

UCLA

Information and Technology

Title

Fifteenth Annual UCLA Survey of Business School Computer Usage: Business School Information Technology and Distance Learning Resources and Uses

Permalink

<https://escholarship.org/uc/item/90c1908k>

Authors

Britt, Julia A.
Fisher, Dorothy M.
Levine, Gary R.
[et al.](#)

Publication Date

1998-09-01

THE JOHN E. ANDERSON GRADUATE
SCHOOL OF MANAGEMENT AT UCLA

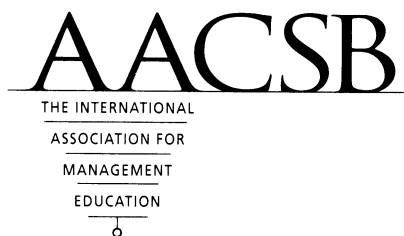
**BUSINESS SCHOOL
INFORMATION TECHNOLOGY and DISTANCE LEARNING
RESOURCES and USES**

**Fifteenth Annual UCLA Survey
of
Business School Computer Usage**

**Conducted in Cooperation with
AACSB – The International Association for Management Education**

August 1998

**Julia A. Britt
Dorothy M. Fisher
Gary R. Levine
Jason L. Frand**



**BUSINESS SCHOOL
INFORMATION TECHNOLOGIES and DISTANCE LEARNING
RESOURCES and USES**

**Fifteenth Annual UCLA Survey
of
Business School Computer Usage**

**Conducted in Cooperation with
AACSB – The International Association for Management Education**

August 1998

**Julia A. Britt
Dorothy M. Fisher
SOM, California State University, Dominguez Hills**

**Gary R. Levine
Extended Education, California State University, Dominguez Hills**

**Jason L. Frand
The John E. Anderson Graduate School of Management at UCLA**

The authors wish to thank those individuals who took the time to gather the extensive data necessary to complete the questionnaire. Without their efforts this survey would have been impossible. Appreciation is also extended to the business school computing directors who reviewed the draft questionnaire. A very special thank you is given to Susan Gutman for her assistance with every aspect of the survey process.

**The John E. Anderson Graduate School of Management at UCLA
Los Angeles, CA 90095-1481
(310) 825-2870
Fax (310) 825-4835**

Executive Summary

The 1998 Fifteenth Annual UCLA Survey of Business School Computer Usage extends the focus of the previous surveys, providing a comprehensive overview of the business school computing, communication, and information environment. This year, 232 schools from eleven countries completed the eleven page questionnaire regarding information technologies and distance learning resources. The sample is demographically very similar to samples from the last five surveys.

Findings

Overall, the business schools seem to have their basic operational and technological infrastructure in place. The computer operating budget as a percent of the school operating budget, 3.5%, is just slightly above that of last year, 3.3%. The decline from the high of almost 5% in 1993 seems to have leveled off. Additionally, the median computer operating dollar per student continues to show a stable expenditure pattern across the quartile schools, with the exception that the first quartile schools continue their gradual increase in spending per student. There is very little change in any additional student usage fees, although the schools seem to be moving away from utilizing annual charges and more towards semester or quarter fee structures. And finally, the quartile computer staff density levels show very little change.

Microcomputers are now ubiquitous and mini/mainframes are becoming rare. Product and market developments have moved microcomputer equipment in the direction of a commodity product. Now all Intel-based microcomputers offer essentially the same features, run the same operating system and application software, and individual purchases are frequently based on just price or convenience rather than unique capability or a proprietary operating system. This year, the business schools reported owning a total of 49,245 microcomputers, an average of 221 per school, a slight increase from the 215 per school as reported last year. This small increase seems to confirm the conclusion that the number of microcomputers per school has reached saturation. The average number of business school owned laptops decreased by 14% and may be partially explained by the increase in the number of schools recommending or requiring student desktop/laptop ownership. Overall, Windows now has a combined 92% share of the desktop operating system usage, up from the 87% reported last year. It appears that almost all of the DOS only systems have now been replaced.

Further, both the faculty-per-micro densities and the quartile median student-per-micro densities show very little change from last year. Eighty-four percent of the undergraduate schools and 91% of the MBA schools indicate that there is usually very little waiting for microcomputer access at a density level of 17 (that is 17 students sharing access to a single microcomputer). They also indicate that when 24 or more students are required to share access to a single microcomputer, there will always be a wait. The median density levels were calculated to be seven for the first quartile schools, 13 for the second, 20 for the third, and 57 for the fourth. Thus the quartile density levels, except for the fourth quartile, again indicate microcomputer saturation. Commercial systems have now allowed also e-mail to become ubiquitous. This year's data shows that 92% of the faculty, 94% of the staff, 77% of the undergraduate, and 87% of the MBAs now use e-mail regularly.

In contrast to this stability in basic operations and technological infrastructure, access to and utilization of the infrastructure is showing dynamic developments. Together with distance learning, the Internet and the Web are becoming one of the business schools' most frequently used application resources. An increasing number of faculty members are using the Internet and Web resources for classroom support. More and more students are using these resources for business research. Ninety-eight percent of the schools indicated having a Web site, provided their URL, and answered the series of questions regarding their Web environment. As could be expected, all of the schools use text on their Web site and almost all are also now using graphics capabilities, increasing from only 23% in last year's data. However, other media are showing increasing usage with animation features now reported by 29% of the schools (up from 5% last year) and audio

capabilities reported by 23% (also up from 5% last year). Video is the least common media, being reported by only 15% of the schools (up from 6% last year).

Forty-four percent of the schools indicated having a formal Web team and almost all of these schools delineated its membership. Together with the establishment of the basic support team and hardware infrastructure, however, there must also be a simultaneous focus on the actual design and development of the Web pages. Compared to last year, usage of all of the development tools has increased. For instance, the percent of schools using MS Frontpage has increased from 52% in 1997 to 74% in 1998, Netscape Gold from 29% to 67%, and MS Word from 5% to 28%. The use of graphics tools has increased as well. The percent of schools using Adobe PhotoShop has increased from 11% to 67% and Corel Draw from 5% to 33%. The largest increase was in the usage of programming and database tools, with many more Web pages now including executable scripts and applets.

Two hundred seven schools estimated the percent of their business school faculty using the Web for classroom support. Of these, three responded that their entire faculty is using the Web for classroom support. On average, it was estimated that 29% of the faculty used the Web for classroom support. Most schools provide the basics such as posting syllabi, class notes, shared files, and handouts, some schools provide adjunct materials and grade posting, and a few schools integrated tools for chat and/or other communications formats. Some faculty are also using online discussion groups to bring students together with real-world managers to discuss management issues, problems, and solution techniques.

The data in this survey also emphasizes that distance learning is in a rapid growth phase. Thirty-nine percent of the respondents (88) indicated that their business school offered distance learning programs. Analysis of the operational data shows these schools, utilizing their information technology in a more expansive scope, have allocated more resources to their computer operating budget. On average, the distance learning schools are spending \$481 dollars per student as compared to \$359 for the total sample. The commitment of business school policy makers is also reflected in a higher computer/school operating budget ratio, a mean of 4.5% as compared to the total sample mean ratio of 3.5%. Yet, a comparison of the demographics show that the distance learning schools are surprisingly similar to the total sample. No one particular set of schools (such as the top quartile schools) is attempting to capture the niche in this emerging form of education.

The organizational units that generally provide distance learning are either the business school, offering their courses as part of the regular curriculum, or extended education. For the undergraduate programs, most (48%) of the distance learning is in the form of separate courses offered in the regular curriculum. In contrast, although there is a considerable percent (36%) of the MBA distance learning being offered as separate courses as part of the regular degree program, a larger percent (47%) of the distance learning involves complete degree program packages. The business schools report very little distance learning involving either certificate or training programs at either the undergraduate or the MBA level.

The target user groups may be described as primarily part time students who are not in close proximity to the business schools' actual locations. This pattern follows the stereotypical understanding of the user group that might be interested in participating in this format to achieve their educational goals. It is surprising to note, however, that there is a large percentage of full time students who are in close proximity to the business schools' physical locations, indicating that the concept of distance learning is expanding beyond its early application, that is of providing education to distance learners. This data suggests that the concept of distance learning now seems to have been expanded to encompass the provision of a convenient education. This convenience is seen in the scheduling of educational sessions, location of education, and in the speed of education, a convenience referenced by the phrase "any time, any place, and at any pace." In support of this expanded interpretation of distance learning, 80% of the respondent schools indicated that students enrolled in their regular on-campus programs were also allowed to enroll in their distance learning courses. More variance, however, was seen with regard to the fee structures. Only 61% of the schools indicated no difference in the fees paid by their regular students and their distance learners.

Faculty support and training were shown as rather significant barriers to the development of distance learning programs. The variety of roles that the business schools' full time faculty plays in distance learning programs seems to offer an understanding for these barriers. Over sixty percent of the distance learning schools indicated that their full time faculty were involved in

curriculum development and revision, governance and program supervision, and actual teaching of all of the distance learning courses. These large response percentages indicate the extent to which some of the full time faculty has obviously embraced this emergent form of education. They also assist in understanding more fully how faculty support and training can be perceived as barriers. All of these roles involve an extensive amount of time and energy on the part of the full time faculty, and as limited resources, this time and energy must be taken away from their other business school commitments.

The largest percentage of the distance learning schools indicated that their faculty and students interacted through the use of e-mail (89%) and fax (65%). Lower interaction response percentages were seen with video and audio conferencing, yet these could be expected because of the requirements of more extensive technological infrastructures. Seventy-eight percent also indicated that their distance learning programs involved some sort of collaborative projects, with these schools suggesting that, on average, 49% of their distance learning classes required some sort of group effort. While many schools indicated that there was very little difference between their on-campus classes and their distance learning classes with regard to collaborative projects, multiple schools stressed the importance of distance collaboration for future managers and emphasized their strong emphasis for student experience in virtual teams. A smaller percent of the schools, 31%, indicated offering interactive Web-based courses.

As a final indicator of the excitement shown by the schools, sixty-nine business schools providing brief statements of their innovative and/or exciting uses of computer information technology and distance learning.

Open Issues

At the 1998 AACSB Learning Technologies Workshop at University of California, Berkeley, a major theme was the need to think about how best to reach our current students as well as the growing numbers of non-traditional learners in light of today's business and demographic climate. Gene Ziegler, Director of Advanced Technology Projects at the Johnson School of Management at Cornell University captured this strategic issue using three geometric shapes: a triangle, a circle, and a square. The triangle, he said, represents the total world population. Currently, only a small fraction at the top is enrolled in our traditional institutions of higher education worldwide. However, perhaps anywhere from a quarter to half of the world population could benefit from some aspects of the programs we offer. The circle represents the total world budget allocated to higher education. Perhaps as few as 20 years ago, almost all of this circle was concentrated in traditional formal educational institutions. Today, perhaps as much as 50% of the dollars spent on higher education are from non-traditional service providers (from Motorola U to U of Phoenix) and literally hundreds of other for-profit service providers address the needs of non-traditional students. Finally, the square represents the "box we find ourselves in" -- the challenge is how to get out!

One approach many schools are considering to "get out of the box" is distance learning programs. In this year's report we have documented many aspects of the emerging distance learning programs being offered at our business schools. However, to marshal a distance learning program requires much more than acquiring and applying technology. Unfortunately, too often there is a push to set up the technological infrastructure (the "easy" part) without building an adequate business case. Several key questions that any school contemplating a distance learning program ought to consider include:

1. Why does your school want to get into the distance learning business?
2. What is the market demand for the kind of program or specific classes you are prepared to offer?
3. Who is your target audience (e.g., those seeking a degree, those seeking continuing education)?
4. Who will champion the distance learning program? Will the champion be responsible (and rewarded) for finding instructors, identifying the course content which fits a

distance learning format (e.g., lecture classes may be work while case oriented course may not), and head the marketing effort to reach the potential audience?

5. Who will manage the distance learning program (e.g., coordinate the overall effort, the logistics for the far sites, the technology at the local and far sites, distribution of materials, work with obtaining copyright protection for materials produced and now available online)?
6. Who will train instructors in online teaching approaches (the "how to" aspect of distance learning)? The pedagogy for face-to-face instruction does not easily translate to a remote contact environment.
7. Who will produce the supporting multimedia courseware needed for a distance learning program? Who will own the intellectual property rights to these assets? If they are in CD-ROM format who collects royalties? If they contain copyrighted materials, who will negotiate the permissions?
8. Who will handle the course logistics (e.g., registration, monitor, and support the students) for a distance learning program?
9. Who is going to collecting fees and how will they be divided between the university, school, instructors, course designers, and technologists?
10. Should your school contract with a third party (non-campus entity) to support the evolution of your distance learning program?

The economics of distance learning program are still unclear. As more schools experiment with the various programs and approaches, more data will emerge and we will be better able to judge the real costs and understand the revenues necessary to sustain these efforts. The next few years will most likely see many schools entering the distance learning market with the likelihood of a few programs being very successful. As we track these programs, the differentiating variables will begin to emerge.

Table of Contents

1.	Introduction	1
2.	Profile of Participating Schools	2
3.	Operational Resources	5
3.1	Business School Computer Services Organizational Structure.....	5
3.2	Operating Budgets	5
3.3	Student Usage Fees.....	7
3.4	Computer Services Staff.....	8
4.	Hardware Resources and Uses	9
4.1	Mini/Mainframe Computer Systems and Usage	10
4.2	Microcomputer Resources	11
4.3	Laptop Resources	13
4.4	Laptop/Microcomputer Densities, Sufficiency, and Ownership.....	13
4.5	Maintenance	16
5.	Communication Resources and Uses	16
5.1	Local Area Network Technologies	16
5.2	Access to Network Resources	17
5.3	E-mail Usage	18
6.	Web Site Resources and Uses	18
6.1	Web Site Resources, Support, and Development Tools	18
6.2	Web Site Contents and Uses	20
7.	Distance Learning and Teleconferencing Resources and Uses.....	21
7.1	Distance Learning	21
7.2	Teleconferencing	24
7.3	Groupware and On-line Software	25
8.	Innovations	25

Appendices

- A General Business School Data
- B Examples of Information Technologies and Distance Learning Innovations

List of Tables

1	Demographics of Participating Schools	3
2	Business School Computer Financials, Demographics and Infrastructure by Total Sample and Computer Dollar-per-Student Quartiles	4
3	Financials: Business School Budgets, Computer Operating Budgets, and Ratios	6
4	Undergraduate Computer Usage Charges at Business Schools	7
5	MBA Computer Usage Charges at Business Schools	8
6	Median Computing Staff Support Categories by Quartiles	9
7	Business School Mini/Mainframe Systems by Vendor	10
8	Business School Desktop Microcomputer Operating Systems	12
9	Microcomputer Operating Systems at Business Schools by Computer Dollar per Student Quartiles	12
10	Business School Microcomputer Operating Systems by User Groups	13
11	Business School Microcomputers Used as Servers	13
12	Laptop Operating Systems at Business Schools	14
13	Microcomputer/Laptop Sufficiency by User Group	15
14	Microcomputers and Laptop Maintenance	16
15	Local Area Network Technologies	16
16	Local Area Network Protocols	17
17	Local Area Network Operating Systems	17
18	Local Area Network Access	17
19	E-mail Usage	18
20	Web Site Media	18
21	Web Site Responsibility	19
22	Web Site Team	19
23	Web Site Development Tools	20
24	Internet and Intranet Web Site Content Availability	20
25	Web-Related Services	21
26	Distance Learning Respondent Demographics	22
27	Distance Learning Providers	22
28	Distance Learning Target User Groups	23
29	Barriers to Distance Learning	23
30	Full Time Faculty Roles in Distance Learning	23
31	Distance Learning Faculty-Student Interactions	24
32	Formats Used to Facilitate Distance Learning	24
33	Video Teleconference Equipment Availability	25
34	Video Teleconference Applications	25
35	Groupware and On-line Software	25
36	Innovative Activities at Business Schools	25

List of Figures

1	Percent Business Schools with Computer Centers Separate from the Central Campus	5
2	Computer Operating Budget as Percent of School Operating Budget	6
3	Median Computing Operating Budget Expenditure by Quartile	7
4	Median Computer Staff Density by Quartile	9
5	Business School Mini/Mainframe Ownership	10
6	Average Number of Business School Desktop and Laptop Microcomputers	14
7	Student Microcomputer Density by Quartiles	15
8	Faculty Microcomputer Density by Quartiles	15
9	Student Microcomputer Ownership	16

1. Introduction

What are the information technologies and distance learning resources and their uses in our business schools? The goal of this, the Fifteenth UCLA Survey of Business School Computer Usage, conducted in cooperation with the AACSB - International Association for Management Education, is to continue to monitor, report, and reflect on the changing nature of the business school computing environment¹. The purpose over the years has remained the same: to provide information that can assist with business school program plans and technology allocation decisions. As always, it is stressed that the focus of these surveys is to summarize what the schools report they are doing rather than project what they should be doing.

Business schools and their users have an extensive variety of hardware, software, and network and application options. For example, business schools may choose to use their information technology infrastructure to extend their educational offerings through various distance learning alternatives. Additionally, faculty, student, and administrative requirements and expectations continue to change with experience and awareness of emergent technology options. All of these dynamics, developments, and alternatives exacerbate planning and resource allocations. Policy and decision-makers continue to need information that enables a perspective beyond the boundary of the individual business school.

For the first nine years, the Annual UCLA Surveys reported on data from AACSB-accredited business schools in the United States and the major Canadian schools. In 1993, because of growing international interest in the North American data and requests for a more global perspective, the population was extended in spite of confounding issues such as differences in culture, economics, educational structures and traditions, language barriers, funding sources, and governmental policies. In 1994, the population was further expanded to the entire AACSB membership that includes accredited as well as non-accredited schools. This 1998 survey continues with this expanded population².

The First, Second, Fourth, Sixth, Eighth, Tenth, and Fourteenth Surveys presented information on the hardware, software, and other technology resources of the schools. The focus of the surveys between these reports changes, providing information on more specific issues. The Third Survey polled the deans as to their concerns related to business school computer issues. The Fifth, Ninth, and Thirteenth Surveys focused on business school computerization in terms of process, pointing out that the introduction, diffusion, and use of technology is ongoing and that the schools may not only be approaching computerization differently, but also at different rates. The Seventh and Twelfth Surveys detailed computer operating budgets and services to provide an overview of budget distributions and estimated service costs. The Eleventh Survey focused on new technologies.

This survey, the *Fifteenth*, continues to update business school information technology and operational commitments, with a particular emphasis this year on network, web, and distance learning resources and uses. Whenever possible, historical data is included to position the findings within a longer-term context. However, these surveys do not comprise an exact longitudinal study as there is variation in the sample from year to year. The survey samples comprise the business schools that choose to add their data. The accuracy of comparisons between years is therefore a function of a changing sample. Yet, given the overall consistency of the sample and its structure as described in the next section, the identification of some general trends seems appropriate.

This report is divided into 8 sections: Introduction, Profile of Participating Schools, Operational Resources, Hardware Resources and Uses, Communication Resources and Uses, Web Site Resources and Uses, Distance Learning and Teleconferencing Resources, and Innovations.

¹ The Executive Summaries of past *Annual UCLA Surveys of Business School Computer Usage* can be found at <http://www.anderson.ucla.edu/faculty/jason.frand/>. Copies of past surveys can be obtained for US\$30 each from Computing Services, Anderson School at UCLA, Los Angeles, CA 90095-1481; fax 310-825-4835. Additional copies of the *Fifteenth Survey* are US\$50 each.

² Interested researchers can access the data via anonymous FTP from [anderson.ucla.edu](http://anderson.ucla.edu/pub/surveys/survey1998) in the directory `/pub/surveys/survey1998`.

2. Profile of Participating Schools

The questionnaire was sent to the entire membership of the AACSB, this year totaling 782 business schools, including 90 schools from 38 countries other than the United States and Canada. Two hundred thirty-two business schools chose to participate, a 30% response rate. Appendix A identifies these respondents. In addition to demographics, the eleven-page questionnaire covered several distinct areas of computer-related resources: operating budgets and computer usage fee structures, the degree of integration between business school/central campus computer resources, computing support staff, hardware, the network environment, distance learning and telecommunications, web-related developments, and examples of innovations in distance learning and information technologies. Deans and associate/assistant deans (54%), computer center directors (33%), and department chairs/faculty members (11%) completed the questionnaires.

Table 1 presents general information about the 232 respondent schools, together with demographics from previous surveys. In general, this table reflects a consistent profile in spite of varying participation. This year's sample remains predominantly North American with a spread of international schools as seen in the Eleventh through Fourteenth Surveys. Further, the school size distribution has remained just about the same since the shift between the Tenth and the Eleventh Surveys when survey participation was opened to the entire AACSB membership rather than being limited to the accredited schools. However, this year's sample shows an increase in the proportion of public versus private schools and an increase in the percentage of schools offering both undergraduate and graduate business degree programs. Finally, this year's survey, in addition to having a greater emphasis on distance learning, continues to focus on new information technology resources and uses like the Eleventh.

When feasible, this report will present the data from two perspectives, first as a total aggregate for all of the schools responding to a particular question and then as a quartile breakout. Because of the wide variance across the business schools, the use of quartiles enables deans and other strategic planners to consider specific information that may be more representative and relevant to their particular school.

The quartile breakout is based on the ratio of computer operating dollars per student, calculated by dividing each school's computer operating budget by its total student FTE. The computer operating budget, as defined in the survey questionnaire, includes computer staff salaries, benefits, and support, software, data acquisition and licenses, supplies, operating overhead, and computer recharge funds and excludes capital expenditures where list value is greater than \$2000 and depreciated 3 years or more (e.g., microcomputer purchases), lease payments, and faculty salaries. The student FTE is the sum of the undergraduate, MBA, and PhD enrollments. One hundred sixty schools provided data for both of these items. The quartiles were established from the frequency distribution and remain constant throughout this report. However, the number of schools in the total aggregate varies, depending upon the schools providing data for the particular item under discussion.

Table 2 provides a summary of the attributes of the schools in this survey by quartiles. The first line in the table shows the computer dollar per student averages and medians for the aggregated sample and the quartiles. In contrast to the total sample median of \$107 computer operating dollars per student, the median for the business schools in the first quartile was \$694, for the second quartile \$181, the third \$66, and the fourth \$21. The forty schools in the first quartile are spending thirty-three times the amount per student as the fourth quartile schools, ten and a half times the amount per student as the schools in the third quartile, and almost four times the amount per student as the schools in the second quartile. These computer operating dollar per student medians are quite close to those of last year's quartiles even though the quartiles are comprised of differing sets of schools. The range of operating dollars per student is very narrow for the third and fourth quartile schools and becomes progressively wider for the second and first quartile schools.

Similarly, the total business school operating budget means vary from a high of over one million dollars for the first quartile schools to a low of just over forty-three thousand dollars for the fourth quartile schools. The ratio of the computer operating budget to the total school operating budget also varies widely, from a high of over five percent for the first quartile schools to a low of just over two percent for the fourth quartile schools.

Table 1
Demographics of Participating Schools
(percent of schools)

	Second	Fourth	Fifth	Sixth	Seventh	Eighth	Ninth	Tenth	Eleventh	Twelfth	Thirteenth	Fourteenth	Fifteenth
	1985 N=125	1987 N=128	1988 N=175	1989 N=163	1990 N=145	1991 N=166	1992 N=178	1993 N=180	1994 N=353	1995 N=240	1996 N=293	1997 N=252	1998 N=232
Type of school:	69%	67%	68%	68%	70%	68%	71%	71%	66%	62%	60%	64%	72%
Public	31	33	32	32	30	32	29	29	31	32	36	36	28
Private									3	6	4		
No data													
Degrees offered:	2	2	2	3	3	5	6	6	11	14	12	10	6
Undergraduate only	86	85	88	89	86	86	86	81	74	77	74	76	80
Undergraduate & graduate	12	13	10	7	9	7	6	10	9	8	7	7	10
Graduate only				1	2	2	2	3	6	1	7	7	4
No data													
Student enrollment (FTE):	22	25	24	22	23	22	18	18	34	43	37	36	35
Less than 1000 students	22	27	21	26	28	29	33	34	26	28	30	29	28
Between 1000 and 2000	26	24	23	20	20	20	20	19	16	15	14	13	17
Between 2000 and 3000	30	24	32	31	27	27	27	26	17	12	11	15	16
More than 3000 students				1	2	2	2	3	6	2	8	7	4
No data													
Geographic region:	100	100	100	100	100	100	100	83	92	95	94	93	94
US/Canada								7	4	3	3	5	4
Europe								6	2	<1	1	1	<1
Asia/Australia								3	1	1	1	<1	1
Latin/South America								1	1	<1	1	<1	<1
Africa/Mid-East													
Survey focus:	What	What	Where	What	Budgets	What	Where	What	New/Tech	Budgets	Where	What	NewTech, DL
Population:	241	264	264	269	274	276	288	388	678	705	771	851	782
AACSB accredited/Canadian													
AACSB membership													

Table 2
Business School Computer Financials, Demographics and Infrastructure
by Total Sample and Computer Dollar-per-Student Quartiles

	Total Sample N=232*	Quartiles			
		1st n=40	2nd n=40	3rd n=40	4th n=40
Financials					
Computer dollar per student (average)	\$359	\$998	\$201	\$69	\$20
(median)	\$107	\$694	\$181	\$66	\$21
(range)	<1-6299	320-3489	112-313	43-108	<1-42
Computer operating budget (1,000s) (mean)	460	1,211	354	164	43
Business school budget (1,000s) (mean)	10,563	27,548	14,000	6,995	4,008
Computer/school operating budget (mean)	3.5%	5.4%	4.0%	2.6%	2.2%
Demographics					
Type of school: public (percent)	72	55	70	93	80
Degrees offered: (percent)					
Undergraduate only	6	3	3	5	5
Undergraduate & graduate	80	65	94	95	95
Graduate only	10	32	3		
No data	4				
Student enrollment (FTE): (percent)					
Less than 1000 students	35	48	35	20	28
Between 1000 and 2000	28	28	30	20	33
Between 2000 and 3000	17	10	25	35	15
More than 3000 students	16	14	10	25	24
No data	4				
Student FTE (mean)	1733	1569	1730	2423	1998
Infrastructure					
Microcomputers	49,245	14,633	9,588	8,216	6,105
Average per school (mean)	221	366	234	205	153
Students per micro density (median)	17.08	9.6	16	22	41
Faculty per micro density (median)	.89	.84	.91	.88	.95
Computer staff FTE (median)	6	15	7	4.9	1.6
Students per staff (median)	271	87	214	473	1035
* n changes based on item responses					

Consideration of the demographic summary shows the first quartile schools to be distinctly different from those in the other quartiles. The first quartile has the smallest percentage of publicly supported schools, the largest percentage of graduate only degree programs, and the largest percentage of the smaller student enrollments.

The lower third of Table 2 summarizes the infrastructure that the schools are able to achieve with their differing median computer operating dollars per student. As expected, the first quartile schools, those with the largest computing dollar per student ratios, are able to provide more physical and support resources than any of the other quartiles. The first quartile schools own most of the quartile schools' 38,542 microcomputers, 38% (14,633 systems) as compared to the 25%, 21%, and 16% ownership respectively for the other quartiles. The other infrastructure data also shows the advantage the first quartile schools have over those in the other three quartiles. As could be expected, the schools in each of the quartiles are able to provide more than the schools in the quartiles below them. The one exception is very minor, the third quartile schools have a slightly better (lower) faculty per micro density than those in the second.

3. Operational Resources

Operational resources provide the base for the staff and information technology at the business schools and are generally administered by the computer services organization. However, these service organizations differ structurally particularly in the degree of integration of their resources with those of the central campus. Other operational issues considered in this section include the computing operating budget that is allocated by the business school, fees collected for computer usage and/or print charges, and the composition of the computer services support staff. Appendix A details the financials and student per staff ratios for those schools which provided the requisite data.

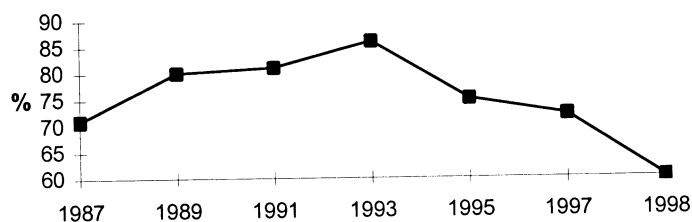
3.1 Business School Computer Services Organizational Structure

Previous surveys have derived data on the business school computer services organizational structure from the number of schools reporting a computer and information technology staff autonomous from the central campus organization. This year a separate question directly referenced the degree of integration between the business school and central campus. The respondent schools were offered four distinct categories of integration: *primarily separate* from the central campus (the business school provides greater than 75% of all computing staff, services, equipment, and local network infrastructure), *partially separate* (the business school provides between 50% and 75%), *partially integrated* (the business school provides less than 50%), and *fully integrated* (the business school provides less than 25%). Two hundred sixteen (93%) schools responded to the question with 60% of the schools indicating that their schools were separate (53% *primarily separate* and 7% *partially separate*) and 40% integrated (7% *partially integrated* and 33% *fully integrated*).

Figure 1 combines these responses with data from previous surveys. Even though 60% of the business schools this year reported that their computer services operational structure was separate from that of the central campus, the figure shows a continuation of the trend for business schools to merge their operations with those of the central campus.

However, this trend needs to be considered within the context of the changing sample over time. The peak of over 80% of the respondent schools with separate business school computer services organizations, shown in the figure as occurring in 1993, was coincident with the last year that the surveys focused on only the accredited schools. The subsequent surveys were opened to all AACSB membership schools, accredited and not accredited. The decline in computer center organizations separate from the campus may thus partially be explained by sample variance. However, the decline is consistent from 1993 on and may be explained partially as a growing trend toward outsourcing of services (discussed in Section 4.3 of the Fourteenth Survey), a direct question as to the degree of integration, and slightly larger school sizes.

Figure 1
Percent Business Schools with Computer Centers Separate from the Central Campus



However, the decline is consistent from 1993 on and may be explained partially as a growing trend toward outsourcing of services (discussed in Section 4.3 of the Fourteenth Survey), a direct question as to the degree of integration, and slightly larger school sizes.

3.2 Operating Budgets

The business schools were asked to provide two operating budgets - the total annual business school operating budget and the total annual business school computer operating budget. As defined previously, the questionnaire defined the business school computer operating budget to include staff salaries, benefits, and support, software, data acquisition and licenses, supplies, operating overhead, and computer recharge funds and exclude capital expenditures where list value was greater than \$2000 and depreciated three or more years, lease payments, and faculty salaries. Some of the schools not answering the budgets questions indicated that the data was

confidential, not available at the time, was unknown, or that the budget was controlled by the university and not by the business school.

Table 3 summarizes various financial data. For the one hundred eighty-six (80%) schools that provided information about their total school operating budget, the budgets ranged from \$42,000 to \$120,000,000, with a mean of \$10,563,590 (median \$5,500,000). One hundred sixty-three schools (70%) provided information about their business school's computer operating budget. For these, the computer operating budget ranged from \$1000 to \$5,500,000, with a mean of \$460,600 (median \$180,000).

As can be seen in the lower half of Table 3, for the 146 (63%) business schools that provided both their school and computer center operating budget, on average, the computer operating budget was 3.53% of the total school budget, with a range of less than 1% to 18.75% (median of 2.78%).

Figure 2 graphs the change in this ratio over the last twelve years, together with this year's data, for the total aggregated sample. This year's ratio of 3.5%, just about the same as shown in last year's, 3.3%, appears to indicate that the decline between 1993 and 1997 in the business school operating budget may have leveled off.

In order to provide a basis of comparison for the budget data across the sample, the annual computer operating budget was converted into a per student statistic by dividing the reported computer operating budget by the reported total student FTE. The lower part of Table 3 shows this ratio. The mean per student statistic was \$359 dollars for the 160 (69%) schools which provided data for both of these items, with a range of less than one dollar to \$6,299 dollars per student. The median was \$107 dollars per student.

For these 160 schools the dollar per student values were ranked and separated into quartiles as discussed in Section 2 and detailed in Table 2. Figure 3 presents the median computer operating dollar per student FTE over a twelve year period, together with this year's data, using the quartile medians. The figure shows a reasonably stable pattern of differences in computer dollars per student spent by the quartile schools, with the first quartile schools spending over three and a half times as much per student as the second quartile schools, ten and a half times as much as the third quartile schools, and thirty-three times as much as the fourth quartile schools. As can be seen in Figure 3, these ratios have held quite consistent, not only over time, but also over changes in the samples and populations. However, the first quartile schools continue their trend of a gradual increase in spending per student.

Table 3
Financials: Business School Budgets, Computer Operating Budgets, and Ratios

	Total sample
Total school budget	N = 186 (80%)
Range: (1000s)	\$42-\$120,000
Mean: (1000s)	\$10,563.6
Median: (1000s)	\$5,500
Computer operating budget	N = 163 (70%)
Range: (1000s)	\$1-\$5,500
Mean: (1000s)	\$460
Median: (1000s)	\$180
Computer operating budget as a percent of the total school budget	N = 146 (63%)
Range:	<1%-18.75%
Mean: (1000s)	3.53%
Median: (1000s)	2.78%
Computer operating budget: dollars per student FTE	N = 160 (69%)
Range:	<\$1-\$6,299
Mean: (1000s)	\$359
Median: (1000s)	\$107

Figure 2
Computer Operating Budget as Percent of School Operating Budget

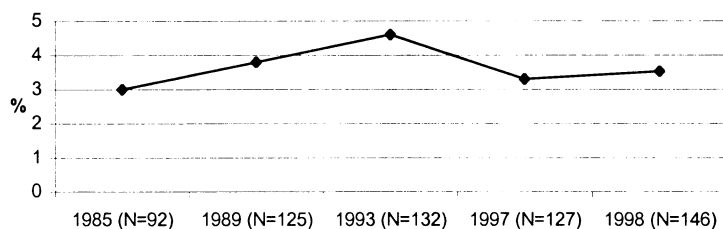
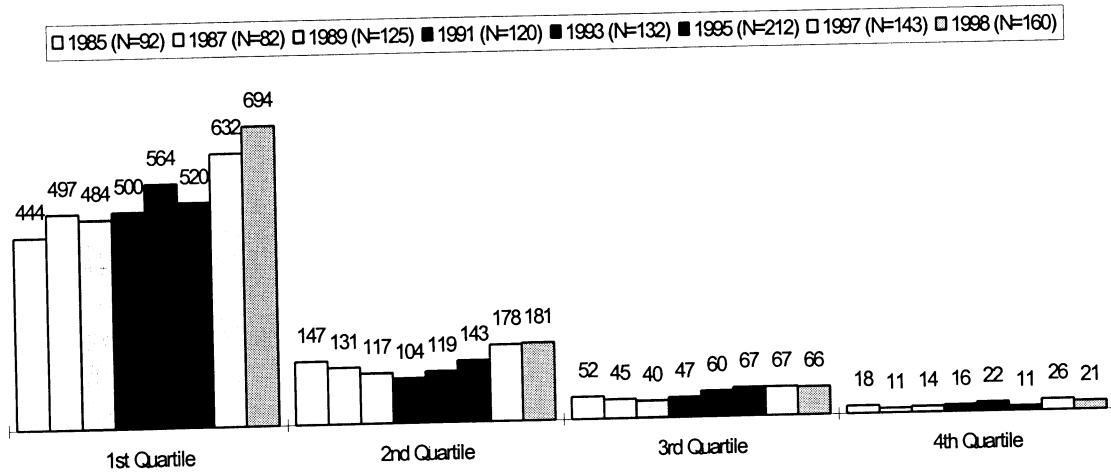


Figure 3
Median Computer Operating Budget Expenditure by Quartile



3.3 Student Usage Fees

Another source of funds for business schools is from computer usage charges and fee structures. Tables 4 and 5 present the data in four year increments to provide a historical context, and then for this immediate year, for the 104 business schools (52%) who provided information about their undergraduate programs and the 92 business schools (44%) who provided information about their graduate programs.

Table 4
Undergraduate Computer Usage Charges at Business Schools
(percent of schools)

	1989 N=149	1993 N=157	1997 N=110	1998 N=104
Computer charges	29%	57%	51%	52%
Charges per course	10%	23%	33%	30%
Range:	\$1-50	\$1-50	\$3-116	\$1-125
Median	\$15	\$13	\$12	\$12
Charges per semester or quarter	5%	22%	47%	46%
Range:	\$15-165	\$ 2-100	\$1-100	\$5-150
Median	\$25	\$30	\$40	\$40
Charges per year	7%	4%	14%	2%
Range:	\$10-300	\$19-250	\$45-400	\$70-100
Median	\$60	\$75	\$75	\$85
Charge for output*	10%	22%	20%	19%
Range:	\$.04-.50	\$.01-1.00	\$.08-.35	\$.05-.25
Median	\$.14	\$.15	\$.15	\$.10
* most indicated for laser output only				

Table 5
MBA Computer Usage Charges at Business Schools
(percent of schools)

	1989 N=157	1993 N=164	1997 N=94	1998 N=92
Computer charges	31%	64%	46%	44%
Charges per course	8%	17%	32%	30%
Range:	\$1-50	\$1-50	\$3-111	\$1-125
Median	\$15	\$13	\$8	\$10
Charges per semester or quarter	5%	15%	38%	47%
Range:	\$15-165	\$2-126	\$3-200	\$5-150
Median	\$25	\$50	\$48	\$48
Charges per year	10%	9%	11%	3%
Range:	\$10-345	\$4-475	\$45-500	\$40-600
Median	\$90	\$250	\$90	\$100
Charge for output*	11%	16%	19%	23%
Range:	\$.04-.50	\$.01-1.00	\$.08-.35	\$.05-.25
Median	\$.15	\$.15	\$.10	\$.10
* most indicated for laser output only				

The schools responding this year showed very little change from last year except for a decrease in the percentage of schools utilizing annual charges. At this point a very limited number of either the undergraduate or graduate program schools indicate using an annual fee structure. The graduate degree schools seem to have changed more to a semester or quarter fee structure. Per page charges decreased slightly.

Charges other than those specifically listed in the tables included per course charges for certain majors, a sliding fee structure for less than full time students, computer charges included in registration fees, a groupware fee, an academic equipment fee of \$136, and a one time fee of \$150. Communication charges are becoming more common. Some schools listed an Intranet fee of \$65 and others a modem pool charge of fifty cents per hour. Additionally, several schools indicated charging for color printing, with one school indicating charging \$1.50 per page for color prints and \$2.00 for color transparencies.

3.4 Computer Services Staff

One hundred seventy-four (75%) business schools reported details about their computing support staff. The data showed the average size of the computer support staff for these schools was ten FTE, with an average part-time staff of 3.8 FTE. These 174 business schools ranged in size from as high as 82 FTEs to a low of .2, with a median FTE of six. When the computing support staff was allocated across functional categories, 95% of the schools reported having staff in the technical hardware and network area, 64% management staff, 63% Web support staff, 60% instructional support staff, and 43% faculty research support staff. Thirty-eight percent of the schools reported audio/visual staff and 25% teleconferencing and distance learning support staff. Other types of staff indicated by the schools included staff assigned to student computer labs, help desks, administration and staff support, and software and application development.

Figure 4 presents a longitudinal view of computing staff support, showing the median staff densities by quartiles over the last twelve years, together with this year's data. This staff density ratio, calculated by dividing the total student FTE by total computing staff FTE, provides an understanding of the number of students supported by a single computing staff member. The data in Figure 4 shows very little change in the median staff densities for the first and the third quartiles. The lower staff density level for the second quartile indicates an improvement, with each staff member being required to support a fewer number of students. In contrast, the median staff density level increased in the fourth quartile, indicating that each staff member was required to support a larger number of students.

Figure 4
Median Computer Staff Density by Quartile

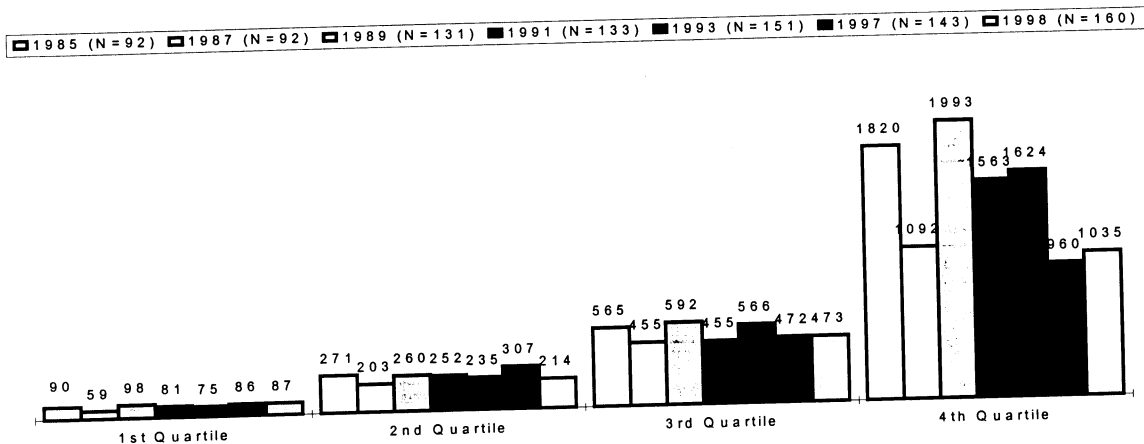


Table 6 displays the median computing staff support categories by quartile. As with the other quartile analyses, the staff resources show systematic allocation across the quartiles. Those business schools in the upper quartile again show more resources available to their students. Technical, hardware, and network staff, as well as instructional support staff, appear in greater proportion in the first quartile schools. However, these are the schools that also have the largest mean computer to school operating budget, the largest number of microcomputers, and the lowest students per micro density levels (Table 2).

Table 6
Median Computing Staff Support Categories by Quartiles

	Quartiles			
	1st n=40	2nd n=40	3rd n=40	4th n=40
Technical/hardware/network	4.6	2.25	2	1
Management	1.5	1	1	1
Instructional support	4	1.8	1.5	.5
Web support	1	1	.5	.25
Research support	1	.5	.6	.5
Audio/visual	1	.5	.25	.25
Teleconference/distance learning	1	.5	.5	.5
Total staff (median)	15	7	4.9	1.6

4. Hardware Resources and Uses

Microcomputers are now ubiquitous in the business schools and mini/mainframes are becoming rare. Product and market developments have moved microcomputer equipment in the direction of a commodity product. All Intel-based microcomputers offer essentially the same features and run the same operating system and application software. Individual purchases are frequently based on just price or convenience rather than unique capability or a proprietary operating system. Additionally, the computing power of microcomputers has continued to increase while their prices have decreased. The distinction between mini/mainframe computers, workstations, and microcomputers has become less obvious. It is increasingly difficult to differentiate between some minicomputers and some workstations, to clearly indicate just where workstations end and microcomputers begin. Furthermore, many schools have removed their traditional transaction-oriented minicomputers, replacing them with clusters of microcomputer-based client/server systems with distributing computation and database tasks.

These technological developments and the broadening use of systems has been reflected in the survey questionnaires. During the 1980s respondents were asked to specify both make and model of computer equipment in four major categories: microcomputers, "32-bit graphic workstations," mini/mainframes computers, and laptop computers. Beginning with the Tenth Survey (1993) microcomputers and workstations were combined so that only three categories were reported. Beginning with the Eleventh Survey (1994) it became clear that categorizing the hardware equipment by operating system was more meaningful than by make and model. This approach has again been continued for this year's survey. Within the mini/mainframe area, the data is reported by manufacturer, irrespective of the operating system, size, or use.

This section covers the business schools' mini/mainframe computer resources and uses, desktop microcomputer resources by operating systems and by user groups, and laptops by operating systems and user groups. Desktop and laptops microcomputers are then combined to look at densities, sufficiency, and recommended/required ownership. This section concludes with a brief discussion of microcomputer maintenance. Appendix A details the student and faculty microcomputer densities and recommended/required microcomputer ownership for those schools which provided the requisite data.

4.1 Mini/Mainframe Computer Systems and Usage

One hundred ninety-one (82%) of the schools indicated some access to a mini/mainframe, with either their business school or the central campus owning a mini/mainframe computer system(s). This percentage was down from 94% in the Tenth Survey (1993). As shown in Figure 5, the percent of respondent business schools reporting ownership of their own mini/mainframe systems peaked in 1989 and has been steadily declining since. This year only 12% of the schools indicated maintaining their own mini/mainframe system, a drop from the 18% reported in the 1997 survey and the lowest reported since the beginning of these surveys in 1984.

Figure 5
Business School Mini/Mainframe Ownership
(percent of schools)

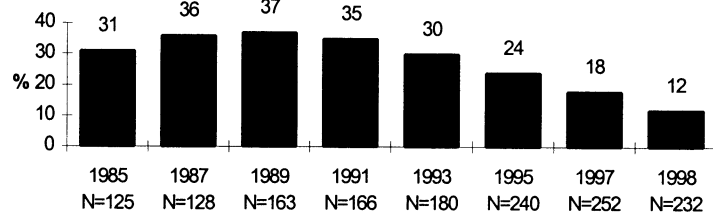


Table 7 displays the distribution of their 29 systems. In the earlier surveys this data was also subdivided by both make and model. However, many schools are now simply listing "VAX" rather than specifying the model, thus making the counts by model impossible. Four different vendor systems were supported by at least 3 or more of the schools. Digital Equipment Corporation had the largest share with 48% of the systems, about the same as in last year's data.

Table 7
Business School Mini/Mainframe Systems by Vendor
(percent of total systems)

Make (at least four systems)	1985 N=39	1987 N=46	1989 N=61	1991 N=58	1993 N=54	1997 N=45	1998 N=27
AT&T		4%	12%	9%	2%		
Digital	17%	33%	34%	38%	45%	49%	48%
Hewlett-Packard	14	14	10	9	18	10	21
IBM	17	20	20	26	16	18	14
Sun					9	18	7
Others (1 - 2 each)	53	30	24	17	10	5	10
Total systems	59	80	122	95	140	61	29
Average per school	1.5	1.7	2.0	1.7	2.6	1.3	1.1

Hewlett Packard's percentage doubled, and both IBM's and Sun's decreased. The schools indicated that their mini/mainframes were used for faculty and PhD research (27%), teaching (21%), administrative systems (17%), and as applications and/or mail servers as well as web support (17%). Several schools indicated other uses including library cataloging and career placement.

4.2 Microcomputer Resources

The desktop data was categorized by operating system only (Apple, DOS only, Windows 3.x, Windows 95, Windows NT, UNIX, and other) instead of by model and vendor as detailed in the first ten surveys. This compression was necessitated because the number of different makes, models, and configurations has become difficult for the schools to keep separately. For example, in the Tenth Survey (1993), 34% of the schools had more than 11 different models, with some schools having over twenty. Further, differences between the various models have become fuzzy and lost most of their value due to greater compatibility. This year, 223 (96%) business schools provided desktop microcomputer data. A total of 49,245 microcomputers were reported, with an average of 221 per school, a slight increase from the 215 microcomputers per school as reported in the Fourteenth Survey. This small increase seems to confirm the conclusion of the Fourteenth Survey that the average number of microcomputers per school has reached saturation.

Table 8 summarizes the distribution of microcomputers at the business school by operating system over a thirteen-year period. While not only allowing a comparison of this year's data to previous years, this table also presents a historical perspective, showing the introduction of various makes and models of microcomputers starting in 1985 with the Apple and DOS systems. At that time, UNIX workstations were in a separate category or available only on mini/mainframe systems. Windows 3.x and UNIX were tracked in the 1989 survey, and Windows 95 and Windows NT in the 1997. Overall, Windows now has a combined 92% share of operating system usage, up from the 87% reported last year. As could be expected, major percentage shifts are seen in the distribution of the individual operating systems. The Windows 3.x systems declined from 38% in 1997 to only twelve percent this year. Windows 95 systems increased from 42% last year to 64% this year and the percentage of Windows NT systems more than doubled, from seven percent last year to 16% this year. And, it appears that almost all of the DOS only systems have now been replaced.

Table 9 presents the distribution of microcomputers by operating system from the computer dollar per student quartile perspective. For each quartile, the number of microcomputers, the percent of schools which reported a specific operating system, and the percent of the total number of systems are displayed. Thus, for the 40 business schools in the first quartile, 58% of the schools reported using Apple operating systems with these systems accounting for 7% of the total 14,633 microcomputers available at these schools. Looking across Table 9 allows a comparison and contrast of the variations in micro distribution between the quartiles. As an example, even though a larger percentage (65%) of the business schools in the third quartile reported having Apple systems, the percent of these systems (4%) as related to the overall number of micro systems was not very high. Thus, even though a larger percentage of the third quartile schools may have an Apple-based system, there are not many per school. Similarly, although the second quartile schools showed a larger percentage (63%) distribution of the Windows 3.x systems, these systems made up only 11% of their total microcomputers.

In contrast, a larger percentage (85%, 90%, 90%, and 93% respectively) of all four of the quartile schools reported Windows 95 systems and these systems comprise the largest percentage of their overall systems. Only 35% of the schools in the fourth quartile reported Windows NT systems, in contrast to the larger percentages in the other quartiles. And, while 48% of the first quartile schools reported UNIX systems, these systems represented a minimal percentage of their total micros.

The first column in Table 10 shows the distribution of the microcomputer systems by user group for all of the respondent schools. This distribution has remained just about the same as it was last year, with students having primary access to about 41% of the total systems, faculty 34%, and staff 25%. Note that the total number of systems in this table (48,652) differs from the total shown in Table 8 (49,245) as some schools did not report their microcomputer counts by user group and the "other" systems are not included.

Table 8
Business School Desktop Microcomputer Operating Systems
(number and percent of systems)

Vendor	1985 N=119		1987 N=128		1989 N=135		1991 N=143		1993 N=164		1995 N=239		1997 N=242		1998 N=223	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Apple																
Mac Plus, Classic	457	5	925	5	2165	7	3412	10	3255	8						
Macintosh II					444	2	868	2	1387	3						
Mac IICI							977	3	1729	4						
Mac Quadra									274	1						
Total	457	5	925	5	2609	9	5257	15	6645	16	6260	12	4153	8	2809	6
DOS only																
HPVectra286	40	0	349	2	1194	4	1328	4	1133	3						
IBM AT, PS	259	3	1194	7	1827	6	4916	14	6604	15						
IBM PC/XT	5120	54	7509	45	9286	30	6543	19	3169	7						
Unisis	544	6	593	4	881	3	731	2	329	1						
Zenith 150	411	4	1791	11	3923	13	1484	4	908	2						
AT&T 286					1043	3	550	1	227	1						
Clones 286					1055	3	2303	6	2708	6						
Clones 8086					2714	9	2070	6	1362	3						
IBM PS2/70,80					2393	8	2545	7	2173	5						
AT&T 6300							678	2	280	1						
Zenith 286							722	2	438	1						
Total	6374	67	11436	69	24316	79	23870	67	19331	45	9212	18	1138	2	236	<1
Win 3.X																
HPVectra386					632	2	886	3	1509	4						
Clones 386							2650	8	6518	15						
Zenith 386							760	2	999	2						
AT&T 386									546	1						
Clones 486									3286	8						
Dell 386									224	<1						
Gateway 386									213	<1						
Gateway 486									479	1						
IBM PS/90									358	1						
ICL 386									290	1						
Total					632	2	4296	13	14422	33	35678	68	19873	38	6017	12
Win 95												21509	42	31666	64	
Win NT												3588	7	7888	16	
UNIX					316	<1	355	<1	553	1	1150	2	897	2	355	<1
Other	2725	28	4364	26	3183	10	1805	5	2038	5	350	<1	747	1	274	<1
TOTAL	9556	100	16725	100	31056	100	35583	100	42989	100	52650	00	51905	100	49245	100
Average per school	80		131		193		217		239		220		215		221	
Change			63%		48%		12%		10%		(8%)		(2%)		3%	

Table 9
Microcomputer Operating Systems at Business Schools by Computer Dollar per Student Quartiles
(percent of schools and systems)
(n = number of microcomputer systems)
N=160

	Quartiles							
	1st n=14,633		2nd n=9,588		3rd n=8,216		4th n=6,105	
	schools	systems	schools	systems	schools	systems	schools	systems
Apple	58%	7%	58%	4%	65%	4%	48%	2%
DOS only	13	<1	13	<1	20	<1	15	2
Windows 3.X	55	9	63	11	55	15	55	26
Windows 95	85	56	90	72	90	68	93	61
Windows NT	75	27	60	10	73	11	35	9
UNIX	48	1	28	<1	30	1	8	<1

Table 10
Business School Microcomputer Operating Systems by User Groups
 (percent of schools and systems)
 (n = number of microcomputer systems)
 N = 223

	Total n=48,652 systems	Win 95 n=31,386		Win NT n=7,886		Win 3.x n=6,005		Apple n=2,787		UNIX n=355		DOS only n=233	
		schools	systems	schools	systems	schools	systems	schools	systems	schools	systems	schools	systems
Student	41%	68%	38%	31%	57%	26%	40%	23%	23%	9%	30%	5%	49%
Faculty	34	86	36	46	25	41	37	50	34	19	55	7	32
Staff	25	81	26	33	17	35	23	30	43	6	15	5	19

The remaining columns of Table 10 show the distribution of operating systems by user group. For example, under the Win 95 column, the data shows for the 223 schools that reported their microcomputer distribution across user groups, 68% had Windows 95 based systems available primarily for their students and that these systems accounted for 38% of the total 31,386 Windows 95 systems. Reading down this column, it can be seen that although a greater number of the schools had allocated their Windows 95 systems to their faculty (86%) and their staff (81%), the students had been allocated the larger number of the systems, 38% as compared to 36% and 26%. This pattern holds for all of the Windows-based microcomputers, but can easily be explained based on the larger number of students compared with the faculty or the staff. While the staff has been allocated the largest percentage of the Apple-based systems, the largest number of UNIX systems has been allocated to the faculty. Further, students are the primary users of the remaining old DOS only systems.

As can be seen in Table 11, 184 schools detailed the number and type of microcomputer systems being used for network servers. The Pentium/Pentium Pros were the most commonly used, accounting for 61% of the total 1,532 systems identified as being used as servers.

4.3 Laptop Resources

One hundred eighty-five (80%) business schools provided data about their laptop systems. As shown in Table 12, a total of 4,618 business school owned laptop systems were reported, with an average of 25 per school, a 14% decrease over the average of 29 laptops per school reported last year. This decrease may partially be explained by the recommended/required increase in student desktop/laptop ownership that will be discussed in Section 4.4 below. Of the total 4,618 laptops reported by the 185 schools, the majority were Windows 95. The table shows that this percentage increased to 80%, up from just 49% the year before. The decrease is seen in the replacement of the older DOS and Windows 3.x systems. In contrast, the percent of Apple systems stayed just about the same.

Table 11
Business School Microcomputers
Used as Servers
 N = 184

Server	n	%
Pentium/Pentium Pro	928	61
Sun SPARC	183	12
386/486	136	9
HP	94	6
PowerPC	58	4
Other	50	3
Dec Alpha	48	3
IBM RS/6000	35	2
Total systems	1532	100

4.4 Laptop/Microcomputer Densities, Sufficiency, and Ownership

The density ratios (the measure of how many faculty or how many students share access to a system) and the concept of microcomputer sufficiency (wait time for microcomputer use) are more meaningful and accurate if the number of desktop and laptop microcomputer are combined. Figure 6 shows the combined number of desktop and laptop systems over a twelve-year period, together with this year's data. The total average number of both systems peaked in 1993 at 258 systems per school, declined to 238 systems in 1995, increased slightly to an average of 244 systems last year, and then again very slightly to 246.

Table 12
Laptop Operating Systems at Business Schools
(number and percent of systems)

	1987 N=82		1989 N=135		1991 N=143		1993 N=164		1995 N=188		1997 N=206		1998 N=185	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Apple					29	1	463	15	661	19	458	8	323	7
DOS and Win 3.X	1627	100	4700	100	3255	99	2696	85	2756	81	2564	43	599	13
Win 95											2958	49	3696	80
Total	1627	100	4700	100	3284	100	3159	100	3417	100	5980	100	4618	100
Ave per school	20		35		23		19		18		29		25	
Percent change	64%		76%		(34%)		(16%)		(6%)		57%		(14%)	
N (percent schools)			83%		86%		91%		78%		82%		80%	

These surveys have consistently presented two ratios to provide further understanding of the business schools' utilization of their microcomputers. The first ratio, student-per-microcomputer, is derived by dividing the total FTE (undergraduate, MBA, and PhD) by the number of a business school's desktop and laptop microcomputers available for student use. This density

measure reflects the number of students who share access to a single system. For example, a student microcomputer density of 57 is interpreted as 57 students sharing access to a single system. The second ratio, faculty-per-microcomputer, is derived by dividing the faculty FTE by the number of a business school's systems available exclusively for faculty use. As these ratios do not include any systems that might be personally owned by either the students or the faculty, the actual number of students or faculty who share access to the systems is probably lower (i.e., better) than reported.

Figures 7 and 8 show ratios historically for the student and faculty density quartiles. These figures are based only on the quartiles as established by the density ratio distributions and are different from those established by the computer dollar-per-student quartiles. In the summary table, Table 2, the student and faculty density ratios are given separately for the computer dollar-per-student quartiles.

In Figure 7, the median student-per-micro densities this year by quartile are 7, 13, 20, and 57. All of the quartiles show very little change in their student density from last year. However, when viewed overtime, the first three quartiles seem to have stabilized, while the fourth seems to be continuing to improve this ratio towards its best density level of 37 shown in 1995. In contrast, Figure 8, giving the faculty-per-micro density, shows stability across all four quartiles. And, even in the fourth quartile, there is little need for sharing systems among the faculty.

Figure 6
Average Number of Business School Desktop and Laptop Microcomputers

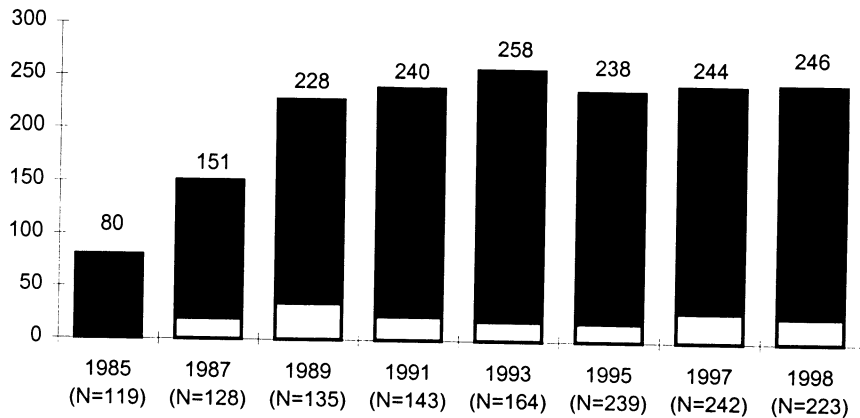


Figure 7
Student Microcomputer Density by Quartiles
 (students per microcomputer)

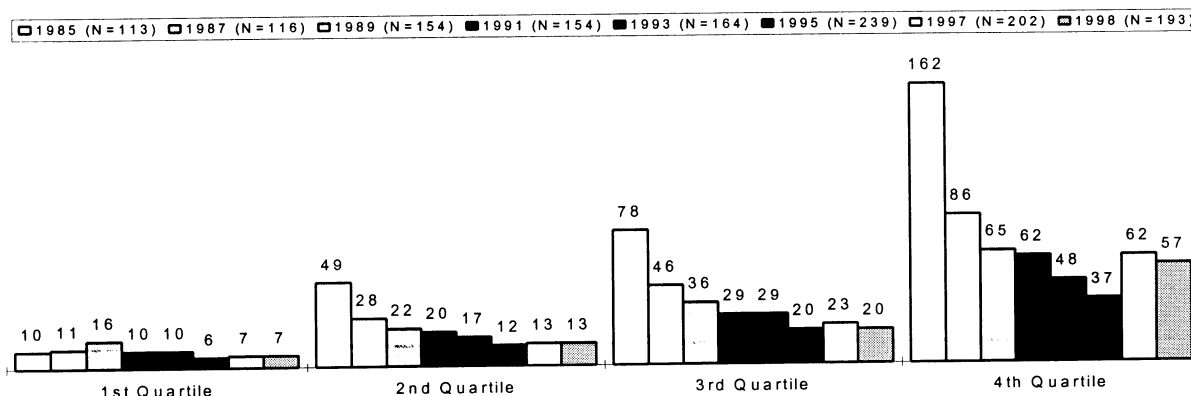
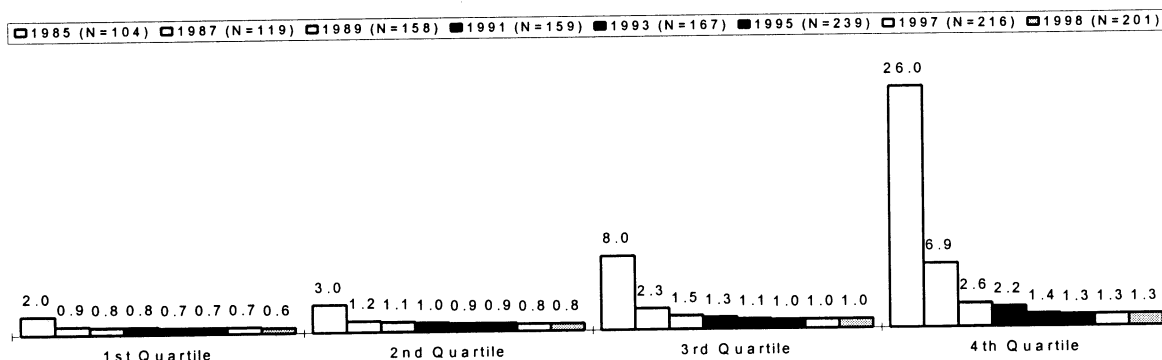


Figure 8
Faculty Microcomputer Density by Quartiles
 (faculty per microcomputer)



The questionnaire also asked about wait time for computer usage. Combining this data with the density levels provides a general understanding of a sufficient number of microcomputers at the business schools. Table 13 shows the current levels of densities at which the business schools consider their present level of ownership as sufficient. Eighty-four percent of the undergraduate schools and 91% of the MBA schools indicate that there is usually very little waiting for microcomputer access at a density level of 17. They both also indicate that when 24 or more students are required to share access to a single microcomputer, there will always be a wait. These density levels are very similar to those reported in last year's survey.

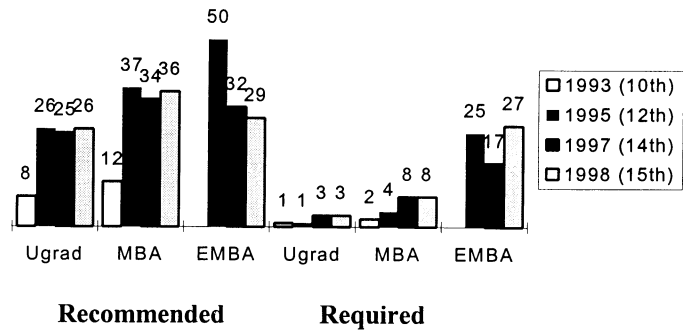
Figure 9 summarizes the business schools' responses concerning recommended and required student microcomputer ownership. In general, when compared to the data from the Fourteenth Survey (1997), the "recommended ownership" responses showed slight increases for both the

Table 13
Microcomputer/Laptop Sufficiency by User Group

	Faculty N = 196		Undergraduate N = 180		MBA N = 181	
	%	density	%	density	%	density
Never any waiting	88	0.83	18	16	27	17
Occasional waiting	10	0.89	66	17	64	17
Usually a wait	2	2.36	14	22	8	20
Always a wait	0		2	24	1	24

Figure 9
Student Microcomputer Ownership
(percent of schools recommending and
requiring ownership)

	Ugrad	MBA	EMBA
1993 (10th)	N=145	N=164	
1995 (12th)	N=216	N=201	N=64
1997 (14th)	N=228	N=218	N=131
1998 (15th)	N=206	N=202	N=121



undergraduate and MBA programs, while the EMBA program showed a slight decrease. However, that slight decrease may be accounted for by the large increase in “required ownership” for the EMBA programs. When recommending systems for the undergraduates, the data showed a very slight preference for the desktop systems. However, at the MBA and Executive levels, there were strong recommendations for laptop systems. When systems were “required”, all three program levels showed a very strong preference for laptops.

4.5 Maintenance

After funding, equipment maintenance has remained as the most critical issue in previous surveys. Table 14 compares the Tenth Survey (1993) data, the data last year, together with this year’s 1997 data. The data has remained about the same as shown last year, except for a decrease in contracting with university services for maintenance of the business school owned microcomputers and laptops. The majority of maintenance is still done by the business school staff, 68%.

Table 14
Microcomputers and Laptop Maintenance
(percent of schools)

	1993 N=141	1997 N=246	1998 N=231
No definite policy	8%	4%	4%
Business school staff	65	68	68
Contract with university service	38	46	40
Contract with outside vendor	35	26	25
Other	5	5	5

5. Communication Resources and Uses

Information technology connectivity is facilitated through communications resources that include both software and hardware as well as the cabling, conduits, phone lines, and switches. Local area networks (LANs) connect communications devices within close proximity while wide area networks (WANs) allow users to access remote networks, the Internet and the World Wide Web. This section presents the findings related to the business schools’ LAN technologies, protocols, operating systems, how the schools achieve access to their network resources, and e-mail usage.

5.1 Local Area Network Technologies

Two hundred twenty-eight schools provided information regarding their local area network technologies and protocols. The local area network technologies for data transmission used by the schools are summarized in Table 15. Of the technologies in this table, only

Table 15
Local Area Network Technologies
(percent of schools)

Technology	1991 N = 166	1993 N = 180	1997 N = 252	1998 N = 228
Ethernet	67%	76%	90%	86%
Wireless				38
Fast Ethernet				32
FDDI				15
ATM			11	14
Token Ring	27	20	13	13

Ethernet, ATM, and Token Ring technologies were included in the past surveys. As in previous years, Ethernet is the dominant technology. Over 30% of the respondent schools are now using newer technologies such as Fast Ethernet and Wireless. Fifteen and fourteen percent of the schools indicated using FDDI and ATM (Asynchronous Transfer Mode) high bandwidth technologies respectively. The use of Token Ring has declined steadily and is now at 13%, the same percentage of use as reported last year.

Protocols are the "hand shake" rules, the standards between computers that allow the transfer of data. As shown in Table 16, TCP/IP (Transmission Control Protocol/Internet Protocol), also referred to as the "Internet Protocol", is the dominant local area protocol and has increased from a low of 4% in 1991 to 95% this year. IPX (Internet Packet Exchange) has increased to 57% in 1998 from 18% in 1991. The percent of respondent schools using AppleShare declined between 1991 and 1997, but showed a slight increase since last year. Of the 228 business schools specifying their LAN protocols, 67 (30%) listed supporting only one protocol, 81 (37%) supported two different protocols, 56 (25%) supported three, 15 (7%) support four, and two supported five.

Network operating systems (NOS) allow users to log into a LAN from their personal computers and communicate with other LAN resources. Table 17 summarizes the responses and indicates that NT has taken the lead and is now used by 145 (64%) schools. The percent of schools using Novell declined from its dominant position of 78% in 1991 to 49% in 1998. Thirty-two percent of the schools reported using UNIX and 11% AppleShare.

Table 16
Local Area Network Protocols
(percent of schools)

Protocol	1991 N = 166	1993 N = 180	1997 N = 252	1998 N=228
TCP/IP	4%	54%	92%	95%
IPX	18	15	56	57
AppleTalk	49	43	26	28
NetBEUI				25

Table 17
Local Area Network Operating Systems
(percent of schools)

NOS	1991 N=166	1993 N = 180	1997 N = 252	1998 N = 228
NT			60%	64%
Novell	78%	74%	70	49
UNIX	11	16	39	32
AppleShare	41	64	16	11

5.2 Access to Network Resources

Given the wide spread personal ownership of desktop computers and the large increase in ownership of portable systems, it is important that faculty and students can access networks on and off campus. Eighty-three percent of the business schools indicated providing network access from off campus, 11% through their own modem pool, 67% through the university modem pool, and 25% through commercial Internet service providers. Telnet is used by 69% of the schools, SLIP (Serial Line Internet Protocol) and PPP (Point-to-Point Protocol) by 17%, and RAS (Remote Access Services) by 4%.

Unlike the general public that must rely upon commercial ISP (Internet Service Provider) for Internet access, the business schools are usually connected to their campus networks and then through them to the Internet at large. However, five schools subscribe to AOL, four to CompuServe, three to Prodigy, and four to MS Network. Thirty schools subscribed to other online services including Dow Jones, Lexis/Nexis, Bloomberg, PeachNet, IBM Global Network, and FirstClass among others.

As shown in Table 18, 97% of the schools provide PC network access and 64% laptop access from faculty offices.

Table 18
Local Area Network Access
(percent of schools)
N = 228

Location	PCs	Laptops
Faculty Office	97%	64%
Admin office	96	50
Computer Labs	96	42
Classrooms	84	51
Library	72	27
Dormitories	54	28
Group Room	43	32

5.3 E-mail Usage

Electronic mail (e-mail), originally introduced in the late 1960s as an esoteric mainframe application, migrated to minis during the 1980s, and became more generally available when microcomputers were networked during the late 1980s. Commercial systems have now allowed e-mail to become ubiquitous. Table 19 compares this year's e-mail usage with that since 1991, and shows that for both the faculty and staff e-mail has become almost universal. The greatest increase among the students is shown for the MBAs with the schools now reporting that 87% of their MBAs now use e-mail regularly. Two hundred twenty-eight respondents rated the effectiveness of their current e-mail in facilitating communications at their school. The average response on a scale of 1 (not effective) to 5 (very effective) was 4.3.

Table 19
E-mail Usage
(percent of users)

User group	1991 N = 166	1993 N = 180	1997 N = 252	1998 N = 228
Faculty	38	47	84	92
Staff	44	54	87	94
Undergraduate	17	17	75	77
MBA	26	28	66	87

6. Web Site Resources and Uses

Together with distance learning, the Internet and the Web are becoming one of the business schools' most frequently used application resources. An increasing number of faculty members are using the Internet and the Web resources for classroom support. More and more students are using these resources for business research. However, the use of the Internet and Web can be independent of a school's own Web infrastructure and content. Anyone with a computer and modem can access the Internet and "surf" using an Internet account available from either the school or a commercial ISP (Internet Service Provider) such as AOL, EarthLink, or AT&T.

This section summarizes the Web site resources and uses available at the respondent business schools, comparing where possible information from the previous two surveys. The first area of this section concerns the Web infrastructure and covers the types of media in current use on the schools' Web sites, organizational support issues such as responsibility for the Web site and its support team, Web site servers, and development tools. The final section details the content available on the business schools' Web sites, the use of the Web for classroom support, and other related services available on the schools' Web sites

6.1 Web Site Resources, Support, and Development Tools

Table 20
Web Site Media
(percent of schools)
N=224

%	Media
100	Text
98	Graphics
29	Animation
23	Audio
15	Video

Two hundred and twenty-four (98%) schools indicated having a Web site, provided their URL, and answered the series of questions regarding their Web environment. As could be expected, all of the schools use text on their Web site. As can be seen in Table 20, a large percent, 96%, are also now using graphics capabilities, increasing from only 23% in last year's data. However, the other media are showing increasing usage with animation features now reported by 29% of the schools (up from 5% last year) and audio capabilities reported by 23% (also up from 5% last year). Video is the least common media, being reported by only 15% of the schools (up from 6% last year).

The business schools were asked to indicate those organizational areas responsible for their school's Web site. These responsibilities include development/getting started, updating content/use, and site analysis for the External/Public Web site as well as for the schools' own Intranets. Table 21 summarizes the responses. Two hundred and eight schools (90%) provided information about their External/Public Web site. Of these, the business school itself held primary responsibility rather than the central campus or some outsourcer. It is interesting to note that 72% indicated that

their faculty and 64% their administrative staff shared the primary responsibility, followed by computing services (52%), and their students (39%). However, when the data is considered by responsibility category, computer services showed more emphasis on development/getting started, together with use and site analysis, whereas the faculty and administrative staff were more involved with updating the contents of the Web site and keeping it current.

Table 21
Web Site Responsibility
(percent of schools)

	External/Public N=208 %	Intranet N=103 %
B-school		
faculty members	72	50
administrative staff	64	60
computing services	52	66
students	39	26
external affairs	19	11
Central campus group(s)	21	14
Outsourced	8	6

Of the one hundred three schools (44%) which provided information about their Intranet Web site, the business school itself again held primary responsibility, rather than the central campus or some outsourcer. However, in contrast to the External/Public Web site, computing services (66%) and the administrative staff (60%) were indicated as holding the primary responsibility, followed by faculty (50%), and the students (26%). When this data was considered by responsibility category, the computer services staff was the most heavily involved in not only developing and getting the Intranet started, its use and site analysis, but also for maintaining its currency.

Forty-four percent of the schools with a Web site indicated having a formal Web team, and almost all of these schools delineated its membership. As can be seen in Table 22, the predominant member of this team was the site manager, indicated by 72% of the schools. Sixty-three percent identified having Web site designers, 61% programmers, and 24% traffic managers. However, the FTE varied by position. The average Web team size was 1.80 FTE, generally

Table 22
Web Site Team
N=96

%	Web team function	Average FTE	Min FTE	Max FTE
72	Site manager, responsible for content, policies, design standards	.68	.30	5.5
63	Web designer/layout	.79	.26	3.5
61	Programmer	.76	.26	4
24	Traffic manager/coordinator	.48	.10	1
	Total Web team	1.80	.25	10

comprised of a two-thirds FTE site manager, a three-quarter FTE Web designer, a three-quarter FTE Web programmer, and about a half time traffic manager. Note that for some schools, the site management responsibility is shared by more than one individual.

However, having a business school Web

site does not necessarily mean that the business schools owns a Web server as central campus facilities may also be used. Sixty-one percent of the business schools (139) indicated owning a Web server. The leading platform for these Web servers was NT followed by UNIX. Since Microsoft IIS (Internet Information Server) is tightly coupled with NT, IIS was the business schools' choice of Web server followed by Netscape. Apache, a freeware follows Netscape.

Together with the establishment of the basic support team and hardware infrastructure, there must also be a simultaneous focus on the actual design and development of the Web pages. Table 23 displays the various editors, graphics, and programming tools used by the respondent schools to create their pages and write applications. Compared to last year, usage of all of these development tools has increased. For instance, the percent of schools using MS Frontpage has increased from 52% in 1997 to 74% in 1998, Netscape Gold from 29% to 67%, and MS Word from 5% to 28%. The use of graphics tools has increased as well. The percent of schools using Adobe PhotoShop has increased from 11% to 67% and Corel Draw from 5% to 33%. However, the largest increase shown in Table 23 is in the usage of programming and database tools. An increasing number of Web pages are including executable scripts and applets. JAVA is now used

by 49% of the respondent schools (increasing from only 5% last year), followed by Virtual Basic at 45% (increasing from 3%), and PERL at 33% (increasing from 3%).

Table 23
Web Site Development Tools
(percent of schools)

	1997 N=197	1998 N=212
Editor Tools		
MS Frontpage	52	74
Netscape Gold	29	67
MS Word/Internet Assistants	15	60
WordPerfect	5	28
Adobe PageMill	10	23
Hotdog Pro	15	19
Hotmetal	7	12
Claris Homepage	6	12
BBEdit	4	6
Graphics Tools		
Adobe PhotoShop	11	67
Paint Shop Pro		37
MS Photo Editor		34
Corel Draw	5	33
Harvard Graphics		8
Programming/database tools		
Java	5	49
Visual Basic	3	45
PERL	3	33
C/C++		29
Dynamic HTML		25
Allaire ColdFusion	8	14
MS Internet Studio	3	10

materials (28%) and online courses (19%), job postings (16%), and student and staff pages (both 11%). The higher overall percent of Internet responses indicates that except for those specific areas considered to be proprietary, the business schools want to disseminate information about their school widely.

Two hundred seven schools estimated the percent of their business school faculty using the Web for classroom support. Of these, only three responded that their entire faculty is using the Web for classroom support and six none. On average it was estimated that 29% of the faculty used the Web for classroom support. Most schools provide basic support such as posting syllabi, class notes, shared files, and handouts, some adjunct materials and grade posting, and a few schools integrated tools for chat and/or other communications formats. Some faculty are also using online discussion groups to bring students together with real-world managers to discuss management issues, problems, and solution techniques. Other examples of classroom Web use are course textbook support on the Internet and accessing financial data from firms.

The survey questionnaire also asked about Web-related services provided by the business schools. Table 25 summarizes these responses for the business schools and the central campus data for this year, sorted by the business school responses. In all instances, the percent of central

6.2 Web Site Contents and Uses

In addition to the use of the Internet for public network access, many business schools are using an Intranet (an internal Internet) to disseminate internal information as well as to facilitate collaborative work. Table 24 compares Internet and Intranet content availability for this year's data, sorted by the Internet response percentages. Interpreting the data in this table shows the highest percentage of Intranet responses to be for those context areas that may be considered proprietary or appropriate only to the specific business school. These include teaching

Table 24
Internet and Intranet Web Site Content Availability
(percent of schools)
1998 N=228

	Internet Access	Intranet Access only
Faculty personal pages	71%	6%
Catalog materials	71	6
Faculty resume pages	67	10
Student club materials	62	6
Teaching materials (syllabi, exams)	59	28
Faculty current research	56	5
Alumni news	50	8
Student newspapers, class schedules	45	11
Student personal pages	36	4
Staff personal pages	35	6
Student resume pages	32	11
Job postings	32	16
Staff resume pages	26	7
Online courses	11	19

campus responses are larger than for the business schools. The indications are, therefore, that these Web-related services are perceived to be the responsibility of the central campus. The single exception is for chat group services that are just about the same for the business school and the central campus.

7. Distance Learning and Teleconferencing Resources and Uses

The data in this survey shows that distance learning is an information technology application that is in a rapid growth phase. For the last two years, distance learning had been merged into two short questions focusing on video teleconference equipment availability and its use in support of either classroom instruction or distance learning. In the Thirteenth Survey (1995), the first year distance learning began to be tracked, only 19% of the respondent business schools indicated some application of video teleconference equipment in support of classroom instruction or distance learning. Last year, in the Fourteenth Survey (1996), 51% of the schools indicated use of this technology.

This year, distance learning was clearly separated from classroom instruction. Thirty-nine percent of the respondents (88) indicated that their school offered distance learning programs and answered a series of questions specific to these programs. The concept of distance learning as used in this survey encompasses an instructor broadcasting classroom program material and interacting with students at remote locations. This section details multiple issues related to the distance learning programs - the organizational units providing the programs, the target user groups, fee structures, faculty roles, pedagogical styles, technological formats, and development barriers. The section concludes with the responses from the total sample about the availability and more general use of their video teleconference equipment and groupware/on-line software.

7.1 Distance Learning

Table 26 compares the respondents to the distance learning section of the questionnaire with the total sample and allows an understanding of the demographics of these distance learning schools. With an emphasis on utilizing information technology in a more expansive scope, it is reasonable, as shown in the table, that the distance learning schools have allocated more resources to their computer operating budget. On average, the data shows that the distance learning schools are spending \$481 dollars per student as compared to \$359 for the total sample. The commitment of the business school policy makers is also reflected in a higher computer/school operating budget ratio, a mean of 4.5% as compared to the total sample mean ratio of 3.5%.

The demographics show that the distance learning schools are surprisingly similar to the total sample and that no one particular set of schools (such as the top quartile schools) is attempting to capture the niche in this emerging form of education. The only differences are a slightly higher representation of publicly supported schools and those schools with FTEs greater than 1000 and less than 3000. The infrastructure statistics are also similar.

The organizational units that generally provide distance learning are either the business school, offering their courses as part of the regular curriculum, or extended education. These various options for the distance learning programs are shown in Table 27 subdivided by program level (undergraduate and graduate) and organizational unit. For the undergraduate programs, most (48%) of the distance learning is in the form of separate courses offered as part of the regular curriculum. In contrast, although there is a considerable percent (36%) of the MBA distance learning being offered as separate courses as part of the regular degree program, a larger percent (47%) of the distance learning involves complete degree program packages. The business schools

Table 25
Web-Related Services
(percent of schools)
N = 228

	Business School	Central Campus
Access/surfing training	53%	73%
Page development training	48	80
User guide/documentation	37	54
Chat groups	26	27
Online admission form	23	47
Class registration	13	35
Bookstore purchases	1	10
Commercial server/payments	1	8

report very little distance learning involving either certificate or training programs at either the undergraduate or the MBA level.

Table 26
Distance Learning Respondent Demographics
N = 88

	Total Sample N=232*	Distance Learning Respondents n=88*
Financials		
Computer dollar per student (average)	\$359	\$481
(median)	\$107	\$85
(range)	<1-6299	<1-3135
Computer operating budget (1,000s) (mean)	460	611
Computer/school operating budget (mean)	3.5%	4.5%
Demographics		
Type of school: public (percent)	72	82
Degrees offered: (percent)		
Undergraduate only	6	6
Undergraduate & graduate	80	82
Graduate only	10	9
No data	4	3
Student enrollment (FTE): (percent)		
Less than 1000 students	35	25
Between 1000 and 2000	28	34
Between 2000 and 3000	17	20
More than 3000 students	16	17
No data	4	3
Student FTE (mean)	1733	2019
Infrastructure		
Students per micro density (median)	17.08	17.14
Faculty per micro density (median)	.89	.87
Students per staff (median)	271	296
* n changes based on item responses		

Table 27
Distance Learning Providers
N = 88

	Undergraduate		Graduate	
	Regular curriculum	Extended Ed	Regular curriculum	Extended Ed
Separate courses offered by	48%	10%	36%	13%
Degree programs offered by	14	5	47	17
Certificate programs offered by	1	3	7	8
Training programs offered by		3	2	6

The target user groups identified by the business schools offering distance learning programs are shown in Table 28 and may be described as primarily part time students who are not in close proximity to the business schools' actual locations. This pattern follows the stereotypical understanding of the user group that might be interested in participating in this format to achieve their educational goals. It is surprising to note, however, that there is a large percentage of full time students who are in close proximity to the business schools' physical locations, indicating that the concept of distance learning is expanding beyond its early application, that is of providing education to distance learners. This data supports those who suggest that the concept of distance learning now seems to have been expanded to encompass the provision of a convenient education. This convenience is seen in the scheduling of educational sessions, location of education, and in the speed of education, and referenced by the phrase "any time, any place, and at any pace."

Target user groups not fitting into the four categories as given in Table 28 were identified by the respondents and included specific user groups such as multiple campuses, a business school's alumni, the general business community, students whose jobs may require extensive travel, and employees of corporate partners.

In support of this expanded interpretation of distance learning, 80% of the respondent schools indicated that students enrolled in their regular on-campus programs were also allowed to enroll in their distance learning courses.

Several specific exceptions were noted. Some schools restricted their regular MBAs from enrolling in distance learning programs and some schools restricted a specific major, such as MS CIS, from enrolling in the distance learning programs.

More variance, however, was seen with regard to the fee structures. Only 61% of the schools indicated no difference in the fees paid by their regular students and their distance learners. Some schools indicated that the fee structure differed only at the MBA level. Others explained that the distance education MBA was seen as a premium degree and therefore should be more expensive. Schools also explained the difference in fees as related to the courses falling under Extended Education, the fees being set differentially by course, being based on a cost plus profit basis, requiring more extensive infrastructure, and being higher at corporate locations.

When asked to identify the barriers that encumbered the development of distance learning, lack of funds, a common barrier to most any endeavor, was identified by 63% of the respondent schools. Table 29 shows how the schools perceived other barriers common to most any project. The only surprising response was the very low percentage of schools that considered that distance learning was beyond the scope of their business school's current mission. This statement could be interpreted in several ways. Earlier surveys have indicated that many business schools do not have, or are in the process of developing, a formal mission statement. Thus for these schools, this response could be interpreted as beyond the scope because there was no understanding of any mission for its inclusion. Alternatively, for business schools with a mission, it could be interpreted that distance learning was an option, yet the other barriers were so great as to prevent development. Other barriers identified by the schools involved union restrictions, resistance to change, lack of qualified faculty, and politics.

Faculty support and training are also shown as rather significant barriers to the development of distance learning programs in Table 29. Table 30 identifies the variety of roles that the business schools' full time faculty play in distance learning programs. The large response percentages for most of these roles indicates the extent to which some of the full time faculty have obviously embraced this emergent form of education. However, these large response percentages also assist in understanding more fully how faculty support and training can be perceived as barriers for the development of distance learning programs. All of these roles involve an extensive amount of time and energy on the part of the full time faculty, and as limited resources, this time and energy must be taken away

Table 28
Distance Learning Target User Groups
N = 88

%	Target user group
80	Students not in close geographic proximity
80	Part time students
59	Full time students
49	Students in close geographic proximity

Table 29
Barriers to Distance Learning
N = 88

%	Barrier
63	Lack of funds
56	Lack of faculty training
52	Lack of technical support
49	Lack of faculty interest
35	Lack of equipment
25	Lack of support from central administration
22	Lack of facility space
15	Lack of vision/leadership
6	DL beyond scope of school's current mission

Table 30
Full Time Faculty Roles in Distance Learning
N = 88

%	Full time faculty role
84	Curriculum development and revision
66	Governance and supervision of the programs
63	Teach all the distance learning courses
44	Teach only some courses
41	Evaluation of technology
44	Training other colleagues

from their other business school commitments.

Considering current pedagogical styles may also derive a fuller understanding of the degree of faculty involvement in distance learning. Table 31 shows that the largest percentage of schools indicated that their faculty and students interacted through the use of e-mail (89%) and fax (65%). Lower interaction response percentages were seen with video and audio conferencing, yet these could be expected because of the requirements of more extensive technological infrastructures. Thirty-five percent of the schools also indicated more specific forms of faculty-student interactions. These included a wide variety of Web-based examples (exams, quizzes, chatrooms, discussion groups, and distribution of course materials) and the use of groupware or other proprietary software. Less high tech examples included campus visits, personal meetings, simple telephone conversations, and the use of everyday mail for homework and diskette exchange.

Seventy-eight percent of the respondent schools also indicated that their distance learning programs involved some sort of collaborative projects, with these schools suggesting that on average, 49% of their distance learning classes required some sort of group effort. While many schools indicated that there was very little difference between their on-campus classes and their distance learning classes with regard to collaborative projects, multiple schools stressed the importance of distance collaboration for future managers and emphasized their strong emphasis for student experience in virtual teams. A smaller percent of the schools, 31%, indicated offering interactive Web-based courses. Again, this smaller percent could be expected simply based on the requisite degree of technological infrastructure. These schools indicated using primarily WebCT and LearningSpace to develop their interactive Web courses, although FrontPage and Authorware were also identified by several schools.

Table 32 summarizes the various formats used to support the delivery of the distance learning. This year there were five differing formats offered by at least 60% of the schools, including the more technological demanding Web-based materials together with lower technology solutions such as e-mail, video-based courses, and simple off campus sites taught in a more traditional manner. In summary, this table emphasizes the wide variety of approaches being used to facilitate distance learning.

Table 31
Distance Learning Faculty-Student Interactions
N = 88

%	Mode of interactions
89	E-mail
65	Fax
56	Video conferencing
38	Telephone based audio conferencing

Table 32
Formats Used to Facilitate Distance Learning
N = 88
(percent of schools)

%	Formats
69	Course outlines and assignment postings
67	E-mail correspondence for students, professors and tutors
67	Internet based materials (WWW)
64	Video based courses
63	Off campus classroom sites with instructors
56	Text-based instructional materials
48	Lectures posted on-line
46	Lectures posted on-line
40	Student chat rooms on-line
36	Video conferencing
31	On-line quizzes or tests
27	Correspondence: audio and/or text based materials sent and received by students and professors via regular mail
24	Video tapes: rented, mailed to, and/or purchased by student to view at home
24	On-line conferencing
19	File sharing
17	Multimedia (CD-ROM cases)
7	Prerecorded lectures transmitted via satellite to extension classrooms or student's home
7	CD-based courses

7.2 Teleconferencing

Teleconferencing was presented as an area distinctly separate from distance learning. As can be seen in Table 33, 218 (94%) of the business schools responded about teleconferencing either at their business school or through the central campus. Portable equipment is available at 15% of the schools and 8% via central campus resources. Permanent classroom or studio set-ups are available at 30% of the schools and on 74% of the campuses. Over eight different

Table 33
Video Teleconference Equipment Availability

	At Business School N = 216	Through central campus N = 194
Portable system	15%	8%
Classroom/studio	30	74
In faculty office	6	2
None Available	49	16

manufacturers were listed for the equipment. PictureTel and Vtel were most commonly specified. All the other manufacturers were mentioned only once or twice each.

As can be seen in Table 34, the most common usage of the teleconference equipment was on an occasional basis, especially for use in the more traditional sense of bringing distant speakers into the classroom. A lesser percent of the schools indicated

using this more traditional application on a regular basis. The schools also indicated that their teleconferencing equipment was being used occasionally (39%) or regularly (8%) to facilitate formal distance learning programs.

Twenty-three schools indicated having a permanent partner to whom they were providing video conference courses. Eleven of these specifically identified other campuses or community colleges with which they were partnered, eight identified multiple corporations, several indicated that they were in the process of negotiation, and one commented that their partnerships were constantly changing. Fifty-nine schools indicated that their video conferencing equipment was multi-point, with a range of between 2 and 12 points and an average of 3.4 points.

Table 34
Video Teleconference Applications
N = 124

%	Usage
82	Occasionally for teleconferences, guest speakers to classes, etc.
39	Occasionally for class instruction offered at distance location
30	Regularly for teleconferences, guest speakers to classes, etc.
8	Regularly for class instruction offered at distance location

7.3 Groupware and On-Line Software

Groupware products consist of software tools that support and facilitate file sharing, file transfer, as well as communications between team members and groups. These software products are especially critical for on-line collaborative efforts. Video conferencing tools, such as Microsoft NetMeeting and Whitepine CUSeeMe, allow face-to-face discussions. Table 35 summarizes the more common groupware and on-line software currently used by the business schools to support their distance learning and teleconferencing efforts.

Table 35
Groupware and On-line Software
N = 163

%	Groupware/software
63	Netscape Communicator
33	Microsoft Exchange
29	Microsoft NetMeeting
15	Lotus Domino
14	Groupwise
9	Whitepine CUSeeMe
8	Netscape Suite Spot

8. Innovations

The schools were asked to describe their innovative and/or exciting uses of computer information technology and distance learning. Sixty-nine schools providing brief statements, all of which have been included as Appendix B. As shown in Table 36, these innovative activities were clustered into five categories. The number of schools in each category is listed.

Table 36
Innovative Activities at Business Schools
N = 69

Number of schools	Category
26	Distance learning
14	Technological environment
14	Web use
11	Curriculum initiatives
4	Administrative applications

Business school	Type	FTE			Faculty	Comp op budget (1000s)			Comp op budget/ sch budget			Densities			Micro ownership		
		Ugrad	MBA	PhD		EMBA	stud	budget	sch	comp	stud/	stud/	fac/	U	M	E	
							1000s	budget	budget	stf	micro	micro	micro	U	M	E	
U of AKRON	pub	1025	254		87	65	50.8	5.1	171	6.88	1.05						
ALABAMA A&M U	pub	525			37	28	53.3	1.2	1050	9.55	0.98						
U of ALABAMA, HUNTSVILLE	pub	549	90		34	114	178.4		128	9.13	0.91						
U of ALASKA, ANCHORAGE	pub	800	300		24	250	227.3	2.6	220	2.93		rec	rec				
U of ALASKA, FAIRBANKS	pub	390	20		59	143.9	2.2		273	9.53	0.89						
APPALACHIAN STATE U	pub	1945	100		84	16	7.8	0.3		75.74	1.03						
U of ARIZONA	pub	3340	450	127	25	220	331.9	6.2	196	8.44	1.35	rec	rec	rec			
ARIZONA STATE U	pub	2500	1000	100	200	1000	277.8	5.6	150	9.00	0.67	rec	rec	req			
ARIZONA STATE U WEST	pub	1022	386		46	45	32.0	1.1	805	67.05	0.74	rec	rec	rec			
U of ARKANSAS	pub	2415	150	40	80	351	134.7	4.0	521	17.14	0.60						
BALL STATE U	pub	1966	111		96	53	25.5	0.6		8.31	0.89						
BARRY U	priv	375	120		30	10	20.2	0.4		1.30	0.78	rec	rec	rec			
BAYLOR U	priv	2717	152	16	41	410	142.1	1.7	324	22.90	0.66	rec	rec	rec			
BERRY COLLEGE	priv	200	50		19				63	8.06	1.03	rec	rec	rec			
BLOOMSBURG U	pub	1498	28		48					31.79	0.84	rec	rec	rec			
BOSTON U	priv	1481	855	75	106	715	296.6	3.7	96	15.55	0.84	rec	rec	rec			
U of BRIDGEPORT	priv	222	175		19	48	120.9	3.4	99	19.85	1.36						
BRIGHAM YOUNG U	priv				130					1.13		rec	rec	rec			
BRYANT COLLEGE	priv	2334	253.5		198	1500	579.7	2.9	104	7.82	1.17						
BUTLER U	pub	640	125		40	40	52.3	1.1		1.00		rec	rec	rec			
U of CAL, BERKELEY	pub	550	365	85	108	1400	1400.0	5.6	37	5.03	1.05	rec	rec	rec			
U of CAL, IRVINE	pub		242	36	48	970	3489.2	6.0	16	0.55	0.46	req	req	req			
U of CAL, LOS ANGELES	pub		1040	70	97	2340	2108.1	6.2	40	12.33	0.52	req	req	req			
U of CAL, RIVERSIDE	pub	1433	151		36	28	17.7	0.9	1584	28.80	0.95						
CAL STATE U, BAKERSFIELD	pub	586	73		27					0.91							
CAL STATE U, CHICO	pub	1623	32		55	155	93.7	2.5	473	12.73	0.89						
CAL STATE U, DOMINGUEZ HILLS	pub	800	200		52	180	180.0	4.6	333	1.24	0.90	rec	rec	rec			
CAL STATE U, SACRAMENTO	pub	3362	579		113	30	7.6		2627	89.57	0.90						
CAL STATE U, FULLERTON	pub	5000	500		155	350	63.6	2.8	444	28.50	19.38						
CAL STATE U, LOS ANGELES	pub	1570	170		80	108	62.1	1.1	870	10.88	0.94						
CAL STATE U, NORTHRIDGE	pub	2399	122		130	271	107.5	2.3	720	11.01	1.04						
CAL STATE U, FRESNO	pub	2250	200		101	245	100.0	3.5	613	12.37	1.40	req	req	req			
CAL STATE U, SAN MARCOS	pub		115		32					0.97	0.53	rec	rec	rec			
CARNEGIE MELLON U	priv		660	80	114	490	662.2	4.2	53	3.87	0.53	req	req	req			
CASE WESTERN RESERVE U	priv	258	810	71	86	1285	1128.2	4.2	44	9.99	0.45						
U of CENTRAL FLORIDA	pub	5183	657	5	48	262	44.8	1.8	531		0.69						

JACKSON STATE U	pub	1929.6	178.5	38	100	47.4	3.3	496	35.73	0.59	rec
JACKSONVILLE STATE U	pub	730	56	32	100	31.9	1.3	1043	12.28	0.86	rec
JAMES MADISON U	pub	2980	150	100	60		1.0		1.22	0.61	rec
KANSAS STATE U	pub	2437	286	73	120	42.9	1.5	147	22.00	0.80	rec
KENT STATE U	priv	461	62	20	1				4.93	1.03	rec
KING'S COLLEGE	pub	450		16	1	2.2	0.1		45.00	1.07	rec
LANDER U	pub			22							
LONGWOOD COLLEGE	pub	1727	434	50	256	111.8	2.4	327	26.02	0.89	rec
LOUISIANA STATE U	pub	1008	574	46	77			233	19.38	0.94	rec
U of LOUISVILLE	priv	600	183	33	69	88.1	2.5	392	46.06	0.86	rec
LOYOLA U	pub	1727	68	51	53	29.5	1.1		51.29	8.50	rec
MANKATO STATE U	pub	1210	394	59	69	43.0	1.2	321	18.87	0.62	req
MARQUETTE U	priv	200	1100	100	1000	714.3		112	13.46	0.82	req
MASSACHUSETTS INST of TECH	pub	847	96	24	15	15.9	0.8	754	18.86	1.09	req
MC NEESE STATE U	priv	600	410	40	750	742.6	6.3	144	22.44	1.16	rec
MERCER U, MACON CAMPUS	pub	2800		158					2.16		rec
MET STATE COLLEGE of DENVER	priv	4095	99					341	27.41		rec
MIAMI U	pub	565	1905	113	1600	631.9		72	9.63	0.53	rec
U of MICHIGAN	pub	5200	402	130	800	138.8	2.9	886	18.47	0.61	rec
MICHIGAN STATE U	priv	390		13	20	51.3	1.3		10.83	1.00	rec
MILLIKIN U	pub	2592	231	36	61	48.3	1.4	596	168.18	0.88	rec
U of MISSOURI, COLUMBIA	pub	358	510	21	258	293.5	3.3	575	12.93	1.03	req
U of MISSOURI, KANSAS CITY	pub	974	20	29	7	7.0	5.0		0.73		req
MONTANA STATE U	pub	822	29	23							
MOORHEAD STATE U	pub	1392	133	61	64	42.0	1.3	2033	12.20	1.10	rec
MURRAY STATE U	pub	450		70	600	1333.3	16.2	180	9.00	0.46	rec
NAVAL POSTGRADUATE SCHOOL	pub	2800	140	65	1	0.3	0.0	243	10.96	0.59	rec
U of NEBRASKA, LINCOLN	pub	1877	354	50	180	80.7	3.3	248	22.31	0.65	rec
U of NEBRASKA, OMAHA	pub	1800	200	95				667	19.42	0.78	rec
U of NEVADA, LAS VEGAS	pub	940	210	55	200	173.9	3.6	192	19.83	1.19	rec
U of NEW MEXICO	pub	2533	650	42	98			531	31.83	1.03	req
U of NEW ORLEANS	priv	2300	3400	200	5500	945.0	5.2	115	20.07	0.59	rec
NEW YORK U	priv	500	130	26	15	23.8	1.2		70.00	0.96	rec
NIAGARA U	pub	600	529	132	1500	1263.7	4.6	37	10.06		rec
U of NORTH CAROLINA, CHAPEL HILL	pub	1747	244	69				3982	0.80		rec
U of NORTH CAROLINA, GREENSBORO	pub	2000	220	85	536	236.1	6.2	239	13.12	0.98	rec
NORTH CAROLINA STATE U	pub	1400	45	49	18	12.5	0.4	1445	21.89	0.88	rec
U NORTH DAKOTA	pub	882	25	25	1.5	1.7	2.2		151.17	1.23	rec
NORTH DAKOTA STATE U	pub	500		12					16.67	0.69	rec
NORTH GEORGIA COLLEGE & STATE U	pub										

TRUMAN STATE U	pub	1021	14	27	3	2.9	2.2	207.00	0.90	rec	rec
NORTHEASTERN ILLINOIS U	pub	1118	63	34	20	16.9	0.9	4724	118.10	0.83	req
U of NORTHERN COLORADO	pub	719		41	282	392.2	7.8	169	6.85	0.74	rec
NORTHERN ILLINOIS U	pub	3381	702	97	150	36.6	1.5	1025	28.68	0.84	rec
U of NORTHERN IOWA	pub	2428	72	82	172	68.8	2.0	1000	17.01	1.09	rec
NORTHWESTERN STATE U of LOUISIANA	pub	1056		30				211	11.73	1.20	
NOVA SOUTHEASTERN U	priv		1807					189	491.40		
OHIO U	pub	1750	35	70	350	196.1	4.6	238	11.90	0.69	rec
OHIO STATE U	pub	2005	436	98	584	234.4	2.4	80	10.38	0.80	req
OKLAHOMA STATE U	pub	2896	549	88	195	55.0	1.8	3544	44.30	0.72	
OLD DOMINION U	pub	1800	500	86	200	85.7	2.9		77.83	1.08	
U of PENNSYLVANIA	pub	2206	1628	238	5500	1371.2	4.6	57	22.28	0.94	rec
PENNSYLVANIA STATE U	pub	5336	281	150	1562	274.5	7.3	184	20.25	0.75	rec
PEPPERDINE U	priv	484	1399	115	937	497.6	4.0	111	6.13	1.49	
PENN STATE U, MALVERN	pub										
PFEIFFER U	priv	350	450	22	250	312.5	6.3	267	24.24	1.00	rec
PITTSBURG STATE U	pub	786	118	37					75.33	1.12	
U of PITTSBURGH	pub	450	446	98	500	530.2	2.8	86	14.07	0.84	rec
PRAIRIE VIEW A & M U	pub	585	77	28							rec
U of PUGET SOUND	priv	325		13							rec
PURDUE U	pub	2209	337	106	630	237.2	4.0	166	15.62	1.00	rec
RENSELAER POLYTECH INST	priv	518	292	45	120	140.7	1.6	190	12.19	0.80	req
U of RHODE ISLAND	pub	1336	186	55	3	1.9	2.9	1559	27.35	0.93	req
U of RICHMOND	priv	494	246	45	3	4.1	0.4	740	67.27	0.83	req
RIDER COLLEGE	priv	1100	236	74					17.58	1.07	
U of ROCHESTER	pub		841.6	57	15			68	3.72	0.39	rec
ST BONAVENTURE U	priv	533	164						697.00		rec
ST MARY'S U	priv	700	160	32				3440	0.89	0.89	rec
SALISBURY STATE U	pub	1200	200	32					0.80		rec
SAM HOUSTON STATE U	pub										
U of SAN DIEGO	priv	900	400		11	8.5	0.1	2600			
SAN DIEGO STATE U	pub	3836	739	108	54	11.8	0.7				
COASTAL CAROLINA U	pub	1015			179	176.4	7.7	68	3.38		
SEATTLE U	priv	550	700	50	50	40.0	1.7	313	13.89	1.19	
SEATTLE PACIFIC U	priv	230	100	22	85	257.6	4.7	330	15.71	1.10	rec
SHIPPENSBURG U	pub	800		41	20	25.0			11.43	0.90	
U of SOUTH CAROLINA	pub	2325	984	134	544	159.8	3.1	296	20.27	0.91	rec
U of SOUTH FLORIDA	pub	2333	563	145	510	175.7	3.6	209	17.08	1.06	rec
SOUTHEAST MISSOURI STATE U	pub	850	35	36	20	22.6	13.6	885	4.92	0.71	rec
U of SOUTHERN CALIFORNIA	priv	3850	1592	294	2300	419.2	2.5	183	19.88	1.67	rec

SOUTHERN ILLINOIS U, EDWARDSVILLE	pub	672	361	57	50	48.4	1.1	0.81	
U of SOUTHERN INDIANA	pub	1416	112	36				15.28	1.00
SOUTHERN METHODIST U	priv	1800	1000	185				22.22	2.40
SOUTHWEST MISSOURI STATE U	pub	2437	127	89				7.33	0.79
SOUTHWEST TEXAS STATE U	pub	3021	314	90				32.70	0.95
U of SOUTHWESTERN LOUISIANA	pub	2250	150	79				17.65	0.95
STATE U of NEW YORK, BINGHAMTON	pub	904	2998	36				391.40	0.47
STATE U of NEW YORK, BUFFALO	pub	1151	610	58				17.53	0.89
STATE U of NEW YORK, STONY BROOK	pub	700	150	40				53.13	
SUFFOLK U	priv	928	515	54				12.77	1.11
SYRACUSE U	pub	1078	380	31				22.98	0.80
U of TENNESSEE, CHATTANOOGA	pub	1500	320	18				130.00	0.85
U of TENNESSEE, KNOXVILLE	pub	2515	256	60				23.36	0.93
TENNESSEE TECHNOLOGICAL U	pub	1251.3	78.5	44				10.15	0.60
U of TEXAS, ARLINGTON	pub	4600	95	94				42.79	1.74
U of TEXAS, BROWNSVILLE	pub	600	120	29				7.20	0.97
U of TEXAS, DALLAS	pub	650	575	49				21.81	0.70
TEXAS A & M U	pub	6326	200	200				37.86	1.25
Texas A & M U, COMMERCE	pub	751	386	31				18.05	0.78
TEXAS SOUTHERN U	pub								
TEXAS TECH U	pub	3895	315	98				33.05	0.89
TULANE U	pub	310	264	42				5.63	0.32
UTAH STATE U	pub	2188	394	100				11.48	0.73
VALDOSTA STATE U	pub	1159	20.5	34				16.38	0.87
VANDERBILT U	priv	358	420	50				9.56	1.11
U of VERMONT	pub	500	10	65				12.38	0.84
U of VIRGINIA	pub	500	10	65				7.18	1.00
WAKE FOREST U, S B A	priv	389	32	30				3.92	1.08
U of WASHINGTON	pub	1500	300	130				7.02	1.00
WASHINGTON U	priv	691	467	72				20.56	2.36
WASHINGTON STATE U	pub	1541	317	94				8.46	0.67
U of WEST FLORIDA	pub	647	138	42				16.49	0.55
WEST GEORGIA COLLEGE	pub	1172	96	38				15.10	
WESTERN CONNECTICUT STATE U	pub	750	300	65				15.85	0.78
WESTERN ILLINOIS U	pub	1250	135	69				35.00	1.20
WESTERN KENTUCKY U	pub							47.76	0.88
WESTERN MICHIGAN U	pub	4800	850	102				22.42	0.86
WESTERN NEW ENGLAND COLLEGE	priv	2200	1000	140				355.56	4.12
WHITTIER COLLEGE	priv	120		5					0.71

WIDENER U	priv	600	350	50	125	131.6	3.1	63.33	1.14	rec	rec
WILLAMETTE U	priv		131	13	50	381.7	3.0	4.37	1.18		
COLLEGE of WILLIAM & MARY	pub	750	380	63	267	236.3	3.6	32.29	1.24	rec	req
WINTHROP U	pub	830.5	125	28	75	78.5	1.9	59.72	0.52	rec	rec
U of WISCONSIN, OSHKOSH	pub	1581	468	40	100	48.8	2.8	128.06	0.79		
U of WISCONSIN, PARKSIDE	pub	415	150	20				20.93	0.95		
U of WISCONSIN, WHITEWATER	pub	3166	253	80	50	14.6	1.0	45.59	0.89	rec	
WORCESTER POLYTECHNIC INSTITUTE	priv	160	80	22	25	104.2	0.2	17.14	1.22		
YOUNGSTOWN STATE U	pub	1205	111	12.5				14.95	0.74		
U of ALBERTA	pub	2200	105	38	12			16.16	0.48	rec	rec
U of BRITISH COLUMBIA	pub	1300	200	60	500	320.5	2.9	19.50	0.64	rec	rec
CONCORDIA U	pub	2658	400	23	40			55.02	40.67	rec	req
MC GILL U	pub	1404	418	16	46			10.47	0.51		
MC MASTER U	pub	1547	532	21	107	51.0	2.4	23.08	1.22	rec	
MEMORIAL U, NEWFOUNDLAND	pub	1150		50				12.50	0.96		
QUEEN'S U	pub	791	55	30	150	171.2	3.3	12.17	0.74	rec	req
SAINT MARY'S U	pub	1900	150	40	20	9.8	0.4	13.67	0.95		
SIMON FRASER U	pub	1291	130	2.7	142			13.96	1.25	rec	rec
U of TORONTO	pub		328	35	123			5.11	0.63	rec	rec
U of VICTORIA	pub	540	120	23	110	166.7	5.0				
WILFRID LAURIER U	pub	2334	315		77	29.1	1.2	132.45			
ESSEC	priv	649	2250	48	2000	689.9		20.27	2.62	rec	req
GROUPE ESC, GRENOBLE	priv	280	668	24	300	308.6	2.3	14.51	1.55	req	rec
GROUPE ESC, NORMANDIE	pub		600	35	500	833.3	8.3	17.65	6.68	rec	
GROUPE ESCP	pub	1200	290	40	84			11.46	0.76	req	
INSEAD	priv		600	35	5000	6299.2	8.0	6.17	0.59	rec	rec
ERASMUS U ROTTERDAM	pub	3575	340	40	1500	379.3	10.0	23.97		rec	rec
ASHRIDGE MANAGEMENT COLLEGE	priv		50	25				0.50		rec	rec
MANCHESTER BUSINESS SCHOOL	pub		374	64	63	6.74		6.74	0.85	rec	
U of WARWICK	pub	689	131	170	500	505.1	2.5	7.33	0.79	rec	rec
CHINESE U of HONG KONG	pub	1607	331	27	218	18.54		18.54	0.91	rec	
KEIO U	priv		90	20	12	133.3		1.07	2.70	rec	
KING FAHD U - PETROLEUM & MINERALS	pub	948	108	60	151	1436.8	4.9	42.24	1.46	rec	rec
EAESP-FGV -	priv	1376	213	151	2500	1166.2		5.91	0.38	rec	rec
INCAE	priv		343	81	400						
IESA	priv										

APPENDIX B
EXAMPLES OF INFORMATION TECHNOLOGIES
and DISTANCE LEARNING INNOVATIONS

ADMINISTRATIVE APPLICATIONS

University of Central Michigan

Frank.Andera@CMICH.edu

SAP Alliance

Timothy.Knickerbocker@CMICH.edu

Novell Academic Education Partnership

Purdue, Krannert Graduate School of Management

Assistant Dean G. Logan Jordan, 765-494-4370, jordan@mgt.purdue.edu

SAP University Alliance Program (SAP) is an integrated database to allow cross functional data retrieval. It reduces the redundancy of data storage and the difficulty of communication between separate departmental databases. It was the pursuit of leading edge information technology capabilities that led us to pursue a curricular implementation of SAP's R/3 software. Early in 1995 the School began a dialogue with recruiters, faculty, and key vendors concerning the practicability and desirability of such an implementation. The support of our key recruiters and dean's advisory council was resounding. The interest from our faculty was also strong. It was very clear that SAP had a role in our practitioner oriented curriculum. After frequent discussions with Hewlett-Packard and SAP AG about our ideas, Krannert became one of the founding members of SAP's University Alliance Program. After securing funding of an Enterprise Integration proposal, we began our SAP content delivery in the fall semester of 1997.

In addition to this curricular success, the school has been involved in many non classroom activities that have fostered faculty development, enhanced student learning, encouraged potential university alliance institutions, and increased overall understanding of Enterprise Resource Planning software. Activities representative of this effort include: training over 10% of the Management faculty in the school in SAP ERP software, winner in January 1998 of the first annual SAP research award (a \$75,000 research grant sponsored by SAP), founding member and key participant of the Indiana SAP User Group, presentations to University Alliance candidates at SAP's Sapphire '97 in Orlando, hosting tours and giving presentations about our Enterprise Integration initiative to several other large universities, and hosting a MS forum day presentation for all MS students by Great Lakes Chemical and Deloitte and Touche. The forum concentrated on the business case for EWRP, and the difficult implementation issues. Encouraging numerous additional ERP presentations by corporate contacts in our undergraduate and graduate classes. Representative firms include HP, Eli Lilly, Price Waterhouse, Ernst and Young, and Arthur Anderson.

SUNY, Buffalo

David Costello (716) 645-3210 dcostell@mgt.buffalo.edu

We are currently testing this Microsoft product which we hope will provide benefits in key areas. First, we hope the package will perform a software and hardware inventory of all workstations on our network. With this complete inventory, we will be able to keep a more accurate and current inventory for our school. It will assist the annual inventory process and when researching upgrades. Second, the inventory will provide us a starting point for developing a Year 2000 test plan.

Youngstown State University, Williamson College of Business Administration

Bart Kittle (330) 742-1882. bkittle@cc.yzu.edu

We have been testing an online classroom management software - IntraKal - which was developed by John A Kaliski of Mankato State University. The software facilitates online testing and student

submission of projects, increases communication through bulletin boards and chatrooms, and allows student access to grades and feedback. The software is accessed through the Internet - using any browser or net connection. Students do not pay extra fees to participate in program. It is licensed by facility user.

CURRICULUM INITIATIVES

Baylor University

<http://hsb.baylor.edu/ramsower/networking>

Using CBT courses instead of textbook.

Berry College, Campbell School of Business

Tom Farnham (706)236-1725 TFarnham@Berry.edu

We make heavy use of specially trained students called Info-Tech RATS. These students are trained in many classifications such as desktop repair, networking, Web and multimedia development. They have an opportunity to earn national certificates such as A+, CNE, etc. They are expected to do real-life work and put in between 15 and 20 hours per week.

Concordia University

Djd@VAX2.CONCORDIA.CA

Dr. Dennis Dicks, Director, Center for Instructional Technology

Faculty of Commerce and Administration (514)848-2762

Extensive use of groupware (FirstClass) as an instructional design tool in classes – Undergrad and MBA programs. Thinkpad university project for executive MBA starting September 1998.

CSUN

Wayne.smith@csun.edu

1. Will be building a centralized quiz processing application for core business skills (FV/PV, supply and demand, financial statements, etc.)
2. Will continue to expand our “on-demand” classroom lecture audio. This is a 100% automated system that captures, encodes, and serves realaudio lectures from our one large lecture hall.
3. Will continue major infrastructure upgrades to provide adequate bandwidth for two-way, interactive, synchronous audio/video conferencing.

CSUSM

Dr. David Janlowski (760) 750-4235 doctorj@csusm.edu

Teaches “Riding the Information Superhighway” as an asynchronous, distributed course.

<http://www.csusm.edu/public/jankowski/superhighway/syllabus.html>

U Detroit Mercy

Terry Drommi 313-993-3337

ISO 9000 lead assessor training via CD ROM and/or Internet. Complete course (16 hours), fully video based.

Oklahoma State University

Rick Wilson 405-744-9000 rlwilson@okway.okstate.edu

Our Master of Science in Telecommunications Management program has been proposed as a workshop for September Continuous Improvement Workshop.

Penn State University

Ginger L Breon (814) 865-1491

The Smeal College of Business Administration has pilot tested an electronic exam that promises to beat a serious numbers crunch, while helping to assure academic fairness at the same time.

Purdue, Krannert Graduate School of Management

Professor Alok Chaturverdi, 765-494-9048, alok@mngmt.purdue.edu.

Synthetic Environments for Analysis and Simulation (SEAS) emulates the Department of Defense's "war gaming" paradigm in business and economic settings. A synthetic economy in the SEAS environment is an extension of the more general concept of synthetic environments. It is the application of computer generated modeling techniques, here-to-fore used to create virtual realities (e.g. 3-D computer representations such as wire framing; rendering; texture, reflection, and environment mapping; ray tracing and animation) to create virtual economies in which executives may participate to test their strategies. These economies are situation-specific and based upon mathematical rule-sets derived from theoretical and empirical work. As with current synthetic environments, synthetic economies could ultimately take advantage of multi-sensory human interfaces such as data gloves, stereoscopic glasses, and data body suits to immerse the participant in a virtual economic world.

In recent times many innovative applications of Synthetic Environments have emerged. For example, the Department of Defense uses synthetic environments for training, acquisition, mission planning and wargaming; the Department of Energy is developing synthetic environments for simulating nuclear explosions; the aerospace industry has synthetic wind-tunnels; the automotive industry is undertaking virtual prototyping; the healthcare industry is pursuing tele-medicine and surgical planning; and, some currency and securities trading companies are now applying these techniques to visualize continually changing data in "real-time" to spot trends in current and price movements.

Seattle Pacific University

Dick Sleight SL8@SPU.EDU (206)281-2265

UUG! "Uswest Users Group" Regular group training meetings open to faculty/staff/students at no cost. Student tutors for faculty. Advanced students are matched with faculty for software training.

U Vermont

Nicole B. Chittenden 802-656-8327 chittenden@bsadpo.emba.edu

See <http://bsad.emba.uvm.edu> for on-line course evaluations, on-line faculty in print, intranet-on-line faculty activity report, on-line technology survey.

DISTANCE LEARNING**U Akron**

Dr. B. S. Vijayaraman, at (330) 665-1934, Vijay@uakron.edu

The College of Business is currently in the process of developing a web-based Global MBA program to be available in Fall 98. The program is currently being designed for the part-time student, with plans for an eventual full-time course offering. The CBA is targeting the web-based MBA courses to students who have not been able to pursue graduate education because of time constraints, location, schedule, or other factors.

ASU, West School of Management

Suresh Chakravarthy, Research Specialist, Principal (602)543-6128 chak@asu.edu

We are currently conducting 3 distance learning courses; one, Graduate Level and 2 undergraduate courses.

1) The graduate level course is being taught across 3 universities and 4 campuses. The 3 universities are Arizona State University (Main and West Campus), The Univ of Arizona and Northern Arizona University. The course is being taught using live TV (open only to students) broadcast to the three different campuses supplemented by interactive web pages and innovative use of the FirstClass Intranet Server (FCIS).* Some of the internet web pages are served using FCIS for security. In addition, FirstClass is being used to hand out lecture notes, hand out and

collect assignments, and contact topic specific discussions. All of this is being done using the web access to FirstClass.

2) The 2 undergraduate courses are also being taught using FirstClass. One course runs a live TV broadcast (Cable TV) and uses FirstClass to deliver lecture notes, handouts, assignments, tests as well as facilitate class wide discussions. The other undergraduate course is taught exclusively using FirstClass. Handing out lecture notes, giving out and collecting tests and assignments, class wide discussions, etc., are all done via FirstClass.

*Apart from the courses mentioned above, FirstClass is used in every course taught by the School of Management. Every School of Management Student is provided with an account. Students get course syllabi, notes, access to advising, job postings, etc. all on-line via FirstClass. In addition all faculty and staff use FirstClass as the primary means of communication. All notices, memos, documents are delivered using FirstClass.

Ashridge Management College

Margaret Spavins, Ashridge Online oll@ashridge.org.uk +44(0)1442 841217
Ashridge Online corporate learning: see <http://www.oll.ashridge.org.uk>

UCI, GSM

John S. Clarke jsclarke@uci.edu

Continuing to support virtual TA sessions whereby notebook equipped students interact with instructors/TA's via the Internet using tools including Netmeeting.

California State University Dominguez Hills, School of Management

David J. Karber, Coordinator, MBA Online, (310)243-2714 dkarber@soma.csudh.edu

A complete MBA degree is offered via the Internet. This program, initiated in September 1997, has over 100 students from 8 countries. It is especially designed for the person whose schedule is constrained because of career responsibilities and precludes committing to set dates/times/places for meeting classes. All work is done via the computer and includes accessing material via web pages and email and utilizes threaded discussion, streaming audio/video and live conferencing. The program is very intensive, with four 12-week sessions per year with short breaks between most sessions and consists of ten 3-unit courses which can be completed within 15 months if a student enrolls in 2 courses per session. The program is highly successful and growing at a rapid rate with interest coming from all parts of the world.

Carlow College (Carnegie Mellon)

Edward A. Cooper 412-578-6278 edcooper@carlowcollege.net

Our division of management is offering an accounting certificate (8 courses) available totally on-line. All courses are available "on-demand" beginning 11 times per year and each can be completed by the student in 8-16 weeks.

U Cincinnati

Raj.mehta@uc.edu

Using campus distance-learning for an international class with students here and in Canada.

Colorado State

Jamie Switzer 970-491-6269 (fax, 970-491-2348) jswitzer@lamar.colostate.edu

We have a unique, state-of-the-art, multipurpose lab/classroom for distance education. We also have a unique mixed media method of delivery of our MBA.

Golden Gate University

Chris Lefferts clefferts@ggu.edu (415) 442-7061

Cybercampus: development of cybercampus courses is proceeding rapidly.

Groupe ESC Normandie

Pascal.KRUPKA@ESC-normandie.FR

We are launching a new distance learning program in Jan 98 for the executive manager. This course will be a year program using: Internet (E-mail, courseware, networking), CD-rom for self-learning, videoconferencing for tutoring each week, and 3 days per month seminar on-site.

U Houston, downtown

Herbert F. Rebhun 713-221-8052 Rebhun@dt.uh.edu

One class for two semesters with a joint program between a Computer Information Systems - graphics course and an English class; developed multi-media hypersystems - students "met" through e-mail and other ways besides in person.

Keio University, Japan

Keinosuke Ono 2-1-1 Hiyoshi-Honcho, Kohoku-ku, Yokohama 2333, JAPAN

Have been experimenting with video conference based system. In 1998, we start to offer credit for these courses. Our downtown classroom and suburban campus will be connected. Both full time and part time students will be allowed to attend either the face-to-face class or the "remote" class.

Murray State University

Several Internet courses.

F. Julian. (502) 762-2696. frank.julian@murraystate.edu

BPA 442, The Ethics and Environment of Business, is a senior-level course. Other sections of this course are being offered the traditional method. This class has been offered on the Internet in previous semesters.

F. Miller (502) 762-6206, fred.miller@murraystate.edu.

MKT 575, Information Technology Marketing, is a senior-level elective.

Naval Postgraduate School

Shu S. Lia SLIAO@MNTY.NPS.NAVY.MIL

Many innovative uses of IT & DL

U Nebraska, Omaha

John Fiene, 402-554-2649 jfiene@unomaha.edu

We are implementing two collaborative labs on campus to emulate group project work at a distance for application development and group decision making. 20 workstations in one lab and 30 in another with color cameras at each workstation can connect in large or small groups. Group displays are available on larger screens.

U North Carolina, Chapel Hill

Finance professor Bob Connolly offers a distance education course in economics. Kenan-Flagler is preparing to offer a program jointly with the School of Information Library Sciences. Kenan-Flagler is preparing to launch an executive MBA program worldwide using distance learning technologies.

Undergraduate students must prove they are computer literate in several major software packages - Word, Excel, Access, PowerPoint etc - in order to graduate from the program. Every seat in every classroom has a computer connection, as well as other connections around the building in the cafeteria, library, etc. In several courses, students work on projects with students at other universities around the world via Internet, giving them a taste of what it's like to work with a virtual team scattered across time zones and continents. Some courses require students to access on-line real data to apply analytical tools and solve real-world problems using time-sensitive data

U North Dakota

dennis_elbert@mail.und.nodak.edu

IVN Interactive Video Network - statewide distance education system, teaches MBA, MPA and undergraduate management programs to multiple distance sites. Cargui Inc has provided

\$150,000 for classroom upgrade. The capstone course for all business majors will be taught starting Fall 98 in the Cargui Boardroom. Remodeling and building to take place during Summer 1998.

Ohio University

STINSON@OAK.CATS.OUIOU.EDU

We have an on-line problem based MBA program called "The MBA without boundaries." Web site is located at MBAWB.COB.OHIO.EDU.

San Diego State University

Carol Houston PhD (594-3735)

Sharon.Lightner PhD Sharon.Lightner@SDSU.edu

A new international accounting class conducted via internet in real time. The class has students enrolled in the US (SDSU), Switzerland, Spain and Japan. They are learning about international communication and discussing international accounting standards. They have been divided into intercultural teams for certain projects.

U Southern Indiana

Larry ARP LARP.UCS@SMTP.USI.EDU

We offer out introductory Computer Applications in Business as a computer-based instruction class. The students must learn Microsoft Office Suite basic applications. This class is required of all business majors as a core class. The same course is offered as a distance education class.

Southwest Missouri State

<http://www.msicis.smsu.edu>

The Master of Science in Computer Information Systems combines minimal instruction time on campus with extensive distance learning via the Internet.

Suffolk University, Sawyer School

ncroll@suffolk.edu

Videoconferencing activities and distance education progressing. We have established one center for interactive distance education (CIDE). We have started our 5th videoconferenced course in 8 months - Masters in Public Administration. Applications planned in two other areas - MBA and undergraduate program.

Texas A&M University

Dr. Lorraine Eden (L-Eden@tamu.edu)

Trilateral grad class on NAFTA with universities in Canada, Mexico & US

Dr. Marty Loudder (M-Loudder@tamu.edu)

Collaborative group projects in accounting classes

Dr. Uday Murthy (U-Murthy@tamu.edu)

Dr. Chris Wolfe (C-Wolfe@tamu.edu)

Dr. Lisa Ottinger (L-Ottinger@tamu.edu)

Use of emerging technologies in Professional Program in Accounting, Info Systems, & Financial Management

Dr. Bob Davis (R-Davis@tamu.edu)

Dr. Powell Robinson (P-Robinson@tamu.edu)

Graduate program in Life-Cycle Engineering and Operations Management

UT, Dallas

<http://mimserver.utdallas.edu/mimshome/fmims.html>

Dr Stephen Guisinger, PO Box 830688, MS LF 16, Richardson, TX 75083-0688

(972)883-2715 (FAX (972) 883-6164) stevg@utdallas.edu

The MIMS program is a Distance Learning Program leading to a Master's Degree in International Management or a Master of Business Administration (MBA) degree. The MIMS program provides a distance education alternative for executives seeking an MA in International

Management or MBA degree with a strong emphasis on International business. The MIMS program utilizes the Internet to deliver curriculum through a variety of audio and video techniques.

Utah State University

Lloyd Bartholome Lbart@B202.usu.edu

We offer all of the following programs through distance learning

- BS - Business Information Systems
- Accounting
- Business Administration
- MS Business Information Systems
- MMS Human Resource Dev

We also have a “traveling” executive MBA program which we will take anywhere in the world. The program is presently being implemented in Taiwan.

USU is taking leadership in Utah as part of the Western Governor’s University. As such, we have faculty developing curriculum for WGU. We will be heavily involved with WGU.

Washington State University

Todd Hall Addition 570, Pullman WA 99164-4750

We have developed a statewide distance degree for

1. BA Business Administration for General Business Major
2. Master of Technology Management

MTM formal approval begins 8-15-98 for MTM but BA has been running since 1-1-98

TECHNOLOGICAL ENVIRONMENT

U Arizona, Tucson

Jquintana@cmi.arizona.edu 520-626-2648 Jcrews@bpaosf.bpa.arizona.edu 520-621-2649

College of Business and Public Administration have engaged in several projects to advance the use of technology to support education within the college and with other departments.

Management Class, U of Arizona, Tucson, undergraduate class utilized the GroupSystems software.

U of Arizona/U of Maryland, use of technology enabled the creation of large virtual classrooms crossing traditional institutional boundaries. Collaborated on design and delivery of graduate information systems course. Partnership enabled collaborative learning and teaching with trans-continental student teams, multiple instructors, and integration of external expertise.

Boston University

S. Hannabury, Asst Dean shannabu@bu.edu

1) Laptop configuration - to allow students to configure their own laptops for dial-in access and for use within the building. Includes software, settings, documentation, etc. Version 2 will have more automatic “scripts” to do the set-ups and will have links to a website that we’ll develop that will have software updates.

2) Orientation CD-ROM - This CD will be sent to all incoming students and will contain general school information, video clips, and on-line training materials (Microsoft Windows and Office). Students will be encouraged to learn the applications during the summer.

UCLA

<http://www.anderson.ucla.edu/faculty/jason.frand/researcher>.

“Briefcase in your laptop” captures the theme behind our 100% student laptop ownership requirement in a building complex where every classroom and library seat has a network connection. In integrating the technology we are placing the emphasis on having each student develop a personal knowledge management system to capture their entire educational experience.

DelawareState University

1200 N DuPont Highway, Dover DE 19901-2277

We have two (2) 25 seat computer labs. One computer lab is a teaching facility. The school of management offers a basic computer application course. This course is taught by faculty in the school.

ESC-GRENOBLE

Clause Albin 33 (0) 4 76 61 28 Claude.Albin@ESC-GRENOBLE.FR

ATM backbone: video on demand, distribute video teleconferencing over ATM.

King Faud University - Petro & Minerals

Gmenon@dpc.kfupm.edu.sa

We are planning to set up a group decision support center within the College soon.

Northeastern Illinois

Peter Stonebraker P-Stonbraker@neiu.edu (773) 794-2642

One faculty member has done a lot to create undergraduate and graduate level production/operations management courses using CD ROM technology. The CD's provide a platform for live course delivery, television course delivery or tape independent hearing via Web or other asynchronous means.

Northern Illinois

<http://syk.cob.niu.edu:8588/purpose.htm>

Business Information Technology Transfer Center. The mission of the Business Information Technology Transfer Center is to enhance the education of students by exposing them to actual business problems and the latest technological solution methodologies.

U Richmond

Ksuddart@richmond.edu

The Robins School of Business is currently undergoing a \$5.5 million renovation which will add multimedia and videoconferencing classrooms, a microcomputer lab, renovated faculty offices and student spaces. The renovations are expected to be completed in the Spring of 1999.

Tulane University

Tom Gerace (504)865-5651 Tom.Gerace@Tulane.edu

A new state-of-the-art electronic classroom is currently being implemented (Summer 1998). This classroom has 42 Pentium II class computers connected to the Business School's Intranet, as well as to the campus network and the Internet, through a switched Ethernet network. Students have access to productivity tools (word processing, spreadsheet, and database software), presentation software, statistical analysis software, and other curriculum-specific software. Students also use electronic mail, which has become integrated into the curriculum. New tools for collaborative teaching give the instructor the ability to display not only his own computer's display, but the display of any student workstation.

This classroom is used for Information Systems, Statistics, and, new for Fall Semester 1998, Organizational Behavior classes. The Organizational Behavior classes will use the technology in the electron classroom for group decision making and collaboration. In these courses, the instructor makes use of groupware in teaching such skills as the Nominal Group Technique, a key decision-making concept. As each new idea is presented using groupware can be projected on the screen or sent to the display of each student workstation.

UT, Arlington

Dr. Mark Hensel (817)272-3380 hensel@exchange.uta.edu

We are developing a multimedia classroom with 120 seats. The MM equipment is installed. We will be cabling the desk locations for Ethernet/network access later in CY98 (after June 98).

U Virginia

Randy Smith 804-924-7135 rrs1u@virginia.edu

Installed ATM backbone during the Summer of 1997. It supports a video server and desktop video conferencing.

Wilfred Laurier University

Frank Anatol, IT Coordinator Voice: (519)884 0710 X2632 fanatol@wlu.ca

Electronic Classroom Project

In the summer of 1997, the School's ten (10) teaching case-rooms were upgraded to electronic classrooms, with fully-appointed consoles housing state-of-the-art PCs, VCRs, document presenters and overhead projection systems. Each console contains a Pentium 166MMX PC, with 32MB RAM, CD-ROM, sound card, video-capture adapter and ZIP drive. The document presenter is the Elmo EV400AF document camera, which can take a picture of any 2- or 3-dimensional object placed under it. The console panel, also permits connection of external portable (MAC or PC) Notebook computers, as well as any video or DVD device. All output (PC, VCR, Elmo camera, external device) is projected from ceiling-mounted Electrohome EPS800 electronic (SVGA) projectors, onto 8 foot fabric screens.

The use of consoles seemed to be the best option for housing the PC, VCR and Document Presenter equipment, both in terms of convenience and aesthetic/professional appearance. Locating the console to avoid obstruction to viewing, safe passage and to also provide a comfortable and convenient workstation for the user, presented a challenge. However, with our Audio/Visual (A/V) department, we modified a basic design from another university, and came up with a creative solution satisfying these requirements. This afforded the maximum visibility and convenience, and offered an architecture that is consistent in every room.

Security was a major issue, given the attractiveness and value of the equipment to potential thieves (and vandals). The precautions taken included locking consoles and aircraft cabling and a fibre-optics alarm system for securing the individual components.

Based on the premise that this project would be supported by corporate funding (and appropriate recognition given to the donors), the current state of the rooms at the time, dictated that major facilities upgrading was also necessary. This included new carpeting, replacing chairs and painting. Concerned about the sensitivity of the electronic equipment to chalk dust, we decided to replace existing blackboards with white boards. This was met with some resistance from traditional 'chalk-users.'

Faculty members (and students) use the system for presentations and for connecting to the LAN and Web, as well as demonstrating analytical models.

UWisconsin, Oshkosh

knaapen@uwosh.edu Laura Knaapen (414)424-0297

Some access to our reservable teaching computer labs is limited. The college purchased 16 laptops and a cart to roll to whichever class room may need computer access for the day. One faculty member used the "portable lab" for an online case study. Two others have used it for having students run business simulation programs in strategy classes. One other used it for students to take an essay exam.

WEB USE

Case Western Reserve, Weatherhead

Linda Karaffa WSOM Computer Support 216-368-8 lek2@po.cwru.edu

See <http://wnatherhead.cwru.edu/courseware>

Features: course web page for every WSOM course

Standard links: email to professor

link to professor's faculty profile page

syllabus

email to class (generated from SQL database)