

**Management Learning**  
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London, Thousand Oaks, CA  
and New Delhi  
Vol. 33(3): 331-347



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## **Technological and Structural Characteristics, Student Learning and Satisfaction with Web-based Courses**

### **An Exploratory Study of Two On-line MBA Programs**

**Abstract** *This article compares courses in two web-based MBA programs on student perceptions of learning and satisfaction. The primary difference between the programs is that one conducts the courses entirely on-line while the other conducts the courses primarily on-line combined with one or two on-site class meetings. The results of the study showed that larger class sizes were negatively associated with learning and course satisfaction while the perceived flexibility of the delivery medium was significantly associated with perceived learning and satisfaction. The results also indicate that more experienced on-line students were more satisfied with their course delivery medium. These findings have significant implications for the role of web-based programs in a business school's strategy. They suggest that rather than using these courses as a means to drive down the cost of delivering education, business schools may need to identify reasons for which they can charge premiums for them. **Key Words:** perceived flexibility; student learning and satisfaction; web-based MBA courses*

With increasing numbers of business schools offering courses and entire MBA programs on-line (Eastman and Swift, 2001), web-based graduate management education is well on its way to the educational mainstream. The acceleration of this trend is due to a variety of factors such as technological advances in both course software and computing capacity (Alavi et al., 1997), increasing numbers of people with internet access, competitive pressures from external stakeholders and alternative sources of education (Kedia and Harveston, 1998; Moore, 1997; Rahm and Reed, 1997), and positive experiences of early adopters (Ellram and Easton, 1999; Greco, 1999; Salmon, 2000).

1350-5076/200209/33:3:331-347:026938

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In spite of these trends, there still are concerns about web-based courses and programs. Some of these concerns are the time and labor-intensiveness involved in both developing and taking the courses, the lack of face-to-face interaction, and questions about their quality relative to traditional classroom-based courses (Berger, 1999; Dyrud, 2000; Flaherty et al., 1998; Gilbert and Moore, 1998). Combine these with concerns about the limited research on the use of the internet in management education (Arbaugh, 2000a; Ellram and Easton, 1999) and concerns that this medium may encourage for-profit providers to enter the education industry (Moore, 1997), and contentions that colleges and universities are racing to adopt educational techniques without fully understanding them may be justified (Grossman, 1999; Shedletsky and Aitken, 2001). Therefore, much more research is required to determine the impacts of this delivery medium on teaching and learning (Alavi and Leidner, 2001; Bilimoria, 2000; Salmon, 2000), to determine the most appropriate uses of the internet to deliver management education.

One of the ways that these educational techniques may be better understood is through comparison of delivery approaches to internet-based MBA programs. There is presently almost as much variation in approaches to delivery as there are schools delivering these courses. Delivery platforms range anywhere from a combination of email and electronic bulletin boards (Bailey and Cotlar, 1994; Dumont, 1996; Partee, 1996) to web-based proprietary software which allows for transmission of multimedia, threaded discussions, and chatroom capability (Greco, 1999; Phillips, 1998). Another continuum on which schools vary is the extent to which the on-line environment is supplemented with other teaching pedagogies, such as the use of videotapes, video-conferencing, or conducting a portion of a course or program on campus (Greco, 1999; Phillips, 1998). In spite of this level of variation in delivery between MBA programs, most of the research to this point on web-based courses in management education has focused on single courses or institutions (Arbaugh, 2000a, 2000c; Ellram and Easton, 1999; Hiltz and Wellman, 1997; Ridley and Sammour, 1994; Taylor, 1996). To date, there have been no studies comparing these differing delivery platforms or supplemental tools of multiple business schools. Therefore, this body of knowledge would be greatly enhanced by multi-platform, multi-institution studies.

This article reports on an initial attempt of a multi-site, multi-course study of web-based MBA courses. The remainder of the article is divided into four sections. The first provides the theoretical rationale for the variables used in the study. The second section describes the measures of those variables and the samples and delivery platforms for the two institutions in the study. The third section presents the results of comparing the two programs. The final section provides a summary of the findings, describes potential implications of those findings, and identifies areas for future research.

## Literature Review

### *The Technology Acceptance Model (TAM) and On-line Education*

Given the relative newness of internet-based education, theoretical perspectives of technology adoption seem particularly appropriate for predicting student learning

and satisfaction with web-based MBA 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 et al., 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 it. This model has become well accepted in the information technology literature and has been found to be a valid predictor of usage of computer software (Bagozzi et al., 1992), e-mail (Gefen and Straub, 1997) and the World Wide Web (Atkinson and Kydd, 1997). In the context of web-based courses, this suggests that perceived usefulness and the ease of use of the delivery medium (course website, software, etc.) will enhance students' attitudes toward their course experience and, therefore, make them more likely to take other courses in the future.

Given the comparative nature of this study, significant differences between the TAM variables may also be associated with differences in perceived learning and satisfaction within the two programs. Several firms now are developing web-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 on-line degree programs (Gilbert and Moore, 1998; Phillips, 1998). While 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. This suggests that if one delivery medium is perceived to be more useful and easier to use than others, then there should also be higher levels of student learning and satisfaction with courses in that delivery format.

#### *Perceived Flexibility*

An emerging perspective within computer-mediated communications (CMC) research 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 (Chidambaram, 1996; Walther, 1992). According to this perspective, flexibility in course delivery comes as a result of the medium being both place and time independent, allowing course conversations to continue over extended time periods (Harasim, 1990; Leidner and Jarvenpaa, 1995; Taylor, 1996). Rather than being inhibited by low media richness and social cues, CMC actually may enhance communication because students are provided with 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; Strauss, 1996). Also, the potential range of students, faculty, and guest speakers becomes much broader because time and location barriers have been removed (Bailey and Cotlar, 1994; Berger, 1999), thereby providing increased opportunities for interaction and bonding. As a result, constructivist teaching approaches and collaborative learning structures produce enhanced conceptual thinking based on the cultivation of multiple points of view

(Brandon and Hollingshead, 1999; Leidner and Jarvenpaa, 1995; Salmon, 2000), thereby increasing the value of the learning experience.

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 (Arbaugh, 2000a; Fornaciari et al., 1999). 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 during the last decade (Clarke, 1999; Dumont, 1996; Greco, 1999). Given the increasingly competitive market for MBA enrollments (MacLellan and Dobson, 1997), the flexibility of web-based courses may attract a competent student with diverse experiences who otherwise might not pursue graduate management education (Ellram and Easton, 1999; Taylor, 1996), thereby increasing the opportunity for enhanced course participation and collaborative learning within that course setting. This CMC research suggests that a purely on-line program has the potential to be a dynamic learning environment. It suggests, too, that this type of program would also be perceived as having a higher level of flexibility than a program that supplemented its on-line courses with on-site meetings.

## Methods

### *Sample and Data Collection*

*School A* The sample from this school was taken from the six class sections that were conducted using Lotus LearningSpace course software in the MBA program of an upper-midwest US university during 1999. All students in these courses were also enrolled in the university's classroom-based MBA program. The combined attrition rate for these courses was less than 5 percent (six out of 134 enrollees), which is substantially less than rates typically reported for internet-based courses or programs (Dyrud, 2000; Ellram and Easton, 1999). Four different instructors taught the courses, with one instructor teaching two of the courses. The courses in the study were Investment Management (MBA elective course), Organizational Foundations (MBA foundations course), Organizational Leadership and Change, Process and Quality Improvement, and two sections of Professional Skills (all MBA management core courses). Each of these courses had on-site meetings. The investment management course had seven meetings, the professional skills courses had two, and each of the other courses had one on-site meeting. Class section enrollments ranged from 14 to 29 students.

Data collection was completed in a two-step process. Students completed a survey either in class for courses that had a final physical meeting, or from the course website for those that did not. In the second step, the remaining non-responding students were mailed a copy of the survey. The student response rate was 71.5 percent (97 out of 128).

*School B* The sample was selected from one on-line course at a western university conducted in the autumn semester of 1999. This university offers both an on-campus and a distance MBA program. Although the two programs are similar, a few minor course differences exist. For example, the on-campus program offer

areas of emphasis while the distance program provides only a general MBA degree with limited elective courses. Most students enroll in a specific program and do not take courses via the other media. Current enrollment in the distance MBA program is approximately 300 students.

The core curriculum operations management course had an initial enrollment of 47 students with two students dropping the course: one due to illness and one due to job changes. This course was entirely web based with no class meetings. Only five of the 45 students were located in the same state as the university. Students were located in seven different time zones.

Data were collected via e-mail. Each student was sent an initial message with the attached survey. Two weeks later, a reminder e-mail with the attached survey was sent to the non-respondents. Students responded via e-mail to the course instructor or anonymously to another researcher. The student response rate was 51 percent (23 out of 45), resulting in a total sample response rate of 69.3 percent (120 out of 173).

#### *Description of Respective Delivery Platforms*

The two schools utilize similar technology platforms, the primary difference being that school A offers courses that are delivered in a blend of on-line and varying numbers of on-site meetings, while school B delivers courses entirely on-line. Table 1 provides a comparison of the primary characteristics of the two schools' programs.

Each course at school A was administered via its respective web site using Lotus LearningSpace software. Derived from the Lotus Notes platform, LearningSpace uses five sectors to simulate the classroom experience: (1) Schedule; (2) Media-Center; (3) CourseRoom; (4) Profiles; and (5) Assessment Manager. Specific characteristics of LearningSpace have been profiled in recent research (Arbaugh, 2000a). The course at school B was administered through E-Education's platform. All distance MBA classes offered at school B use the same platform with the same features and icons. However, each course instructor may or may not use any of these features. Although the E-Education platform is used by many schools, icons have been tailored and named specifically for school B. The main student features of the web page include the following: (1) Home Page; (2) Orientation; (3) Study Guide; (4) Announcement; (5) Forum; (6) Test; (7) Chat; (8) Profiles; (9) Help; and (10) Feedback. Specific characteristics of these features are provided in Table 2.

**Table 1** Pedagogical characteristics of the two programs

Variable	School A	School B
Mode of on-line communication	Asynchronous	Asynchronous
Course delivery method	Internet supplemented with on-campus meetings	Internet only; some use of video tapes
Percentage of MBA program delivered via the internet	50 percent of foundation courses and MBA core	Full program

**Table 2** Characteristics of the E-education platform

Student Feature	Description
Home Page	The main navigational page for the course. The Home Page includes overviews of the course topics, links to all the modules in the Study Guide, assignment due dates, and general course information.
Orientation	Provides an overview of the web site and the tools available for the students.
Study Guide	The main course document including readings, lecture notes, and other questions directed at enhancing understanding of the materials.
Announcements	Saves a collection of past announcement messages for student reference.
Forum	The main discussion platform for the course. Students and faculty can introduce topics for discussion and others may answer in a linked format. Participants can direct comments to the class, groups, or individuals. Weekly assignments are listed and group responses are posted.
Test	Provides a means for giving exams, grading multiple choice exams, and monitoring students' usage of the exam. (This feature was not used for this course.)
Chat	Provides a typical chatroom for student use. Although this feature is available, most students used e-mail for individual messages and group discussions.
Profiles	Contain personal information listings for each student and the instructor. Typical information includes: contact information, education, work experience, personal information (family members), hobbies, and the 'things most important to me'.
Help	Provides a detailed help function for common question about the web features. E-Education provides both on-line and phone help for students.
Feedback	Contains the course evaluation survey instrument.

The primary differences between the platforms used by the two schools are structural in nature. Both platforms have a course front page and defined areas for locating course materials, posting comments to threaded discussions, providing personal information, and conducting assessments. However, E-Education separates out several features that would have been embedded within sectors of the LearningSpace platform or placed outside LearningSpace. For instance, announcements in LearningSpace would have to be included in the discussion platform instead of being placed in a separate section. Since there were no defined features for them in the platform and the information applied to multiple courses, school A placed orientation and help information on a separate web page outside the course. The primary feature difference between the two platforms used in the study was that LearningSpace did not have a chatroom capability, while this feature was included in E-Education.

### Measures

Unless otherwise mentioned, each of the items was measured using seven-point Likert-type scales, ranging from 1, 'strongly disagree' to 7, 'strongly agree'.

### Dependent variables

- *Perceived student learning*: Student learning was measured using Alavi's (1994) six-item scale. A factor analysis revealed that these items loaded on to a single common factor with all items loading at .81 or higher and a coefficient alpha of .92.
- *Perceived student satisfaction with taking the course via the internet*: Satisfaction with course activities has often been included as a dependent variable in studies of distance education, computer-mediated communication and web-based courses (Alavi et al., 1995, 1997; Chidambaram, 1996; Strauss, 1996; Warkentin et al., 1997; Yellen et al., 1995). Given the newness of the use of the educational medium, student satisfaction with web-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 these courses, they probably 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 for whom they 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 on-line degree program, they can easily transfer to another.

In this study, student satisfaction was measured using Arbaugh's (2000a) 12-item scale that focused on their satisfaction with taking the course via the internet, their perception of its quality, and their likelihood of taking future courses via the internet. A factor analysis revealed that these items loaded on to two factors: (1) satisfaction with the medium (eight items loading at .61 or higher; coefficient alpha = .93); and (2) satisfaction with the course (four items loading at .63 or higher; coefficient alpha = .89).

### Independent variables

- *Perceived usefulness and perceived ease of use of course software*: Perceived usefulness and ease of use of the software platforms were measured using the four items for each construct adapted from prior studies of the Technology Acceptance Model (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 .87 for perceived usefulness and .78 for perceived ease of use, with coefficient alphas of .95 and .89 respectively.
- *Perceived flexibility*: Perceived flexibility was 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: (1) course flexibility, or the ability to arrange the work of the individual course around other activities; and (2) 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 at .55 and the other five at .68 or higher. Four items loaded on program flexibility, two at .42 and the other two at .84 and higher. Coefficient alphas were .87 for course flexibility and .81 for program flexibility.

The complete results of the factor analysis for all variables used in this study are available from the authors.

#### *Control variables*

- *Gender*: While empirical study of gender effects on internet-based communication is a relatively new research stream (Arbaugh, 2000c), there is anecdotal and theoretical evidence that suggests men and women may 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 also suggests that men communicate via the medium in a competitive mode, either elevating their own status or lowering that of others. Conversely, it has been suggested that women see cyberspace as a means to develop increased collaboration and support networks for increasing the learning and communication of the entire group (Brunner, 1991; Canada and Bruscha, 1991; Gefen and Straub, 1997; Herring, 1996). Initial evidence suggests that women may participate more in web-based class discussions than they do in traditional classroom discussions (Althaus, 1997; Arbaugh, 2000b). Therefore, we included gender as a control variable in the study.
- *Student use of the course website*: Prior studies have shown that computing experience is a strong predictor of attitudes toward computers, computer usage (Colley et al., 1994; Dyck and Smither, 1994; Thompson et al., 1994; Whitley, 1996, 1997), and internet usage (Atkinson and Kydd, 1997; Kraut et al., 1996). In a web-based course environment, this experience has been associated with spending more time on 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 and Sammour, 1994). This implies that students who spend more time on the web-based course are more likely to be satisfied with the experience and take more ownership of the learning process, thereby increasing their own learning. Course web site usage was measured by the average number of minutes a week the student was logged on to the course web site.

Other control variables used in the study were student age, the number of students in each of the class sections, and the number of web-based courses the student had taken prior to participating in this study.



## Results

Table 3 presents the descriptive statistics for each of the variables, and Table 4 presents the results of regression analyses with student learning and the satisfaction variable as dependent variables for the entire sample. The results show that student use of the course site was moderately associated with perceived learning ( $T = 1.80, p < .08$ ) and satisfaction with a course ( $T = 1.88, p < .07$ ). Class size ( $T = -2.98, p < .01$ ) ( $T = -2.28, p < .05$ ) showed a significant negative association with learning and satisfaction with a course. While course flexibility ( $T = 4.43, p < .001$ ) ( $T = 3.22, p < .002$ ) and program flexibility ( $T = 2.83, p < .01$ ) ( $T = 2.97, p < .004$ ) were significantly positively associated with learning and satisfaction with a course. Course flexibility ( $T = 7.69, p < .001$ ) and program flexibility ( $T = 3.24, p < .002$ ) were also significantly associated with student satisfaction with the delivery medium.

Table 5 presents the results of t-tests comparing the seven courses on the dependent variables and the independent variables significantly associated with them. The results of these tests indicate that there were significant differences between the courses for several variables. Only two variables presented significant differences between the schools. The operations management course (from school B) had a significantly higher class section size than all of school A's courses, and the respondents from that class reported significantly higher experience with web-based courses. The students in that course had significantly higher satisfaction with their course delivery medium, and perceived a significantly higher degree of program flexibility than four out of the six classes at the other school. For the dependent variables—perceived learning and perceived satisfaction with the course—there were no apparent differences between the schools. The operations management course differed from one course on each variable, however other courses at school A also differed from these courses. Therefore, we assumed that no differences exist between the schools on these dependent variables. These findings will be elaborated on in the discussion section.

## Discussion

This study produced three potentially noteworthy findings. First, larger class sizes may be negatively associated with perceived learning and course satisfaction in on-line MBA courses. Second, perceived flexibility of these courses and degree programs are significantly associated with perceived learning and satisfaction in the on-line format. Third, more experienced on-line students tend to be more satisfied with their web-based delivery medium. In the context of this study, these findings underscore the strength of the relationship between program flexibility and the dependent variables. With the geographical distribution of school B's on-line MBA student population, it appears that many of these students are in this program because their location or work schedules do not allow them to participate in a traditional MBA program. Therefore, the flexibility of the medium is especially salient for them (Clarke, 1999; Phillips, 1998).

Larger class sizes may be negatively associated with perceived learning and course satisfaction in on-line MBA courses. Although the larger class size of school

**Table 3** Descriptive statistics, correlations, and scale reliabilities among study variables—entire sample ( $n = 120$ )

Variable	Mean	S.D.	1	2	3	4	5	6	7	8	9	10	11
1. Student learning	5.41	1.19	(0.92)										
2. Satisfaction with course	5.09	1.72	0.73	(0.89)									
3. Satisfaction with medium	4.79	1.93	0.29	0.00	(0.93)								
4. Usefulness	4.06	1.79	0.34	0.27	0.47	(0.95)							
5. Ease of use	5.10	1.39	0.07	-0.05	0.21	0.00	(0.89)						
6. Course flexibility	5.40	1.77	0.48	0.34	0.65	0.53	-0.05	(0.87)					
7. Program flexibility	5.54	1.81	0.23	0.21	0.30	0.25	0.08	0.00	(0.81)				
8. Age	31.02	5.83	0.16	0.10	0.19	0.21	-0.01	0.10	-0.03	(n.a.)			
9. Gender	0.45	0.50	0.13	0.03	0.04	-0.03	0.07	0.03	0.18	-0.24	(n.a.)		
10. Student usage	188.88	135.61	0.16	0.19	0.05	0.07	-0.08	0.19	0.01	0.09	0.00	(n.a.)	
11. Prior experience in internet courses	1.83	2.67	0.12	0.03	0.36	0.20	0.29	0.03	0.30	0.25	0.09	0.10	(n.a.)
12. Class size	27.63	9.51	-0.11	-0.16	0.26	0.16	0.05	0.16	0.27	0.18	-0.03	-0.06	0.70

**Notes** Correlations above .18 are significant at the  $p < .05$  level. Interitem reliabilities are shown in parentheses.

**Table 4** Results of regression analyses on student learning and satisfaction ( $n = 120$ )

Variables	Student Learning		Satisfaction with medium		Satisfaction with course	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Age	.03 <sup>+</sup>	.02	.02	.01	.02	.01
Gender	.25	.19	.10	.05	.08	.01
Class size	-.04**	-.03**	.00	.02	-.03*	-.03*
Student usage	.00 <sup>+</sup>	.00 <sup>+</sup>	-.00	-.00	.00*	.00 <sup>+</sup>
Prior experience with internet courses	.13**	.07	.11*	.01	.06	.01
Usefulness		.05		.06		.05
Ease of use		-.03		.10		-.09
Course flexibility		.41***		.60***		.32***
Program flexibility		.24**		.23***		.27**
F	4.02**	7.40***	3.77**	15.87***	2.12 <sup>+</sup>	4.46***
Degrees of freedom	5,114	9,110	5,114	9,110	5,114	9,110
Adj. R-squared	0.11	0.33	0.10	0.53	0.04	0.21
Change in R-squared		0.22**		0.43**		0.17**

**Notes** Standardized regression coefficients reported.

<sup>+</sup>  $p < .1$ ; \*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$

**Table 5** Post hoc comparison of means between courses on study variables

Variables	Courses							Results of post hoc tests ( $p > .05$ )
	1. Prof skills 1 ( $n = 23$ )	2. Invest mgt ( $n = 28$ )	3. Process & Quality ( $n = 11$ )	4. Org found ( $n = 9$ )	5. Prof skills 2 ( $n = 16$ )	6. Org ldrship ( $n = 12$ )	7. Ops mgt ( $n = 23$ )	
Class section size	24	29	23	14	18	25	45	7 > 1-6; 2 > 1,3-6; 6 > 1,3-5; 1 > 3-5; 3 > 4-5
Student time spent on-line	210.00	199.62	269.09	123.39	205.25	116.63	161.94	3 > 4,6,7
Student prior course experience	0.57	0.79	2.00	0.11	0.56	1.60	5.96	7 > 1-6; 3 > 1,2,4,5
Perceived usefulness	-0.34	-0.15	-0.54	-0.06	0.51	-0.10	0.50	5,7 > 1-3
Perceived ease of use	-0.65	-0.32	0.63	0.40	0.12	0.40	0.32	3,4,6, 7 > 1-2; 5 > 1
Course flexibility	-0.22	-0.35	0.19	0.17	0.51	-0.37	0.31	5 > 1,2,6; 7 > 2
Program flexibility	-0.10	-0.13	0.21	-0.62	-0.16	-0.03	0.51	7 > 1,2,4,5
Perceived learning	-0.18	-0.52	0.32	0.54	0.64	-0.30	0.13	3,4,7 > 2; 5 > 1,2,6
Perceived satisfaction—medium	-0.27	-0.21	-0.12	-0.45	0.21	-0.00	0.62	7 > 1-4
Perceived satisfaction—course	0.13	-0.44	0.22	0.22	0.74	-0.55	-0.05	5 > 1,2,6,7; 1 > 2

**Note** All variables but class section size, student time spent on-line and student prior course experience were measured with a sample mean = 0 and standard deviation = 1.

B may appear to bias this finding, the results suggest that the school is not a major determinant. There is no significant difference in perceived student learning and perceived course satisfaction between the schools. Therefore, the finding that class size impacts these dependent variables is noteworthy.

The association of greater experience with web-based courses and higher levels of satisfaction with the delivery medium found in the course from school B provides several potential insights into the future of web-based MBA course delivery. First, it indicates that the learning curve effects for students taking these courses may be significant. This electronic maturation of students suggests that findings concerning technology, learning, and satisfaction in initial studies of these courses may change as the delivery medium moves further into the mainstream. Second, this finding raises questions about the effects of student self-selection into these courses. Considering the concerns about dropout rates in many web-based courses (Dyrud, 2000; Ellram and Easton, 1999; Ridley and Sammour, 1994), studying these more experienced students could be a means for detecting positive characteristics of the technology and identifying problem areas that contribute to the relatively high dropout rates.

Lastly, it raises the question as to whether some software delivery platforms are better than others. While the design of this study did allow for direct comparison of the delivery platforms, it may be that school B's course software package was more user friendly and conducive to facilitating the learning process than school A's. And even if one platform is better than the other, if instructors differ in their use of them, or can elect to use some features rather than others, these significant differences can be lost. Collectively, these points support contentions of other researchers that there will be abundant research opportunities to study web-based courses for the foreseeable future (Bilimoria, 2000; Frost and Fukami, 1997; Salmon, 2000).

There were also some non-findings that merit discussion. Student usage of the course website was only moderately associated with perceived learning and course satisfaction. This may suggest that variables such as skill level in using a computer and/or the internet and hardware processing speed may moderate this relationship. Those students with higher skill levels or faster hardware may actually spend relatively less time on the courses, but achieve similar or higher levels of learning and satisfaction. The amount of variation on technology- and flexibility-based measures between courses that used the same delivery platform suggests that other factors, such as instructor experience and skill level, may also influence learning and satisfaction. Therefore, additional student and instructor characteristics merit consideration in future studies.

Considering how well established the constructs of the TAM and personal usage are in the technology adoption literature, the fact that neither perceived usefulness nor perceived ease of use of the technology were associated with perceived student learning or satisfaction is noteworthy. There are at least two possible explanations for this non-finding. First, perceived usefulness and ease of use have historically been studied in the context of whether to adopt a new technology (Davis, 1989; Gefen and Straub, 1997). It could be that what a student believes they learn from a course and whether they will continue to take future courses on-line are distinctly different questions. In fact, it could be argued from their level of prior experiences with on-line courses that most of the students from school B

have already made the adoption decision. Another possible explanation is that the technology platform may play a role similar to a referee at a sporting event in that the platform might only be noticed as a factor if it performs poorly.

The study has several limitations that make any definitive interpretations of the findings tentative at best. First, because of the multi-course, multi-instructor design, we were only able to measure student perceptions of their learning rather than actual learning. Future studies may consider the use of a pre-test/post-test design to address this concern (Arbaugh, 2000b). Second, no students in the study were taking courses from both schools. Perhaps the findings may have been different if the sample had taken courses in both formats. This makes it difficult to state whether one delivery platform is superior to the other. Third, the single course sampled from school B makes it impossible to determine whether these findings are generalizable to other courses in that school's on-line program. Fourth, characteristics such as differences in course content, instructor experience with the delivery medium, instructional style, and classroom dynamics make it very difficult to draw conclusions from class-by-class comparisons. Therefore, future multi-institutional studies should consider using multiple class sections from each institution and multiple sections of courses in the same discipline if at all possible.

This article helps to show that there are several significant directions for future research in the area of internet-based business education. First, using multi-school samples will probably produce larger sample sizes, which will help to diminish concerns over appropriate statistical power in previous studies of web-based MBA courses (Arbaugh, 2000a). Second, multi-school samples will increase the external validity of the findings. Third, these studies can accelerate the development of best practices in the development and delivery of these courses by comparing approaches and determining which approaches seem to work best.

In spite of the study's limitations, these findings have potentially powerful implications for schools seeking to deliver effective on-line MBA courses and programs. The suggestion that larger class sizes are negatively associated with learning and course satisfaction supports a feminist model of on-line education (Brunner, 1991; Canada and Bruscha, 1991; Herring, 1996), and contentions from earlier scholars of on-line courses that they should have fewer rather than more students than traditional classrooms (Dumont, 1996). This could mean that the idea of using on-line courses as a cost reduction tool for delivering MBA programs may be unfounded.

The findings of this study suggest that effective on-line courses could be even more expensive than traditional classroom courses (Dyrud, 2000; Fornaciari et al., 1999). However, this does not mean that these courses could not be more profitable than traditional courses. The strong association in both types between flexibility and learning and satisfaction suggest that these courses may support a premium price. Considering the significant investment in faculty time and technical support required (Arbaugh, 2000a; Dumont, 1996), premiums for these courses may well be warranted. These findings may have significant implications for the strategies of business schools operating in the on-line environment (Fornaciari et al., 1999). It may turn out that rather than using web-based courses to drive down costs, business schools may have to resort using them to increase revenues by determining the price elasticity of the flexibility and other value-added elements of the medium and charging a premium for them.

## Note

A version of this manuscript was presented at the 2001 Academy of Management meetings, where it received the award for Best Paper in Management Education.

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