	0.19	5, 2 > 1
Interaction difficulty	0.25	-0.21	-0.03	0.38	-0.27	4 > 5, 2
Instructor emphasis on interaction	0.21	0.00	-0.75	0.20	0.03	1, 2, 4, 5 > 3
Student use of course Web site	5.46	3.57	4.82	3.40	4.13	1 > 2, 4, 5 3 > 2, 4
Satisfaction with an Internet-based course	-0.07	0.09	-0.65	0.21	0.09	2, 4, 5 > 3

NOTE: All comparisons except student use are based on standardized mean scores.

a. Numbers refer to course number.

* $p < .05$, two-tailed.

Instructors of the courses reported some variance in the amount of interaction within their respective courses. The instructor of Course 2 reported that students would respond to direct questions posted on the Web site but was disappointed at the relative lack of follow-on discussion those questions provided. Course 3's instructor reported little to no student participation or interaction throughout the course until he directly reminded them that course participation was a part of their grade, which seemed to have some impact. However, the instructor pointed out that the MBA program's technical support person for Internet-based courses was on vacation when the course started and was not available to assist students during that critical time. This may have limited student participation in the course discussions because they could not get assistance with their technical questions. Course 4 also had relatively low levels of interaction and participation, albeit not as low as for Course 3. Conversely, Course 5's instructor reported that difficulty associated with communicating via the medium did not seem to affect the interaction between class members adversely. The instructor stated that it was hard to keep up with the pace of interaction in the first half of the course but that the pace slowed somewhat in the second half. These reports generally support the results of the comparisons of the courses on interaction difficulty (see Table 4). As

predicted, interaction difficulty was negatively associated with student satisfaction (see Table 3), thereby supporting Hypothesis 4.

Hypothesis 5 predicts the perceived emphasis an instructor places on course interaction will be positively associated with student satisfaction with the Internet-based course. As Table 3 suggests, Course 3's instructor's direct call for class participation may have been necessary because students perceived a significantly lower emphasis on interaction than in the other courses. Conversely, the instructors for Courses 1, 4, and 5 reported that they tried to create an environment of interaction through the use of audio clips and an increased emphasis on personal conversations and notes in their classes. These efforts may have enhanced verbal immediacy and made their courses a more media rich environment (Comeaux, 1995; Daft & Lengel, 1986; Freitas et al., 1998), resulting in comparatively higher scores on this variable (see Table 4). Instructor emphasis was positively associated with student satisfaction (see Table 3), thereby supporting Hypothesis 5.

Hypothesis 6 predicts that student use of the course Web site would be positively associated with student satisfaction. However, although student use was positively associated with satisfaction, the relationship was not significant (see Table 3). Likewise, the relationship between gender and satisfaction was not significant (see Table 3). This contradicts Hypothesis 7, which suggests that women would report higher levels of satisfaction than men. Therefore, Hypotheses 6 and 7 were not supported.

Discussion

SUMMARY OF FINDINGS

This study tested variables that have been developed in the information technology and distance education literatures for their association with student satisfaction with an Internet-based course experience. Based on the results of the hypothesis tests, it appears that the flexibility of the medium and the ability to develop an interactive course environment play a larger role in determining student satisfaction than the ease or frequency with which the medium can be used. These findings provide some empirical support for the contentions of some CMC researchers of the value of the time- and place-independent benefits of the medium as an educational delivery format (Althaus, 1997; Harasim, 1990; McComb, 1994). The findings also support prior research on the importance of participant interaction in distance education settings (Holland, 1996; Thach & Murphy, 1995; Webster & Hackley, 1997). These findings provide a basis for identifying several potential

challenges and frontiers for Internet-based management education that are discussed below.

LIMITATIONS OF THE STUDY

Any findings or implications from this study need to be considered in light of its limitations. In this study, there are at least three that render any conclusions as tentative. One limitation is the relatively small sample size ($n = 88$). A power analysis shows that this sample size has an 80% chance of detecting R^2 's of .17 and higher at a .05 alpha level (Cohen & Cohen, 1983). Although this is sufficient power for testing the entire model, it may explain why perceived ease of use, student Web site usage, and gender were not significantly associated with student satisfaction. The sample size reflects the emergence of the delivery medium in that a limited number of courses with relatively small enrollments was available to sample (Dumont, 1996; Taylor, 1996). As more business schools offer degree programs online, there will be more opportunities to conduct studies with samples large enough to detect smaller effect sizes.

Another major limitation is that the magnitude of the findings may be inflated due to common method variance (Williams, Cole, & Buckley, 1989). The relatively high R^2 for the model and significant correlations between the perceived usefulness of the software, course flexibility, and the interaction-related variables contribute to this concern. Instructor interviews roughly corroborated the empirical findings for course flexibility, interaction difficulty, and instructor emphasis on interaction, but the findings raise enough concern to warrant particular emphasis on the use of multiple data collection methods such as interviews and course grades for future studies of Internet-based courses.

Finally, the students in these courses were enrolled in the university's regular MBA program and were taking these courses along with courses in physical classrooms. This may prevent the study's findings from being generalizable to programs that are offered completely online and do not allow students to take courses in both formats.

SOME POTENTIAL CHALLENGES AND FRONTIERS OF INTERNET-BASED MANAGEMENT EDUCATION

In spite of these limitations, the findings of the study can be used to identify potential challenges and frontiers related to Internet-based management education. These can be grouped by challenges and frontiers for researchers, for management educators, and for business schools. Each of these groups is discussed below.

Challenges and frontiers for researchers. The findings of this study represent an initial examination of Internet-based course effectiveness. In addition to addressing concerns related to the limitations of this study, there are several opportunities for researchers of Internet-based management education to advance theoretical and empirical work.

First, researchers can build on this study by incorporating additional independent variables. An expansion of instructor and student characteristics could be a good starting point. Educational communication researchers have called for additional study of the effects of instructor immediacy in Internet-based learning environments (Freitas et al., 1998). The study of instructor immediacy could provide additional insights into the nature of virtual classroom interaction and how instructors may generate it more effectively. Other instructor-based variables could include instructor attitudes toward the course and technology (Dillon et al., 1991; Dillon & Walsh, 1992; Webster & Hackley, 1997) and instructor experience and skill level with the medium. Future studies also should examine the effects of student experience and skill level on the perceptions of their experience with Internet-based courses.

A second opportunity is the refinement and incorporation of additional dependent variables. Although satisfaction initially may be an important factor in determining whether students continue with Internet-based programs, the viability and credibility of these courses and programs ultimately will hinge on whether they can generate effective learning outcomes. Along with using objective measures such as grades or test scores, attempts should be made to develop measures of student learning that could be applied to multiple courses and subjects to reduce the confounding effects of variables such as preparation and perceived motivation when assessing learning through course grades alone (Alavi, 1994; Gorham, 1988).

A third opportunity is developing theory based on additional multicourse studies. Prior studies of Internet-based courses have been criticized for focusing on individual courses (Grossman, 1999). These studies could be quantitative, qualitative, or a combination of these approaches. Quantitative studies would be valuable for examining the generalizability of theoretical approaches such as the TAM to Internet-based courses. Qualitative studies would be valuable for determining how patterns of interaction develop and how learning occurs within these courses and then looking for generalizable patterns across courses to develop richer, more generalizable theory. Whichever approach researchers use, it is important to note that single-course studies are no longer sufficient for advancing knowledge about Internet-based courses.

Finally, a challenge for researchers will be to keep theory of Internet-based courses current to reflect changes in technology. Comparative studies

of the effectiveness of various course software packages may accelerate the emergence of a “dominant design” for this delivery medium. Internet-based courses already are transitioning from being purely text-based to incorporating streaming audio and multimedia presentations to ultimately using full-motion video. This enhanced media richness likely will have implications for how instructors, students, and degree programs make the courses more effective, and it will be up to researchers in the area to keep up with these advancements.

Challenges and frontiers for management educators. The study’s findings also present several challenges and frontiers for management educators. First, the finding that perceived ease of use of the course software was not associated with satisfaction and was not correlated with course flexibility or interaction suggests that at least for now, pedagogical approaches may be more important than the technology in determining the effectiveness of these courses. This implies that instructors need to develop different ways to deliver their course material using this medium because it has been suggested that the same skills that make an instructor successful in a physical classroom will not be transferable directly to the Internet-based environment (Dede, 1991; Dumont, 1996; Rahm & Reed, 1997). At a minimum, management educators need to evaluate their instructional styles in light of the characteristics of the technology and adjust their style to fit best with those characteristics (Leidner & Jarvenpaa, 1995).

Second, the significant differences across courses for several of the variables in the study raise questions about why these differences occur. Because the courses all were delivered using the same software, are the differences based on instructor characteristics, student characteristics, or course characteristics? It is possible that some courses may be transferred more easily to an Internet-based environment than others. If this is the case, another challenge for educators will be to create methods to develop courses that can meet the needs of both the subject matter and the medium.

Third, as with researchers, management educators will need to ensure that they stay current in their skills to integrate advances in technology into their virtual classrooms. This, in turn, raises additional questions. When features such as streaming audio and full motion video are available for Internet-based courses, do these courses become the equivalent of the physical classroom or video-based distance education, or do they require yet another pedagogical approach?

Challenges and frontiers for business schools. Finally, the findings imply several challenges and frontiers for MBA programs. First, one of the biggest

challenges will be acquiring and using resources to operate both physical and online degree programs simultaneously, particularly when initial indications are that the students who take these courses represent different markets (Clarke, 1999; Kwartler, 1998). Training faculty to teach effectively in both environments, maintaining dedicated equipment, and ensuring adequate technical support likely will be both time-consuming and expensive. One possible solution to this challenge may be charging a premium for the flexibility of taking Internet-based courses. However, such premiums will require MBA programs to know their market well to ensure that they gauge the price elasticity of their courses accurately.

Second, the finding of the role of flexibility in predicting satisfaction with these courses suggests that MBA programs will have to be creative in making themselves distinctive. Flexibility-based advantages such as any time, anywhere access, although attractive, can be replicated fairly easily given adequate hardware and technical support. Also, as the technology advances, issues such as enhanced site navigability and processing speed will play a more prominent role in determining the convenience of these courses in the future. Like other media of distance education delivery, novelty effects of Internet-based courses are likely to be short lived (Gibson & Gibson, 1995) and students likely will expect the quality level of these courses to equal that of traditional classrooms fairly quickly (Rahm & Reed, 1997). Based on this study's findings, software and Web site enhancements that diminish interaction difficulty may be a basis for competitive advantage. Those schools with available expertise could develop their own software that incorporates the best features of a variety of packages and is tailored to their specific student-faculty population. However, because online degree programs will not have the mobility barriers associated with traditional programs, this opportunity may be brief.

A third challenge for business schools concerns positioning within the online environment. This positioning decision raises several questions. Should a school keep its online MBA program distinct from its physical MBA program, or should students be allowed to take courses from both? Should the target market for the online program be within the school's present service area, or should the school expand its boundaries to go national or global? Should a school shut down some portion of its physical operations to free up resources to support an online degree program adequately, or should it abandon the possibility of an online program to support existing programs adequately?

Conclusion

The emerging virtual environment for management education presents great opportunity and risk. New students, pedagogies and technological enhancements, and blurring traditional competitive barriers certainly promise an exciting time for all involved. By identifying the importance of flexibility and interaction in the Internet-based course environment, this study represents a starting point for determining how to develop courses that will be profitable for students, faculty, and business schools. Such actions probably will require business schools to move faster than they are accustomed, to counter traditional and emerging rivals (Kedia & Harveston, 1998; Moore, 1997), but moving more quickly will be a common challenge for all who enter the 21st century.

Note

1. Complete factor analysis results can be obtained from the author.

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