UCLA
Information and Technology

Title
Fourteenth Annual UCLA Survey of Business School Computer Usage: Business School Information Technology Resources and Uses

Permalink
https://escholarship.org/uc/item/73452394

Authors
Frand, Jason L.
Britt, Julia A.

Publication Date
1997-09-01

eScholarship.org Powered by the California Digital Library
University of California

THE JOHN E. ANDERSON GRADUATE
SCHOOL OF MANAGEMENT AT UCLA

# BUSINESS SCHOOL
# INFORMATION TECHNOLOGY RESOURCES and USES

## Fourteenth Annual UCLA Survey
## of
## Business School Computer Usage

**Conducted in Cooperation with the**
**AACSB - International Association for Management Education**

**August 1997**

**Jason L. Frand**
**Julia A. Britt**

FC

# BUSINESS SCHOOL INFORMATION TECHNOLOGY RESOURCES and USES

## Fourteenth Annual UCLA Survey of Business School Computer Usage

## Conducted in Cooperation with the AACSB - International Association for Management Education

## August 1997

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

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

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.

Microsoft, Inc. and Archipelago Productions (Multimedia Division of Harcourt Brace) underwrote this year's survey project. Their commitments have made this research and its dissemination possible.

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

© 1997 Regents of the University of California

# Executive Summary

The 1997 Fourteenth 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, 252 schools from 15 countries completed the twelve page questionnaire regarding hardware, software, and resource commitments. The sample is demographically very similar to samples from the last four surveys.

## Findings

Adequate funding for operational support was ranked as the number one strategic issue in the 1988, the 1992, and the 1996 surveys. This year's survey reinforces this reality. Over the past 14 years, the samples of participating business schools showed a slight increase in the computer operating budget as a percentage of the total school operating budget, from about 3% in 1985 to just over 4% in 1993. However, this year the average allocation decreased to 3.3% (Section 3.1). Paying for technology is a critical issue and many schools, public and private, supplement their computing operating budget with computer fees. The percent of schools with fees has doubled in the past four years, going from 45% to 80% for undergraduates and 32% to 70% for MBA programs. Recognizing that computer use can apply to all courses, the fees are now per semester or quarter, rather than by class (Section 3.2).

The major developments in the operations area dealt with the addition of Web staff and outsourcing. Fifty-four percent of the schools responded that they have allocated staff exclusive to Web development. The remaining schools have given the Web responsibility to others (Section 4.1). Collected for the first time this year, the outsourcing data showed that about half the schools relied exclusively on the central university for telecommunication support and for Internet and Web services. Additionally, about 10% of the schools rely on commercial organizations for all Web development and maintenance (Section 4.3). Training remains an ongoing challenge. Given the rapid technological changes in both hardware and software, the need for users to keep current with these developments is critical. However, the data shows very little change from four years ago in terms of the schools effectiveness of their training efforts. In fact, the overall rating by the schools is that their training efforts are below "adequate for most users" (Section 4.4).

Business school ownership of mini/mainframe computer systems continues to decline with only 18% of the schools supporting their own systems, down from a peak of 37% of the schools in 1989. These systems are primarily used for research support and as network and communication servers (Section 5.1). Business school ownership of combined desktop and laptop microcomputers is averaging 244 systems per school, about the same as it was two years ago. However, desktop microcomputer ownership is averaging 215 units, down 2% from two years ago. On the other hand, laptop microcomputer ownership has surged, up 57% in the same period. Overall, 80% of all microcomputers use a Windows operating system. The remaining 20% are divided between Apple, UNIX, DOS, NT, and OS/2 (Sections 5.2 and 5.3). Ninety-nine percent of the schools reported a sufficient number of microcomputers to meet faculty needs, while 83% and 87% of the schools reported a sufficient number for undergraduate and MBA student needs, respectively (Section 5.4). This confirms observations from previous surveys that except for upgrades and replacements, there is little expectation of further growth in the number of microcomputers at the business schools.

Business schools seem to be moving toward greater student microcomputer ownership with 29% of the undergraduate, 42% of the MBA , and 49% of the EMBA programs recommending or requiring ownership. Yet, student ownership implies expectations for greater use than the schools may be able to achieve (Section 5.4).

Over the past eight years the business schools have consistently allocated about 40% of their microcomputers to a lab setting. Nearly all schools (97%) reported their lab equipment as

networked. However, this year for the first time, 21% of the schools reported computer labs with zero computers, that is, computerless labs with just networked ports available for students to plug in their laptops. Some labs have cluster tables where groups of students can share a monitor. Peripheral devices such as CD-ROMs and scanners, which just two years ago were separated out as special multimedia equipment, are now commonplace (Section 5.5).

The schools were asked to estimate whether integration of computer technology into their curriculum was meeting their expectations. The overall rating of 2.8 on a five point scale suggests that technology is not living up to its promises. When asked about the impact on the curriculum, about half of the schools gave scores of 4 or 5 on a five point scale indicating that the impact is perceived as positive. That is, the technology is perceived to be having a positive impact, but more could be done (Section 6.1). About 20% of the undergraduate programs and 30% of the MBA programs have computer entrance requirements. The new Web-related skills have been added to the previous graduation requirements by 12% of the schools (Section 6.2). This year, required computer usage in the core curriculum is at its highest level in the history of the surveys. Overall, 77% or the undergraduate core courses and 72% of the MBA core courses have at least some required computer component (Section 6.3). Two areas of exceptionally high growth are database and e-mail usage. Not only are more on-line databases available, greater numbers of users are accessing them (Section 6.5). For the first time, regular e-mail usage was reported as over 80% for the faculty and staff and over 65% for the students (Section 6.6).

Software resources show the dynamics of the market place impacting the business schools. The schools are supporting a greater number of generic applications with four new categories being added this year (Web browsers, suits, groupware, and network management). However, the numbers of different software packages within these application categories is quite varied. Considerable consolidation was shown in the productivity software (word processing, spreadsheets, and graphics), while many other applications categories experienced growth as new packages were introduced to better meet user needs. As an example, the number of different statistical software packages used in the schools increased from 22 in 1993 to 33 this year. Although the more generic packages, SAS and SPSS, continue to dominate, the packages which are coming on the market are more specialized (Section 7).

Another impressive shift in the data over the past 14 years is networked connectivity. The thrust of schools in 1985 was to acquire microcomputer systems with only 14% of the schools reporting having more than two-thirds of their systems networked. Today, while the average number of microcomputer systems has tripled, networked computers have become the standard (Section 8.1). Because of the Internet, the very old and stable network protocol of TCP/IP has experienced major growth in the past four years, from 54% to 92% utilization.

Eighty-five percent of the business schools indicated they had access to distance learning and teleconferencing equipment. However, even though they have access to this equipment, only 39% of the schools indicated using it regularly for class instruction offered to distant locations (Section 9).

As might be expected, growth in areas of required on-line use has grown substantially, reflecting the power of the World Wide Web. Reminiscent of the early surveys when there would be 25 different word processing packages on the market, each offering something slightly different, the schools identified 108 separate Web tool software packages. Today there are dozens of Web development and management tools representing the enormous energy and excitement associated with this new information technology. The next few years will probably show a significant consolidation to fewer packages (Section 10). A large portion of the innovation this year were Web related (Section 11).

## Open issues

In reviewing the "open issue" section of the past several surveys, both "good news" and "bad news" perspectives emerge. Many of the past issues are still relevant -- financial resource limitations, training, and curriculum integration. On the other hand, each annual survey report

shows a broader scope of information technology being utilized by schools and individuals. Based on an intrinsic belief that information technology can add value to the educational process, there is growing use throughout all aspects of our schools (in the curriculum, research, and administrative support) and by all participants (faculty, students, and staff). The list of innovations include curriculum, Web, and team developments. For example, there are a growing number of new applications to support the teaching and learning processes. Electronic trading rooms simulating Wall Street provide students realistic experiences. Web-based chat rooms enable in-depth and on-going discussion in which every student in a class participates. Real time information retrieval extends classroom case discussions. CD-ROM based case materials enable students to develop multiple managerial skills in realistic business situations. These and other emerging novel uses of technology may enable our students to gain better insights into problem solving processes, and to apply and appreciate the theory behind the applications, thus becoming better decision makers and managers.

However, a persistent issue over the years has been financial resource concerns. Our schools have made a significant investment in developing information technological infrastructures. This investment includes not only hardware and software, but all the after purchase requirements of support staff, maintenance, space allocations and modifications, the refocusing of time and energy, together with the personal time and efforts on the part of the faculty, staff, students and vendors. A pressure within our environments is "to do more with less" -- increase educational productivity through one teacher reaching more students or individuals students acquiring ideas at a faster pace. In a recent discussion regarding the statement "doing more with less," Gene Ziegler, Director of Advanced Technology Projects at the Johnson School of Management at Cornell University, pointed out that the phrase was coined for large corporate environments for which communication technologies and automation enable the reduction of many staff positions. However, for small organizations, such as our business schools, which struggle for every additional support resource, the more accurate statements are "doing less with less" and "doing more with more." It is unrealistic to think otherwise.

Business schools are adding to the cost of education through computer related fees as well as increasing assumptions that students will own, or have available, computers and Internet access outside of the school setting. The impact on selection of students who can or cannot afford to participate in our programs thus becomes relevant. In response, given the ongoing dynamic changes in technological capabilities, there are new venues for acquiring the knowledge and skills students feel appropriate for their careers, including the continuing training corporations offer their employees. A variety of business courses are being offered over the Web and other non-traditional distance learning technologies. These external alternatives to education are forcing changes to our more traditional university-based approaches and our educational offerings. How each school responds will be a function of how the problems are perceived and the willingness of the institution to make an investment in change. A major challenge facing business schools today is educational leadership in understanding the problems, identifying alternatives, and building on the opportunities these present.

## Table of Contents


1. Introduction ..... 1

2. Profile of Participating Schools ..... 2

3. Financial Resources ..... 5
   - 3.1 Operating Budgets ..... 5
   - 3.2 Student Usage Fees ..... 5

4. Operational Resources and Uses ..... 7
   - 4.1 Business School Computer Services Organization ..... 7
   - 4.2 Maintenance ..... 8
   - 4.3 Outsourced Services ..... 8
   - 4.4 Training ..... 10

5. Hardware Resources and Uses ..... 11
   - 5.1 Mini/Mainframe Computer Systems and Usage ..... 11
   - 5.2 Microcomputer Resources and Usage ..... 12
   - 5.3 Laptop Microcomputer Resources and Usage ..... 15
   - 5.4 Desktop/Laptop Microcomputer Densities, Sufficiency, and Ownership ..... 16
   - 5.5 Computer Labs ..... 18

6. Curriculum Integration ..... 19
   - 6.1 Integration Expectations and Curriculum Impact ..... 20
   - 6.2 Student Entrance Requirements and Graduation Expectations ..... 21
   - 6.3 Integration Into Undergraduate and Graduate Courses ..... 22
   - 6.4 Sources of Course Software ..... 23
   - 6.5 Database Usage ..... 24
   - 6.6 E-mail Usage ..... 26

7. Software Resources ..... 26
   - 7.1 Software Details by Application Category ..... 27
   - 7.2 Software Standards ..... 35

8. Communications Resources ..... 35
   - 8.1 Local Area Networks ..... 36
   - 8.2 Remote Access to Local Area Networks ..... 36

9. Distance Learning and Teleconferencing Resources ..... 37
   - 9.1 Equipment Availability ..... 37
   - 9.2 Utilization ..... 37

10. Web Development and Uses ..... 38

11. Innovations ..... 40


## Appendices


1 General Business School Data
2 Innovations

## List of Tables


1 Demographics of Participating Schools ..... 3
2 Business School Computer Financials, Demographics and Infrastructure by Computer Dollar-per-Student Quartiles ..... 4
3 Undergraduate Computer Usage Charges at Business Schools ..... 6
4 MBA Computer Usage Charges at Business Schools ..... 6
5 Median Computing Staff Support Categories by Quartiles ..... 8
6 Microcomputers and Laptop Maintenance ..... 8
7 Services Outsourced to the Central Campus and Commercial Vendors ..... 9
8 Effectiveness of Computer-Related Training by User Group ..... 10
9 Business School Mini/Mainframe Systems Installed by Model ..... 12
10 Business School Desktop Microcomputer Operating Systems ..... 13
11 Microcomputer Operating Systems at Business Schools by Computer Dollar per Student Quartiles ..... 14
12 Business School Microcomputer Operating Systems by User Groups ..... 15
13 Laptop Operating Systems at Business Schools ..... 15
14 Business School Owned Laptop Operating Systems by User Groups ..... 16
15 Microcomputer / Laptop Sufficiency by User Group ..... 17
16 Business School Computer Labs ..... 19
17 Computer Lab Peripheral Devices ..... 19
18 Undergraduate Computer Requirements and Expectations Upon Graduation ..... 21
19 MBA Computer Requirements and Expectations Upon Graduation ..... 21
20 Required Computer Usage in Core Courses: An Historical Perspective 1985-1997 ..... 23
21 Sources of Undergraduate Courseware ..... 24
22 Sources of MBA Courseware ..... 24
23 Databases Available for Research and Instruction ..... 24
24 E-Mail Usage ..... 26
25 Summary of Microcomputer Software Usage ..... 27
26 Artificial Intelligence, Expert System Software ..... 28
27 Business Games ..... 28
28 Database Management System Software ..... 29
29 Desktop Publishing Software ..... 29
30 Development/CASE Tools Software ..... 29
31 Graphics and Presentation Software ..... 30
32 Groupware ..... 30
33 Modeling and Optimization Software ..... 31
34 Multimedia and Hypermedia Software ..... 31
35 Programming Language Software ..... 32
36 Simulation Software ..... 33
37 Spreadsheet Software ..... 33
38 Statistical Software ..... 33
39 Virus Protection Software ..... 34
40 Word Processing Software ..... 35
41 Local Area Network Environment: Protocols/Topologies ..... 36
42 Local Area Network File Sharing Software: Network Operating System ..... 36
43 Video Teleconference Equipment Availability ..... 37
44 Video Teleconference Applications ..... 37
45 Formats Used to Facilitate Distance Learning and Teleconferencing ..... 38
46 Web site Content Availability ..... 38
47 Web Site Media ..... 39
48 Web Related Services ..... 39
49 Web Site Development Tools ..... 40
50 Innovative Activities at Business Schools ..... 40

## List of Figures


1 Computer Operating Budget as Percent of School Operating Budget ..... 5
2 Median Computing Operating Budget Expenditure by Quartile ..... 6
3 Percent Business Schools with Autonomous Computer Support Staff ..... 7
4 Median Computer Staff Density by Quartile ..... 7
5 Business School Mini/Mainframe Ownership ..... 11
6 Microcomputer Distribution by Operating System ..... 14
7 Microcomputer Distribution by User Group ..... 15
8 Average Number of Business School Desktop and Laptop Microcomputers ..... 16
9 Student Microcomputer Density by Quartiles ..... 17
10 Faculty Microcomputer Density by Quartiles ..... 17
11 Student Microcomputer Ownership ..... 18
12 Computer Integration into the Undergraduate Business School Curriculum ..... 20
13 Computer Integration into the MBA Business School Curriculum ..... 20
14 Impact of Computer Technology on the Undergraduate Business Curriculum ..... 20
15 Impact of Computer Technology on the MBA Business Curriculum ..... 20
16 Required Computer Use in Undergraduate Core Courses ..... 22
17 Required Computer Use in MBA Core Courses ..... 22
18 Overall Required Computer Usage in Core Courses ..... 23
19 Sources of Undergraduate Courseware ..... 25
20 Sources of MBA Courseware ..... 25

## 1. Introduction

*What are the hardware, software, and information technology support structures and their usage in our business schools?* The goal of this, the Fourteenth 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 environment[1]. 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 options. Faculty, student, and administrative requirements and expectations continue to change with new experiences and awarenesses of emergent technology options. And, these dynamic changes exacerbate planning and resource allocations. Business school policy and decision makers continue to need information which enables them to achieve a perspective beyond the boundary of their own school.

For the first nine years, the Annual UCLA Surveys reported on data from AACSB-accredited business schools in the United States and Canada schools. In 1993, because of growing international interest in the North American data and requests for a more global perspective, the population was expanded in spite of confounding issues such as differences in culture and economics, educational structures and traditions, language barriers, funding sources, and governmental policies. In 1994, the population was further expanded to the entire AACSB membership which included accredited as well as non-accredited schools. This 1997 survey continues with this population[2].

The First, Second, Fourth, Sixth, Eighth, and Tenth Surveys presented information on 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 *Fourteenth*, returns to the focus on hardware, software, and other technology resources, updating with current data these specifics of the business school computer environment. New sections dealing with distance learning and Web sites have been added. The survey continues to provide details regarding instructional support resources, entrance and graduation requirements and expectations, the impact of information technology on the curriculum, and classroom electronic equipment. Whenever possible, historical data is included to provide a longer term perspective. However, these surveys do not comprise an exact longitudinal study as there is some variation in the sample from year to year. The survey samples comprise the business schools which choose to add their data. The accuracy of comparisons between years are 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.

---

[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 surverys 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 *Fourteenth Survey* are US$50 each.

[2] Interested researchers can access the datasets set via anonymous FTP from anderson.ucla.edu in the directory /pub/surveys/survey1997.

This report is divided into 11 sections: Introduction, Profile of Participating Schools, Financial Resources, Operational Resources and Uses, Hardware Resources and Uses, Curriculum Integration, Software Resources, Communications Resources, Distance Learning and Teleconferencing Resources, Web Development and Uses, and Innovations.

## 2. Profile of Participating Schools

The questionnaire was sent to the entire membership of the AACSB, this year totaling 851 business schools including 180 schools from 44 countries other than the United States. Two hundred fifty-two business schools chose to participate, a 30% response rate. Appendix 1 identifies the respondent business schools. In addition to demographics, the twelve-page questionnaire covered several distinct areas of computer-related resources: operating budgets and computer usage fee structures, computing support staff, hardware and computer labs, software usage, computer integration into the curriculum, databases, the network environment, distance learning and telecommunications, and web-related development. The questionnaires were completed primarily by deans and associate/assistant deans (46%), computer center directors (36%), and department chairs and faculty members (14%).

Table 1 presents general information about the 252 respondent schools, together with demographics from previous surveys. In general, this table reflects a consistent profile in spite of varying participation. The sample is predominantly North American with a spread of foreign schools as seen in the Eleventh through Thirteenth Surveys. Private schools continue to make up just over a third of the sample. Both the distribution of types of programs offered and school size have remained just about the same since the shift between the Tenth and the Eleventh Surveys when survey participation was opened up to the entire AACSB membership rather than being limited to the accredited schools. Finally, this year's survey, like the Second, Fourth, Sixth, Eighth, and Tenth, focuses on information technology resources and uses.

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 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 and 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 forty-three schools provided data for both of these items. The quartiles were established from the frequency distribution and remain constant throughout this report with school quartile numbers of 36, 35, 36, and 36 for the first through the fourth quartiles respectively. However, the number of schools in the total aggregate will vary, 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 Table 2 shows the computer dollar per student medians. For the business schools in the first quartile the median computer operating dollar per student was $632, for the second quartile $178, the third $67, and the fourth $26. Interpreting these median figures, the 36 schools in the first quartile are spending about twenty-four times the amount per student as the fourth quartile schools, about nine and a half times the amount per student as the schools in the third quartile, and over three and a half times the amount per student as the schools in the second quartile. Although the range of operating dollars per student is very narrow for the third and fourth quartile schools, it becomes progressively wider for the second and first quartile schools.

## Table 1
## Demographics of Participating Schools
## (percent of schools)

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

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

| | Quartiles 1st n=36 | 2nd n=35 | 3rd n=36 | 4th n=36 |
|---|---|---|---|---|
| Financials | | | | |
| Computer dollar per student (median) | $632 | $178 | $67 | $26 |
| (range) | 304-3750 | 93-294 | 48-92 | 1-47 |
| Computer operating budget (1,000s) (mean) | 1,100 | 428 | 162 | 47 |
| Business school budget (1,000s) (mean) | 29,200 | 14,000 | 8,300 | 4,700 |
| Computer/school operating budget (mean) | 5% | 4% | 3% | 2% |
| Demographics | | | | |
| Type of school: percent public | 50 | 77 | 75 | 89 |
| Degrees offered: | | | | |
| Undergraduate only | 6 | 3 | | 8 |
| Undergraduate & graduate | 61 | 3 | 100 | 83 |
| Graduate only | 31 | 94 | | 9 |
| No data | | | | |
| Student enrollemnt (FTE) | | | | |
| Less then 1000 students | 47 | 12 | 11 | 45 |
| Between 1000 and 2000 | 36 | 51 | 33 | 19 |
| Between 2000 and 3000 | 3 | 14 | 31 | 22 |
| More than 3000 students | 14 | 23 | 25 | 14 |
| Student FTE (mean) | 1441 | 2246 | 2375 | 1720 |
| Infrastructure | | | | |
| Microcomputers | 12,428 | 10,272 | 8,502 | 4,548 |
| Average per school (mean) | 345 | 293 | 236 | 126 |
| Students per micro density (median) | 24 | 17 | 20 | 18 |
| Faculty per micro density (median) | 0.84 | 1.04 | 1.03 | 0.90 |
| Computer staff FTE (median) | 13 | 5 | 3 | 1.5 |
| Students per staff (median) | 86 | 307 | 472 | 960 |

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

Consideration of the demographic summary shows that the first quartile has the least representation of public schools and the fourth quartile the greatest. The first and fourth quartiles are more evenly spread across the programs offered and the size of their schools although the first quartile schools appear to be smaller. In contrast, the second quartile is made up of almost all medium to large sized graduate only programs and the third quartile is made up of medium to large schools which offer only both undergraduate and graduate programs. There seems to be no consistent relationship between school size and quartile membership.

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. Although the 143 quartile schools are only 57% of the total 252 schools, they own 69% of the microcomputers. As expected, the first quartile schools own the most, 35% (12,428 systems) followed respectively by 29%, 24%, and 12% for the other quartiles. The average number of microcomputers, computer staff FTE, and support staff density (number students supported per computer staff FTE) follow this same pattern. The schools with the larger computing operating budgets are able to provide more equipment and support for their students. Yet, it is interesting to note that even with the largest number and highest average of business school microcomputer ownership the first quartile schools seem to be allocating fewer of them to their students, as shown in the student density ratios. Twenty-four students, as a median, must share access to a single microcomputer, as compared with 17 to 20 students, as a median, for the other quartiles.

## 3. Financial Resources

The financial resources provide the base for the staff and physical information technology infrastructure at the business schools. The general funding base is through the computing operating budget which is allocated by the school or university. However, an additional source of funding may come through the fees that schools collect for computer usage and/or print charges. This section considers both sets of these financial resources.

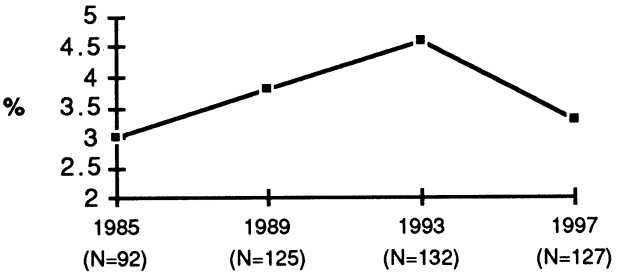
### 3.1 Operating Budgets

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 mentioned previously, the questionnaire defined the business school computer operating budget as including staff salaries, benefits, and support, software and data acquisition and licenses, supplies, operating overhead, and computer recharge funds and excluding capital expenditures where list value was greater than $2000 and depreciated three or more years, lease payments, and faculty salaries.

One hundred fifty-six (62%) schools provided information about their total school operating budget. For these, the school operating budgets ranged from $35,000 to $180,000,000, with a mean of $12,278,565. One hundred forty-six schools (58%) provided information about their business school's computer operating budget. For these, the computer operating budget ranged from $100 to $6,000,000, with a mean of $427,866.

For the 127 business schools (50%) providing information about both of their operating budgets, on average, the computer operating budget was 3.3% of the total school budget. Some of the schools not answering these 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. Figure 1 graphs the change in this ratio over the last twelve years in four year increments. This year's ratio of 3.3, the same as it was ten years ago in the Fourth Survey, suggests that the trend of the past several years of increasing allocations may have reversed. There are many possible interpretations, including sample variation, the 1997 data is an anomaly, or the schools are in fact collectively spending less of their total operating budget on computing and information technology resources. The quartile data provides additional insight into the schools' expenditures.

**Figure 1**
**Computer Operating Budget as Percent of School Operating Budget**




As discussed earlier, 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. For the 143 schools (57%) both of these items, the dollar per student values were ranked and separated into quartiles. Figure 2 presents the median computer operating dollar per student FTE over a twelve year period 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, about nine and a half times as much as the third quartile schools, and twenty-four times as much as the fourth quartile schools. These ratios have held quite consistent, not only over time, but also over changes in the samples and populations.

### 3.2 Student Usage Fees

Another source of funds for business schools is from computer usage charges and fee structures. Tables 3 and 4 summarize details regarding these charges for the 110 business schools (51%) who provided information about their undergraduate programs and the 96

**Figure 2**
**Median Computer Operating Budget Expenditure by Quartile**

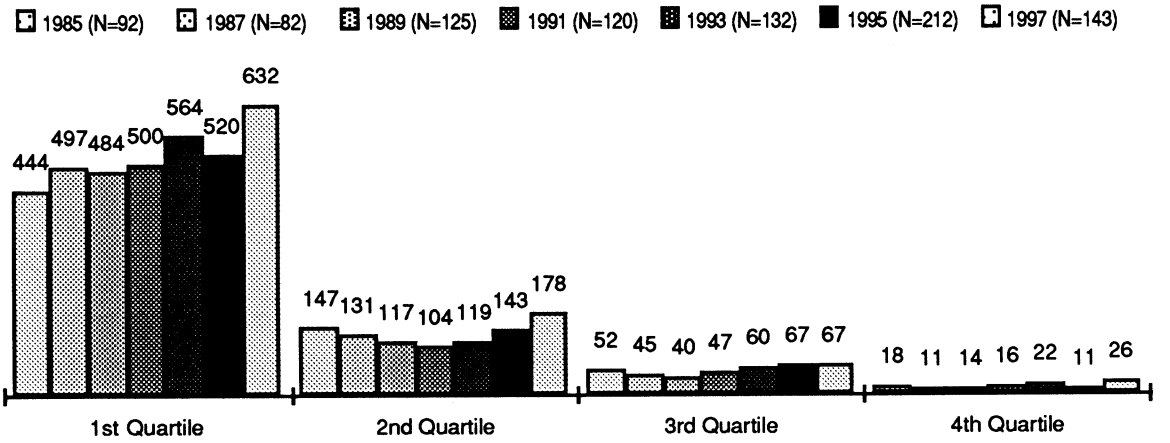



**Table 3**
**Undergraduate Computer Usage Charges at Business Schools**
**(percent of schools)**

| | 1989 N=149 | 1993 N=157 | 1997 N=110 |
|---|---|---|---|
| Computer charges | 29% | 57% | 51% |
| No computer charges | 71 | 43 | 49 |
| Charges per course | 10% | 23% | 33% |
| Range: | $1-50 | $ 1-50 | $3-116 |
| Median | $15 | $13 | $12 |
| Charges per semester or quarter | 5% | 22% | 47% |
| Range: | $15-165 | $ 2-100 | $ 1 - 200 |
| Median | $25 | $30 | $40 |
| Charges per year | 7% | 4% | 14% |
| Range: | $10-300 | $19-250 | $45-400 |
| Median | $60 | $75 | $75 |
| Charge for output (most schools indicated for laser output only) | 10% $.04-.50 $.14 | 22% $.01-1.00 $.15 | 20% $.08-.35 $.15 |

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

| | 1989 N=157 | 1993 N=164 | 1997 N=94 |
|---|---|---|---|
| Computer charges | 31% | 64% | 46% |
| No computer charges | 69 | 36 | 54 |
| Charges per course | 8% | 17% | 32% |
| Range: | $ 1-50 | $ 1-50 | $ 3-111 |
| Median | $ 15 | $ 13 | $ 8 |
| Charges per semester or quarter | 5% | 15% | 38% |
| Range: | $ 15-165 | $ 2-126 | $ 3-200 |
| Median | $ 25 | $ 50 | $ 48 |
| Charges per year | 10% | 9% | 11% |
| Range: | $ 10-345 | $ 4-475 | $ 45-500 |
| Median | $ 90 | $250 | $ 90 |
| Charge for output (most schools indicated for laser output only) | 11% $.04-.50 $.15 | 16% $.01-1.00 $.15 | 19% $.08-.35 $.10 |

business schools (46%) who provided information about their graduate programs. Although the median charges have remained similar to those of four years ago, the most popular charge program is now by the quarter or semester, rather than by the course. When taken together, these two sources of computer funds were reported by 80% of the undergraduate program schools and 70% of the graduate program schools, increasing substantially from the similar data four years ago of 45% and 32% respectively. Charges other than those specifically listed in the tables included per course charges for certain majors, charges included in the registration fees, charges differing by the time of day (such as free computer usage before 9:00 AM and after 7:00 PM), and dial-in (specified as $11 per 20 hours) and e-mail fees (specified as $20 per semester).

## 4. Operational Resources and Uses

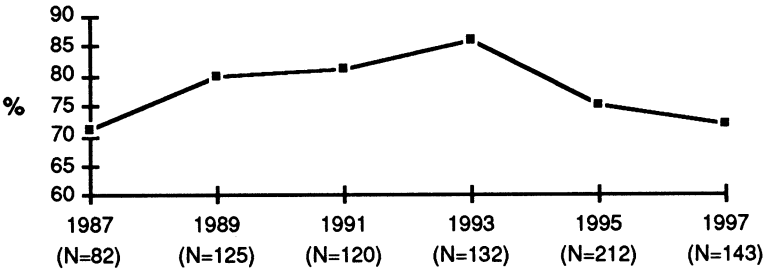
Business schools have opted for various organizational structures in order to meet the needs of their users. Some business schools in this survey indicated that all or at some of their functions are outsourced, either to the central campus and/or to commercial vendors. Others work together with the central campus to augment some of their operational functions. And still others have developed extensive organizations within the school and provide all, or almost all, of their users' information technology support.

This section reports on these organizational options, computer center staff support, outsourced services and the uses of staff resources, maintenance, and training.

### 4.1 Business School Computer Services Organization

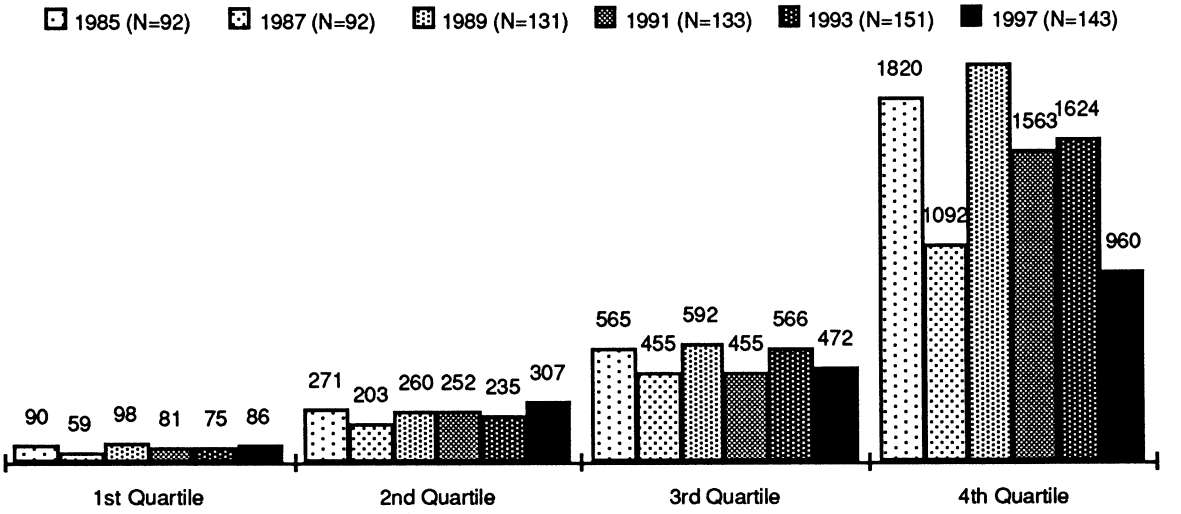
Over the time period of these surveys, the number of schools reporting a computer and information technology staff autonomous from the central campus organization has varied. Figure 3 which presents historic data indicating the percent of respondent schools reporting separate organizations, shows that there was an increasing trend from 1987 through 1993, with a decline over the past four years. This decline may be a result of sample variance and/or may represent a growing trend toward outsourcing of services (discussed in Section 4.3 below). It also corresponds to the decrease in overall school allocations of their total operating budget to computing and information technology resources (discussed in Section 3.1 above). It should be noted that in the Thirteenth Survey (1996), two percent of the 241 responding schools indicated that they were actually phasing out their computer center operations in favor of outsourcing services, while another seven percent indicated that they were in the investigation stage regarding the establishment of their own organization.

**Figure 3**
**Percent Business Schools with Autonomous Computer Support Staff**




The 182 (72%) business schools with autonomous computing support provided data indicating how their staff were allocated across functional area categories: 96% of the schools reported having staff in the technical hardware and network area, 62% with management staff (in addi-

**Figure 4**
**Median Computer Staff Density by Quartile**



tion to the individuals in the other areas), 56% with instructional support staff, and 54% provided Web support staff. About one-third of the schools (35%) had an individuals allocated to supporting faculty research, 26% of the schools audio/visual person(s), and 21% staff allocated to teleconferencing and supporting distance learning efforts.

Figure 4 presents a longitudinal view of computing staff support by showing the median staff densities by quartiles over the last twelve years. The staff density ratio was calculated by dividing the total student FTE by total computing staff FTE and provides an understanding of the number of students supported by a single computing staff person. Whereas the first through third quartile schools show a relatively stable level of support over the twelve year time period, the fourth quartile schools have greater variance in their level of student support. This year's data shows that while the fourth quartile schools are at their best level to date, a single staff person in the fourth quartile schools is still required to support over ten times more students than in the first quartile schools.

**Table 5**
**Median Computing Staff Support Categories by Quartiles**

| | Quartiles | | | |
|---|---|---|---|---|
| | 1st n=36 | 2nd n=35 | 3rd n=36 | 4th n=36 |
| Technical/hardware/network | 5 | 2.38 | 2 | 1 |
| Management | 1 | 1 | 1 | 0.75 |
| Instructional support | 2 | 2.5 | 1 | 1 |
| Web support | 1 | 1 | 0.45 | 1.25 |
| Research support | 1.4 | 1 | 0.5 | 1 |
| Audio/visual | 1.3 | 0.5 | 0.23 | 1 |
| Teleconference/distance learning | 0.55 | 0.5 | 0.45 | 0.75 |
| Total staff (median) | 13 | 5 | 3.13 | 1.58 |

Table 5 displays the median computing staff support categories by quartile. The considerable variation within this table illustrates the allocation of scarce resources within the business schools. For example, the schools in the third quartile seem to be just following the first and second quartiles, in contrast to those in the fourth quartile which are aggressively pursuing the first and second quartiles and, based on their higher staff allocations, possibly developing niches in Web support and teleconference/distance learning.

### 4.2 Maintenance

Equipment maintenance has remained as the second most critical issue in previous surveys since 1988. Table 6 compares the Tenth Survey (1993) data and this year's 1997 data on maintenance of the business school owned microcomputers and laptops. There has been a slight increase in the schools making formal policy decisions about microcomputer and laptop maintenance. A large percentage of the maintenance, however, is still done by the business school staff, 68%, although there has been an increase in work done by the central campus staff and a corresponding decrease in reliance on outside vendors. Several schools indicated that maintenance was being done by a faculty micro support unit and even IS department staff.

**Table 6**
**Microcomputers and Laptop Maintenance (percent of schools)**

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

### 4.3 Outsourced Services

As shown in the Twelfth (1995 ) Survey, full-time and part-time staff salaries accounted for 61% of the business schools' computing operating budget, followed by hardware and software allocations of eleven and nine percent respectively. Thus, one way that business schools can contain costs and work within their computer operating budgets is to outsource computer staff operational functions. This year's survey included an open-ended question concerning which services were outsourced to the central university campus and/or to commercial vendors.

Table 7 summarizes the responses of 180 (71%) of the business schools who indicated outsourcing some or all services. Of these 180 business schools, 166 schools (92%) indicated that

**Table 7**
**Services Outsourced to the Central Campus and Commercial Vendors**
**N=180**
**(percent of schools)**

| Outsourced to Central Campus | n=166 |
|---|---|
| All computer services | 19% |
| Connectivity | |
| Internet/web access, backbone infrastructure, routers | 49 |
| Web/network development, maintenance, management | 12 |
| E-mail | 11 |
| Teleconferencing, distance learning | 5 |
| Remote dial-in access | 2 |
| Microcomputer-related | |
| Microcomputer installation, upgrades, repairs | 26 |
| PC labs | 8 |
| Technical support | 8 |
| Helpdesk, training and consulting | 5 |
| Purchasing, software license negotiations | 4 |
| Printer repairs, maintenance | 3 |
| Mini-mainframe-related | |
| Applications development, statistics, database support | 9 |
| Mini/mainframe, VAX, UNIX support | 6 |
| General | |
| Audiovisual | 6 |
| Core administration, student records | 5 |
| Printing, photocopying | 2 |
| **Outsourced to Commercial Vendors** | **n=61** |
| Connectivity | |
| Web/network development, maintenance, management | 10% |
| Web page development | 1 |
| Microcomputer-related | |
| Hardware repairs, warranty | 17 |
| Printer repairs | 10 |
| Mini-mainframe-related | |
| Applications development, statistics, database support | 5 |
| Mini/mainframe, VAX, UNIX support | 1 |
| General | |
| Course training, consulting | 3 |
| Audio visual maintenance | 2 |
| Color printing | 1 |

they outsourced one or more services to the central campus and 61 (34%) indicated that they outsourced one or more services to commercial vendors. As can be seen in Table 7, 19% of the schools indicated that they outsourced all computer services to their central campus. One area of heavy dependence on the central campus resources was for connectivity to the external environment. Forty-nine percent of the business schools indicated dependence on the central campus for their backbone communications infrastructure and all of their Internet/Web access equipment. Additionally, twelve percent indicated reliance on the central campus to provide Web/network development, maintenance, and management, eleven percent for e-mail, five percent for teleconferencing and distance learning, and two percent for remote dial-in access.

Another area that was outsourced to the central campus was related to microcomputers, with 26% of the schools answering this question indicating using central campus computing services to install, upgrade, and repair their microcomputers. Another eight percent outsourced their

computer labs and depended on the central facility for technical support. Other areas more traditional to central campus support are mini/mainframe-related applications development (9% of the schools), statistical research and database support (6%), audiovisual (5%), and student records (5%).

The operational services outsourced to the commercial vendors were in similar areas but reported to a much lesser extent by the schools. Microcomputer and printer repairs were the two largest areas outsourced, 17% and 10% respectively. Due to the large percentage of the computer operating budget designated to personnel costs, it interesting to note that three percent of the schools seem to be taking advantage of outsourcing the labor intensive areas of course training and consulting.

### 4.4 Training

Training has also been among the most critical computer center operational issues identified in these annual surveys. As reported last year in the Thirteenth Survey, faculty training returned as the number one concern, as it had been in the Fifth Survey (1988), although in the Ninth (1992) it had dropped to fourth place. In contrast, student training, dropped to twelfth place last year, having been third in the Ninth (1992) and fifth in the Fifth Survey (1988). Last year's report suggested that the issue of student training may have been approaching resolution, reflecting perhaps that business students were entering with more sophisticated, or at least adequate, computer skills.

As in several previous surveys, the responding business schools were asked to rate the effectiveness of eight different types of computer-related training programs offered to their students, faculty, and staff. The rating scale was on a zero to five scale, with zero being "none," one indicating "inadequate," three indicating "adequate for most users," and five indicating "exceptionally effective in meeting user needs."

Table 8 gives this year's data relating to the eight different training approaches by user group. The overall average of the rated effectiveness for both the Tenth and Fourteenth Surveys are below "adequate for most users," 2.6 for the Tenth and 2.7 for the Fourteenth.

Classroom instruction is the dominant form of training for students, followed by handouts/documentation, and university-provided workshops. University-provided workshops followed by documentation was the primary approach offered to both faculty and staff. Training as part of classroom instruction was considered to be the most effective for undergraduates, while workshops prior to the beginning of classes were rated as most effective for the MBAs. Individual training was indicated as most effective for both faculty and staff. The only major change from

**Table 8**
**Effectiveness of Computer-Related Training By User Group**
**(percent of schools)**

| Type of Training | Undergrad N=198 | | MBA N= 88 | | Faculty N=209 | | Staff N=208 | |
|---|---|---|---|---|---|---|---|---|
| As part of classroom instruction | 96% | 3.3 | 86% | 3.1 | 29% | 2.5 | 26% | 2.7 |
| University-provided workshops | 46 | 2.5 | 43 | 2.5 | 81 | 2.6 | 84 | 2.8 |
| University provided one-on-one training | 20 | 2.5 | 18 | 2.3 | 35 | 2.6 | 32 | 2.6 |
| Business school workshops (prior to the beginning of classes) | 19 | 2.7 | 39 | 3.1 | 27 | 2.6 | 25 | 2.8 |
| Business school workshops (during the academic year) | 30 | 2.7 | 38 | 2.8 | 47 | 2.7 | 46 | 2.7 |
| Business school individual training | 20 | 2.6 | 23 | 2.8 | 56 | 3.2 | 53 | 3.2 |
| Handouts, workbooks, and other documentation | 61 | 2.6 | 65 | 2.7 | 66 | 2.7 | 64 | 2.6 |
| CAI, video training | 16 | 2.5 | 15 | 2.6 | 20 | 2.5 | 18 | 2.4 |

* Average effectiveness, scaled
1 = inadequate
3 = adequate for most users
5 = exceptionally effective in meeting user needs

the 1993 data was a slight increase in the effectiveness of the CAI, video training, but it still remains among the least effective type of training.

When asked about the obstacles to providing adequate student training, 179 schools identified an array of problems. Both time/scheduling conflicts and a lack of resources (funds to hire training personnel or training labs) were identified by about 33% of the schools. Other issues listed multiple times were student indifference (non-attendance unless there was an immediately perceived need) and the wide range of student skills and knowledge.

One hundred five schools indicated training obstacles for their faculty. Of these, time constraints were identified by 46% of the schools, followed by lack of incentives, interest, and motivation by 33%. The rapid rate of technological change, need for just-in-time training and change, and faculty preferences for individual rather than group training were other obstacles.

## 5. Hardware Resources and Uses

During the past few years market forces 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. 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 that point where workstations end and microcomputers begin. Furthermore, many schools have removed their traditional transaction-oriented minicomputers, are replacing them with clusters of microcomputer-based client/server systems, and are distributing computation and database tasks as appropriate.

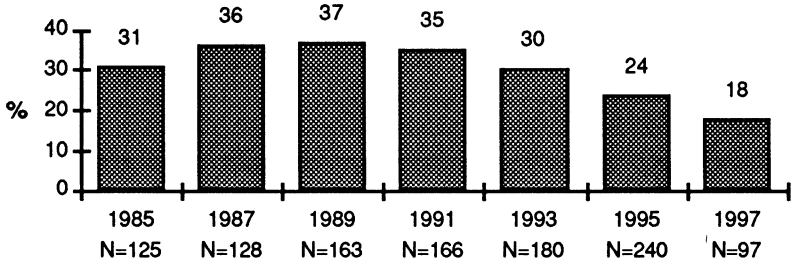
These technological developments and the broadening use of systems has been reflected in the survey questionnaires. During the 1980s respondents were asked to specify both make and model of computer equipment in four major categories: microcomputers, "32-bit graphic workstations," mini/mainframes computers, 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 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, desktop microcomputer resources by operating systems and by user groups, and laptop microcomputers by operating systems and user groups. Desktop and laptops microcomputers are then combined to look at user groups, densities, sufficiency, and recommended and required ownership. This section concludes with a summary description of the business schools computer labs.

### 5.1 Mini/Mainframe Computer Systems and Usage

One hundred forty (56%) of the business schools indicated that their users had access to mini/mainframe computer systems, down from 94% in the Tenth Survey (1993 ). As shown in Figure 5, the percent of respondent schools reporting ownership of their own mini/mainframe systems peaked in 1989 and has been steadily declining since. This year 18% of the schools indicated that they maintained their own mini/mainframe systems, a drop

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



from the 24% reported in the 1995 survey and the lowest reported since the beginning of these surveys in 1984.

The 45 schools which reported mini/mainframe ownership this year specified 61 separate systems. Table 9 displays the distribution of these systems by manufacturer. In previous surveys the 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. Five different vendor systems were supported by at least 3 or more of the schools. Digital Equipment Corporation had the largest share with 49% of the systems, a slight increase in Digital's share since the Tenth Survey. The table also shows IBM's share with a slight increase and Hewlett-Packard with a large decline. However, Sun Micro Systems doubled its market share in the same period. The schools indicated that the mini/mainframes were used for research (28%), teaching (10%), administrative systems ( 11%), and as network servers (25%). No usage data was provided for the remaining 26%.

### 5.2 Microcomputer Resources and Usage

As in the Twelfth Survey (1995), both the desktop and the laptop microcomputer data was categorized by operating system only (Apple, DOS, Windows, UNIX, and other) instead of by model and vendor detail as in the first ten surveys. This compression was necessitated because the number of different makes, models, and configurations had become difficult for the schools to keep separately. As an example, in the Tenth Survey, 34% of the schools had more than 11 different models, with some schools having over twenty. Further, differences between the various models had become fuzzy and lost most of their importance due to greater compatibility.

**Table 9**
**Business School Mini/Mainframe Systems Installed by Model**
**(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 |
|---|---|---|---|---|---|---|
| AT&T | | 4% | 12% | 9% | 2% | |
| Digital | 17% | 33 | 34 | 38 | 45 | 49% |
| Hewlett-Packard | 14 | 14 | 10 | 9 | 18 | 10 |
| IBM | 17 | 20 | 20 | 26 | 16 | 18 |
| Sun | | | | | 9 | 18 |
| Others (1 - 2 each) | 53 | 30 | 24 | 17 | 10 | 5 |
| Total systems | 59 | 80 | 122 | 95 | 140 | 61 |
| Average per school | 1.5 | 1.7 | 2.0 | 1.7 | 2.6 | 1.3 |

This year, 242 (96%) business schools provided desktop microcomputer data. A total of 51,905 systems were reported, with an average of 215 microcomputers per school, a two percent decrease from the 220 microcomputers per school as reported in the Twelfth Survey. This decrease may be explained by the increase in smaller schools participating in the survey (from Table 1) as well as the probable increase in student microcomputer ownership resulting in less demand for access to microcomputer resources at the business school. Also, as shown below in Table 13, the average laptops per school increased 57%, indicating that the schools maybe adjusting their ratio of desktop and laptop ownership.

Table 10 summarizes the distribution of microcomputers at the business schools by operating system for a twelve year period. While not only allowing a comparison of this year's data to previous years, this table also shows the introduction of various makes and models of microcomputers starting in 1985 with 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 made their appearance on microcomputer systems in 1989, and Windows 95 and Windows NT this year. Overall, the Windows operating system have a combined 80% share of operating system usage.

Figure 6 graphically displays the operating system data of Table 10, showing the historical growth and then redistribution of the various systems as reported by the business schools in these surveys. The steady decline of DOS only systems is seen as the more advanced operating

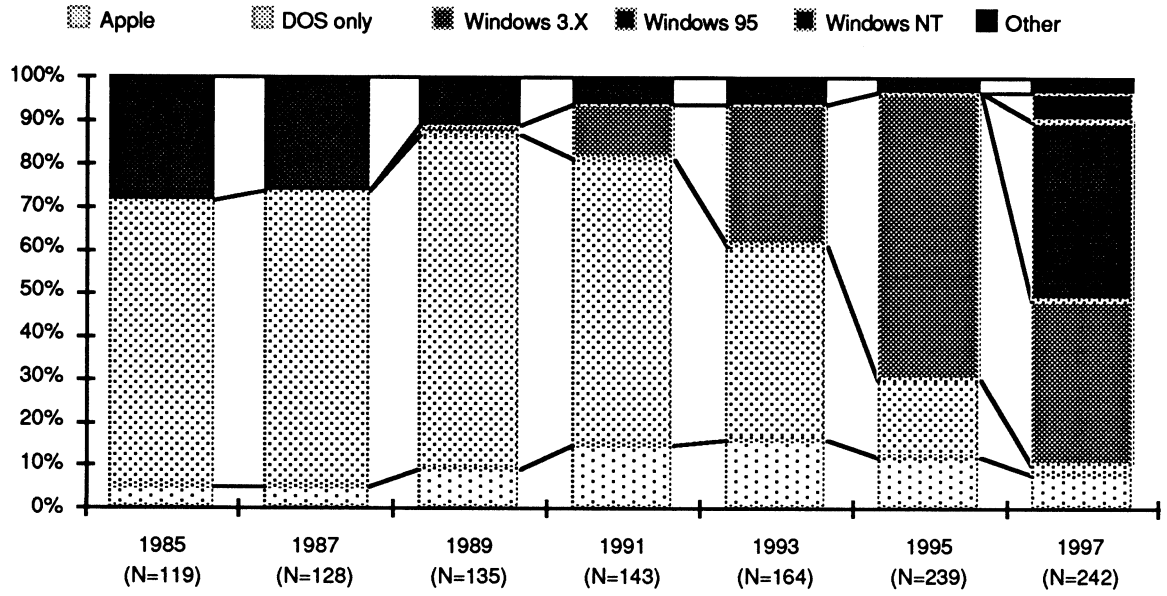
**Table 10**
**Business School Desktop Microcomputer Operating Systems**
**(number and percent of systems)**

| Vendor | 1985 N=119 n | % | 1987 N=128 n | % | 1989 N=135 n | % | 1991 N=143 n | % | 1993 N=164 n | % | 1995 N=239 n | % | 1997 N=242 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 |
| **DOS only** | | | | | | | | | | | | | | |
| HP Vectra 286 | 40 | 0 | 349 | 2 | 1194 | 4 | 1328 | 4 | 1133 | 3 | | | | |
| IBM AT, PS2 | 259 | 3 | 1194 | 7 | 1827 | 6 | 4916 | 14 | 6604 | 15 | | | | |
| IBM PC/XT | 5120 | 54 | 7509 | 45 | 9286 | 30 | 6543 | 19 | 3169 | 7 | | | | |
| Unisys | 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 |
| **Windows 3.X** | | | | | | | | | | | | | | |
| HP Vectra 386 | | | | | 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 |
| **Windows 95** | | | | | | | | | | | | | 21509 | 42 |
| **Windows NT** | | | | | | | | | | | | | 3588 | 7 |
| **UNIX Workstations** | | | | | 316 | <1 | 355 | <1 | 553 | 1 | 1150 | 2 | 897 | 2 |
| **Other** | 2725 | 28 | 4364 | 26 | 3183 | 10 | 1805 | 5 | 2038 | 5 | 350 | <1 | 747 | 1 |
| **TOTAL** | **9556** | 100 | **16725** | 100 | **31056** | 100 | **35583** | 100 | **42989** | 100 | **52650** | 100 | **51905** | 100 |
| Average systems per school | 80 | | 131 | | 193 | | 217 | | 239 | | 220 | | 215 | |
| Percent change | | | 63% | | 48% | | 12% | | 10% | | (8%) | | (2%) | |

systems were introduced. The most dramatic changes are the rapid growth and then decline in the Windows 3.x operating system, growing from 2% in 1989 to 68% in 1995, and then dropping to 38% this year. Windows 95 clearly dominates at this time. Apple Computer's presence grew through 1993, but has been falling over the past four years to its present 8% market share.

Table 11 presents the distribution of microcomputers by operating system from the computer dollar per student quartile perspective. For each quartile, the number of microcomputers reported, the percent of schools which reported a specific operating system, and the percent of the

**Figure 6**
**Microcomputer Distribution by Operating System**




total number of systems are displayed. Thus, for first quartile schools, 81% reported using the Apple operating system, and these systems accounted for 15% of the total 12,428 microcomputers available at these schools. The first quartile schools have more than double the percentage of Apple operating systems and fewer Windows 3.x operating systems than any of the other quartiles. And, while the third quartile have the largest percentage of Windows 3.x operating systems, all four quartiles have just about the same percentage of Windows 95 operating systems. As could be expected, the first quartile schools have the largest percentage of the newest operating systems, Windows NT.

**Table11**
**Microcomputer Operating Systems at Business Schools by Computer Dollar per Student Quartiles (percent of schools and systems) (n = number of systems) N = 143**

| | Quartiles | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1st n=12428 | | 2nd n=10272 | | 3rd n=8502 | | 4th n=4548 | |
| | schs have | sys use | schs have | sys use | schs have | sys use | schs have | sys use |
| Apple | 81% | 15% | 66% | 6% | 78% | 5% | 39% | 7% |
| DOS only | 25 | 1 | 43 | 2 | 36 | 3 | 17 | 4 |
| Windows 3.X | 61 | 27 | 86 | 38 | 89 | 44 | 64 | 38 |
| Windows 95 | 86 | 42 | 97 | 42 | 94 | 42 | 78 | 43 |
| Windows NT | 81 | 11 | 83 | 7 | 58 | 4 | 44 | 4 |
| UNIX | 67 | 3 | 60 | 1 | 44 | 2 | 22 | 2 |

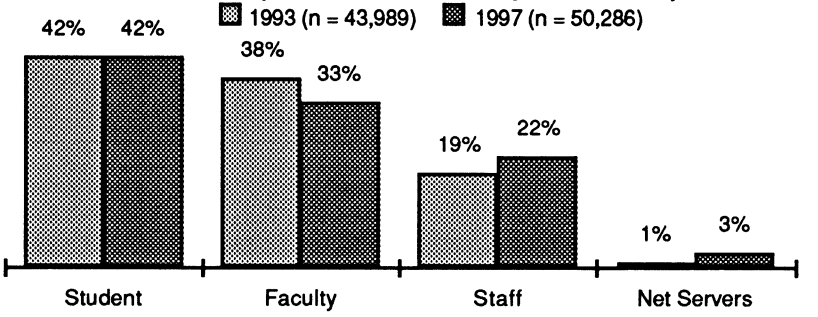
Table 12 shows the distribution of business school microcomputer operating systems for the entire survey sample and by user groups. Note that the total number of systems differs from the total shown in Table 10 since some schools did not report their microcomputer counts by user group. The data shows that 92% of the schools reported microcomputers available for students and public access, and that these accounted for 42% of the total microcomputers available. The table also shows that the students have both the highest percentage of the older DOS only operating systems (at only 16% of the schools) as well as the highest percentage of the newest Windows NT operating systems (also at 16% of the schools, but a different subset than the DOS schools). The operating systems are rather evenly spread for the faculty, with the exception that they have a low percentage of the newest Windows NT systems. The Unix systems show the largest percentage of network use.

**Table 12**
**Business School Microcomputer Operating Systems by User Groups**
**(percent of schools and systems)**
**(n = number of systems)**
**N = 252**

| | Total n=50286 | | Win 95 n=20934 | | Win 3.x n=19141 | | Apple n=4109 | | Win NT n=3538 | | DOS only n=966 | | UNIX n=880 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | schs have | sys use | schs have | sys use | schs have | sys use | schs have | sys use | schs have | sys use | schs have | sys use | schs have | sys use |
| Student/public | 92% | 42% | 60% | 40% | 49% | 42% | 27% | 34% | 14% | 61% | 14% | 65% | 12% | 27% |
| Faculty | 92 | 33 | 74 | 35 | 64 | 36 | 48 | 29 | 25 | 17 | 15 | 32 | 16 | 32 |
| Staff | 91 | 22 | 69 | 24 | 62 | 21 | 30 | 36 | 18 | 9 | 10 | 3 | 5 | 8 |
| Network | 76 | 3 | 16 | 1 | 15 | 1 | 10 | 1 | 40 | 12 | 5 | 1 | 28 | 33 |

Figure 7 compares the distribution of operating by user groups for the Tenth (1993) and the current Fourteenth Survey. While the percentage of microcomputers allocated to students has stayed at 42%, faculty allocations have decreased from 38% to 33%, with the difference going to staff and network use.

**Figure 7**
**Microcomputer Distribution by User Group**




### 5.3 Laptop Microcomputer Resources and Usage

Two hundred six (82%) business schools provided data about their laptop systems, shown in Table 13. A total of 5,890 systems were reported, with an average of 29 per school, a 57% increase over the 18 laptops per school as reported in the Twelfth Survey (1995). This increase may help to explain the slight decrease in average number of desktop microcomputers per school as discussed above referencing Table 10. Of the total 5,890 laptops report by the 206 schools, 49% were using Windows 95, indicating recent purchases by the schools. The percent of Apple systems decreased to 8%. Furthermore, 50% of the laptops were allocated for faculty use, 34% for student use, and 26% for staff.

Table 14 shows the distributions of laptop operating systems by user groups. Looking at the first column, 76% of the schools have provided laptops for faculty use, accounting for 50% of all of the systems. Only 23% of the schools provide laptops for student use as "loaner" systems,

**Table 13**
**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 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | n | % | n | % | n | % | n | % | n | % | n | % |
| Apple | | | | | 29 | 1 | 463 | 15 | 661 | 19 | 458 | 8 |
| DOS and Windows 3.X | 1627 | 100 | 4700 | 100 | 3255 | 99 | 2696 | 85 | 2756 | 81 | 2564 | 43 |
| Windows 95 | | | | | | | | | | | 2958 | 49 |
| Total | 1627 | 100 | 4700 | 100 | 3284 | 100 | 3159 | 100 | 3417 | 100 | 5980 | 100 |
| Average per school | 20 | | 35 | | 23 | | 19 | | 18 | | 29 | |
| percent change | | | 76% | | (34%) | | (16%) | | (6%) | | 57% | |
| Percent schools | 64% | | 83% | | 86% | | 91% | | 78% | | 82% | |

**Table14**
**Business School Owned Laptop Operating Systems by User Groups**
**N=252**
**(percent of schools and systems)**

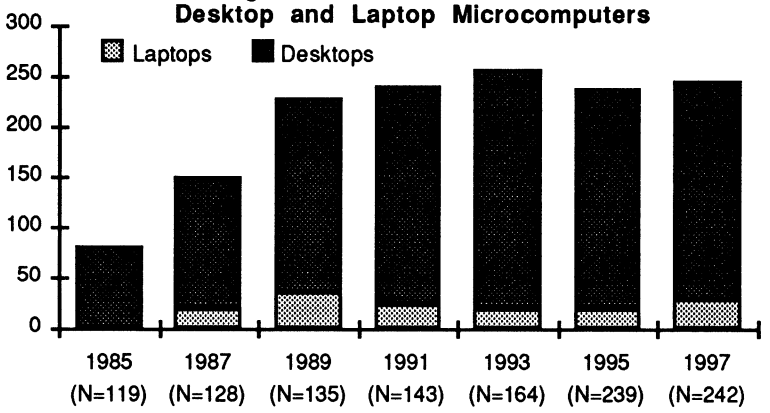
| | Total n=5980 | | Win 95 n=2958 | | Win 3.x n=2221 | | Apple n=458 | | DOS only n=343 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | schs have | sys use | schs have | sys use | schs have | sys use | schs have | sys use | schs have | sys use |
| Student/public | 23% | 34% | 3% | 41% | 13% | 3% | 4% | 7% | 3% | 12% |
| Faculty | 76 | 50 | 54 | 47 | 50 | 52 | 28 | 71 | 9 | 45 |
| Staff | 40 | 16 | 26 | 12 | 19 | 15 | 11 | 22 | 4 | 43 |

accounting for 34% of the systems. This distribution may help to explain the decrease in percentage of microcomputers allocated to the faculty shown in Figure 7. Rather than getting desktop microcomputers, the faculty maybe choosing to have laptop systems. Looking across the table, the faulty also have the highest percentages in all of the various operating systems, including 71% of all of the Apple laptops.

### 5.4 Desktop/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 8 shows the combined number of desktop and laptop systems over a twelve year period. The total average number of both systems peaked in 1993 at 258 systems per school, declined to 238 systems in 1995, and then this year increased to an average of 244 systems.

**Figure 8**
**Average Number of Business School Desktop and Laptop Microcomputers**




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 student 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 37 is interpreted as 37 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 9 and 10 show the 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 9, the median student-per-micro densities by quartile are 7, 13, 23, and 62. The first three quartiles show very slight increases, while the fourth quartile increased by 62%. There is no obvious explanation for this increase. However, when viewed overtime, the first three quartiles

**Figure 9**
**Student Microcomputer Density by Quartiles**
**(students per microcomputer)**

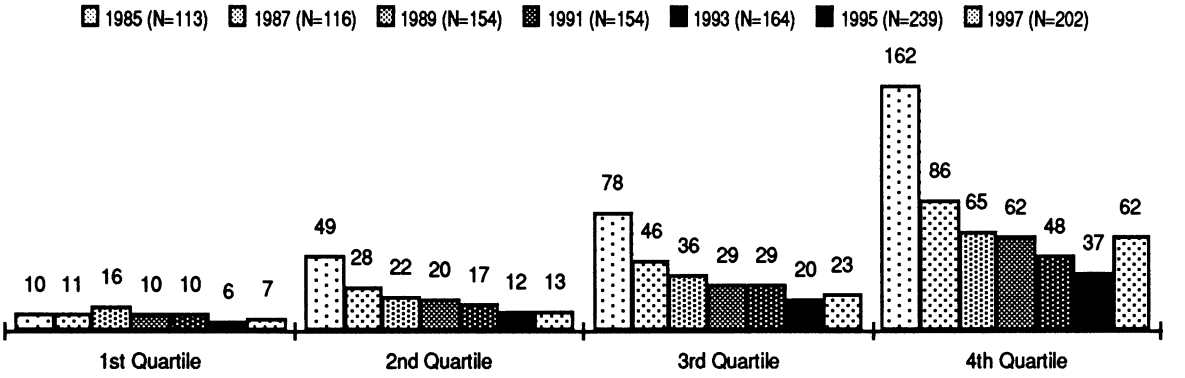
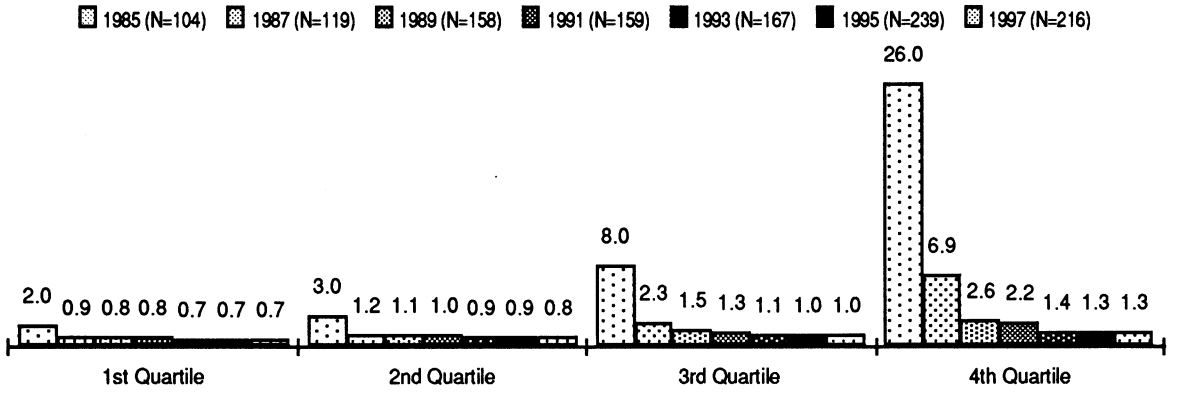



**Figure 10**
**Faculty Microcomputer Density by Quartiles**
**(faculty per microcomputer)**




seem to have stabilized, and the fourth seems to be continuing to work to improve this ratio. Figure 10, 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.

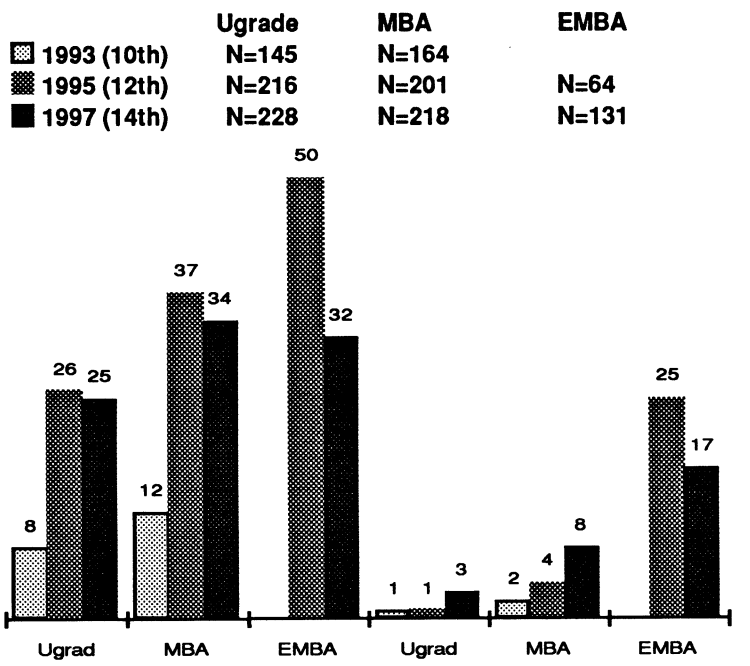
The questionnaire also asked about wait time for computer usage. Combining this data with the density levels provides a general understanding of a sufficiency number of microcomputers at the business schools for its users. Table 15 shows the current levels of densities at which the business schools consider their present level of ownership as sufficient. It isn't until the median density levels reach 31 for the undergraduates or 24 for the MBAs that the schools report that there is always a wait for computer usage.

**Table 15**
**Microcomputer / Laptop Sufficiency by User Group**
**(percent of schools)**

| | Faculty N = 238 | | Undergraduate N =203 | | MBA N = 197 | |
|---|---|---|---|---|---|---|
| | % | density | % | density | % | density |
| Never any waiting | 82 | 0.83 | 14 | 12 | 23 | 12 |
| Occasional waiting | 17 | 1.00 | 69 | 16 | 64 | 17 |
| Usually a wait | 1 | 0.70 | 13 | 18 | 11 | 21 |
| Always a wait | 0 | 0.00 | 3 | 31 | 2 | 24 |

Figure 11 summarizes the business schools' responses concerning recommended and required student microcomputer ownership. Note that while the sample size for both undergraduate and MBA students has remained about the same, the number of responding EMBA programs has more than doubled (105% increase). Thus, in absolute numbers, there has been a significant change in the composi-

**Figure 11**
**Student Microcomputer Ownership**
**(percent of schools recommending and requiring ownership)**




tion of the EMBA sample.

In general, when compared to the data from the Twelfth Survey (1995), the "recommended ownership" responses stayed about the same for the undergraduate and MBA programs. For the Executive MBA programs, even though there was a decrease in the percent of schools recommending ownership, in absolute numbers there was an actual increase from 32 to 42 schools.

With respect to requiring ownership, while only small percentages of the undergraduate and MBA programs required ownership, both of these percentages doubled. Again, for the EMBA programs, even though there was an 8% decrease in the past two years, the actual number of programs now requiring ownership has increased from 16 to 22.

When recommending systems for the undergraduates, the data showed no preference for either a desktop or a laptop system. However, at the MBA and Executive levels, there were strong recommendations for laptop systems. When systems were required, at both the undergraduate and Executive MBA level, laptops were preferred, while at the MBA level either system would suffice. The last column of Appendix 1 details those schools which recommend (rec) or require (req) microcomputer ownership.

### 5.5 Computer Labs

Data on computer labs was provided by 215 (89%) of the business schools. Table 16 summarizes and compares this data with that from 1989 and 1993. This year 747 separate computer labs were identified for an average of 3.5 computer labs per school, the same as four years ago. Of the total microcomputers reported in this year's survey, 20,536 (40%) were available in the labs, a fairly consistent percentage over the eight years of data collection. The average number of computers per lab was 27.6, with the range including "0 computers" (or "computerless" labs with only network connections for students to plug-in their laptop computers to 193). In the communications area, while nearly all (97%) of the labs have network connections , 21% now have connections for laptop computers.

This year, 7% of the labs are designated as exclusively for faculty and staff use, 13% for undergraduates only, and 16% for MBAs only. The number of labs used for regular classroom instruction increased to 61% from 51% in 1993. The labs are open an average of 87 hours per week, with many open 24 hours a day. However, availability of consultants at the labs has decreased. The percent of schools with a consultant at least two-thirds of the open hours is the lowest (51%) since data was first collected in 1989. This once again may reflect not only the difficult budget situation for many business schools, but also the user's increasing computer literacy.

Table 17 shows the wide range of peripheral devices which are now commonly available in the computer labs. Seventy-six percent of the labs have laser printers and about half (51%) have CD-players. Other multimedia support equipment such as scanners, video converters and CD-recorders are available in more select lab settings.

**Table 16**
**Business School Computer Labs**

| | 1989 N = 157 | 1993 N = 169 | 1997 N = 215 |
|---|---|---|---|
| Number of labs | 490 | 594 | 747 |
| Average per school | 3.1 | 3.5 | 3.5 |
| Range | 1-12 | 1-12 | 1-11 |
| Total lab micros | 12,450 | 16,449 | 20,536 |
| % of total micros reported | 40% | 38% | 40% |
| Average micros per lab | 25.4 | 29.6 | 27.6 |
| Range | 1-84 | 2-158 | 0-193 |
| Communications | | | |
| % labs networked | 48% | 93% | 97% |
| % network ports for laptops | | | 21% |
| User group dedication (number of labs) | 477 | 584 | 554 |
| Faculty or faculty/staff only | 11% | 6% | 7% |
| Undergraduate only | | | 13 |
| MBA only | | | 16 |
| Undergrad and MBA only | | | 27 |
| All users | 86 | 94 | 27 |
| Other (e.g., staff or Ph.D. only) | | | 10 |
| Usage | | | |
| Regular classroom instruction | 49% | 51% | 61% |
| Lab availability (number of labs) | | | 659 |
| hour open mean | | | 87 |
| range | | | 5 - 168 |
| Consultant availability (number of labs) | 432 | 534 | 639 |
| less than 1/3 time | 31% | 31% | 35% |
| 1/3 to 2/3 time | 10 | 12 | 14 |
| greater than 2/3 time | 59 | 57 | 51 |

**Table 17**
**Computer Lab Peripheral Devices**
**N = 247**
**(percent of labs)**

| Printers | | | | Multimedia | | | |
|---|---|---|---|---|---|---|---|
| Dot matrix | B/W Laser | Color Laser | Ink jet | Scanner | Video converter | CD players | CD recorder |
| 31 | 76 | 12 | 18 | 28 | 14 | 51 | 11 |

## 6. Curriculum Integration

A major purpose of information technology in the business schools is to give students an opportunity to use computers, the hardware, software, and networks, to become familiar with the potentials as well as the risks of technology. Last year's survey showed "defining an appropriate level of curriculum integration" and "selection of courses to be integrated" to be the most important instructional issues at the business schools, issues which have remained among the most critical since 1988. This section first presents an orientation to curriculum integration by considering the business schools' expectations, their perception of the impact that the use of information technology is having on their business school curriculum, and student entrance requirements and graduation expectations. Data regarding actual usage of the information technology in (undergraduate and graduate courses, databases, and e-mail) follows.

### 6.1 Integration Expectations and Curriculum Impact

The schools were asked to indicate, given the resources available at their school, the degree to which computer integration into the curriculum was meeting their expectations. The response to this question was on a one to five scale, with one indicating the "less than expectations" responses and five indicating "exceeding expectations." Figures 12 and 13 summarize the responses for the undergraduate and MBA programs respectively and compare them with those of the Tenth Survey (1993). The average for the 220 business schools that responded about their undergraduate programs is 2.83, little changed from that of 2.73 four years ago. Similarly, the average for the 207 business schools who responded about their MBA programs is 2.81, only slightly higher than the 2.61 four years ago. Looking at both of these figures, it is obvious that most of the schools are not too impressed with their overall computerization efforts. There seems to be something lacking as 35% of the undergraduate respondents and 36% of the MBA respondents indicated that the level of integration was less than expected. The schools seem to want their programs to do more with their current resource levels.

**Figure 12**
**Computer Integration into the Undergraduate Business School Curriculum**
**(percent of schools)**

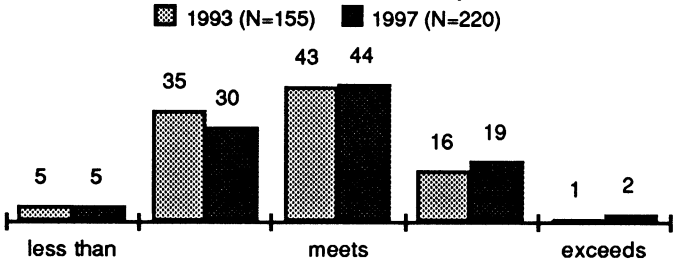
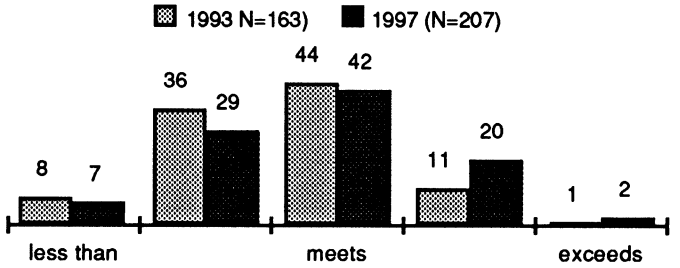



**Figure 13**
**Computer Integration into the MBA Business School Curriculum**
**(percent of schools)**




Another approach to the same issue was asking the schools the degree to which computer technology had positively impacted the curriculum. The response scale was zero to five, with zero being "none," one indicating "somewhat," and five "extensively." As can be seen in Figures 14 and 15 for the undergraduate and MBA programs respectively, these results were more impressive, although some of the MBA program respondents still seem disappointed and serve to bring that overall average down. Figure 14 shows the responses for 214 business schools who responded regarding their

**Figure 14**
**Impact of Computer Technology on the Undergraduate Business Curriculum**
**(percent of schools)**

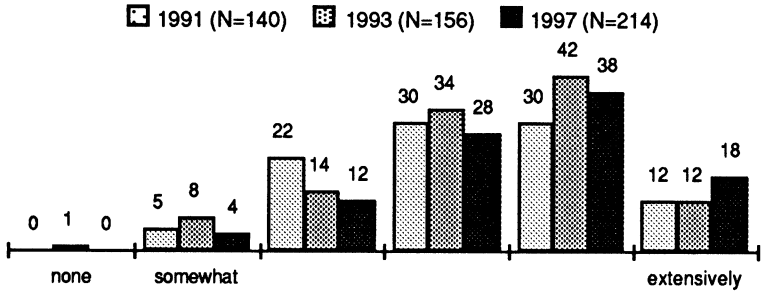
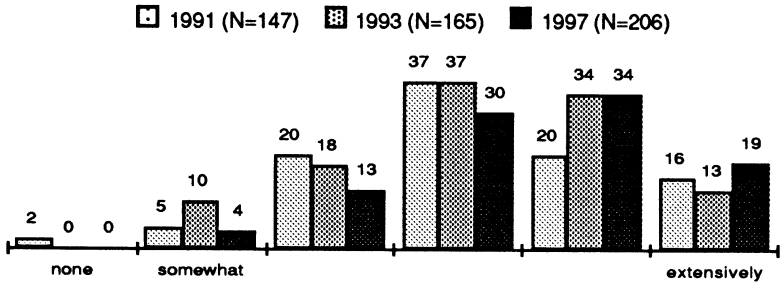



**Figure 15**
**Impact of Computer Technology on the MBA Business Curriculum**
**(percent of schools)**



undergraduate programs, with an average of 3.54, up from 3.23 for the 1991 data and 3.31 for the 1993 data. Fifty-six percent of the respondents indicated that the impact was "extensive" (4 or 5), as compared to 49% in 1993 and 42% in 1991. Figure 15 shows the responses for 206 business schools who responded regarding their MBA programs, with an average of 2.51, up from 2.18 for the 1991 data and 2.19 for the 1993 data. However, 53% of the respondents indicated that the impact was "extensive" (4 or 5), as compared to 42% in 1993 and 36% in 1991.

### 6.2 Student Entrance Requirements and Graduation Expectations

Nineteen percent of this year's undergraduate program schools and 30% of the MBA program schools indicated that there were computer competency entrance requirements. These percentages are about the same as in 1993, when 22% of the undergraduate and 28% of the MBA program schools indicated entrance requirements. For the undergraduate programs, common descriptions of the entrance requirements included completion of a workshop, proof of competency, the option to test out of the basic required courses, and/or a required course during the first year of the program. For the MBA programs, common descriptions of the requirements included an assumption of basic computer skills, the use of a self-assessment process, a required entrance exam, the requirement of an undergraduate computer literacy course, and/or a required MBA course.

Tables 18 and 19 summarize the computer requirements and/or expectations upon graduation from business school for both the undergraduate and MBA programs respectively and

**Table 18**
**Undergraduate Computer Requirements and Expectations Upon Graduation**
**(percent of schools)**

| | 1989 N=149 | | 1993 N= 157 | | 1997 N= 215 | |
|---|---|---|---|---|---|---|
| Requirements/Expectations | Required | Expected | Required | Expected | Required | Expected |
| Computer/Info System course | 91% | 3% | 86% | 7% | 81% | 7% |
| Spreadsheet use | 81 | 14 | 76 | 19 | 80 | 20 |
| Microcomputer use | 83 | 12 | 76 | 19 | 76 | 18 |
| Word processing use | 71 | 20 | 68 | 25 | 76 | 24 |
| Database use | 58 | 19 | 61 | 20 | 61 | 23 |
| E-mail | | | | | 50 | 43 |
| Web search skills | | | | | 45 | 46 |
| Online database retrieval | 18 | 25 | 24 | 34 | 35 | 20 |
| Programming language | 41 | 16 | 32 | 17 | 20 | 17 |
| Pass computer literacy exam | 11 | 10 | 16 | 14 | 20 | 17 |
| Web page development | | | | | 12 | 33 |
| Mini/mainframe use | 50 | 25 | 31 | 28 | 11 | 32 |
| Groupware (forum, brainstorm) | | | | | 7 | 21 |

**Table 19**
**MBA Computer Requirements and Expectations Upon Graduation**
**(percent of schools)**

| | 1989 N=157 | | 1993 N= 164 | | 1997 N=208 | |
|---|---|---|---|---|---|---|
| Requirements/Expectations | Required | Expected | Required | Expected | Required | Expected |
| Spreadsheet use | 72% | 21% | 66% | 30% | 67% | 28% |
| Microcomputer use | 76 | 17 | 68 | 27 | 66 | 25 |
| Word processing use | 51 | 37 | 54 | 37 | 65 | 30 |
| Computer/Info System course | 75 | 10 | 72 | 15 | 60 | 19 |
| E-mail | | | | | 47 | 44 |
| Database use | 41 | 29 | 40 | 35 | 44 | 32 |
| Online database retrieval | 17 | 29 | 24 | 39 | 39 | 48 |
| Web search skills | | | | | 38 | 52 |
| Pass computer literacy exam | 12 | 11 | 15 | 16 | 13 | 16 |
| Mini/mainframe use | 38 | 30 | 21 | 30 | 12 | 29 |
| Web page development | | | | | 11 | 28 |
| Groupware (forum, brainstorm) | | | | | 8 | 25 |
| Programming language | 19 | 15 | 9 | 20 | 5 | 19 |

compare this year's data with that from 1989 and 1993. The importance of the requirements may be assumed from their percentage rankings and are quite similar for the undergraduate and MBA programs, with the basic skill sets being identified first for both programs, followed by network and information retrieval skills. Additionally, the required percentages are higher for the undergraduate programs whereas the expected percentages are higher for the MBA programs. Slight variations occur. For instance, in the first four skill set listings, computer/information systems course is ranked fourth for the MBA programs instead of first as for the undergraduate programs. The next set of four network and data retrieval listings are the same for both with only slight variations in the order. Mini/mainframe usage, earlier required by 50% of the undergraduate and 38% of the MBA program schools, dropped to 11% for both of the programs. The new skill of Web page development is required at about the same amount for both programs, 11% and 12%, as is the use of groupware, 7% and 8%.

### 6.3 Integration Into Undergraduate and Graduate Courses

The same question format regarding actual information technology usage in the core curriculum courses has consistently been used throughout these surveys. Using the course descriptions as given by AACSB, the schools responded whether required computer use occurred in none, some, or all of the core course sections. Figure 16 summarizes this year's data for 215 business schools' undergraduate core curriculum and Figure 17 for 204 business schools' MBA core curriculum. The individual classes within these figures are ranked according to their overall usage and show a very similar pattern between the undergraduate and MBA programs, with statistics, computer information systems, accounting, and finance being ranked as the first four in terms of computer usage.

**Figure 16**
**Required Computer Use in Undergraduate Core Courses**
**N=215**

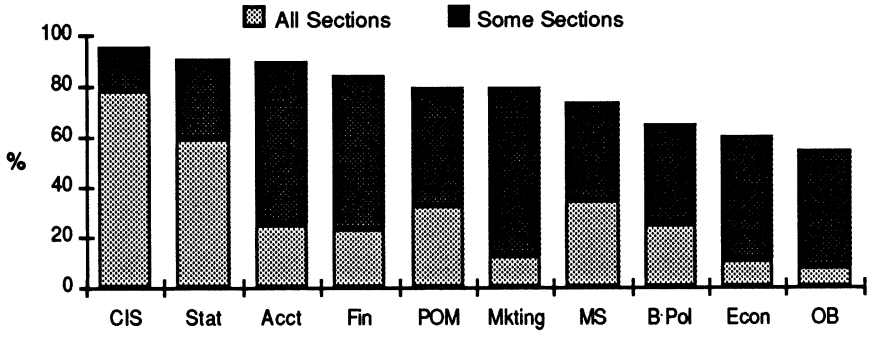



**Figure 17**
**Required Computer Use in MBA Core Courses**
**N=204**

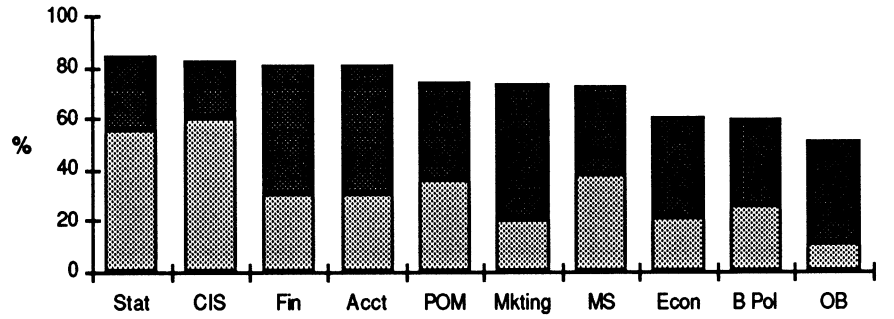
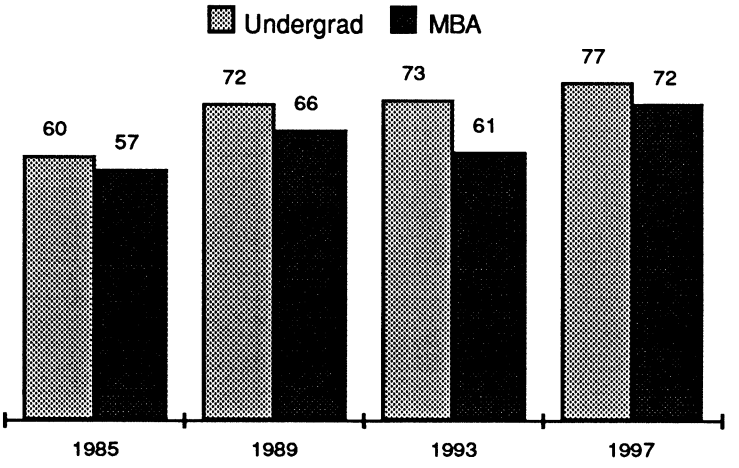



Table 20, detailing individual course percentage usage, and Figure 18, graphing the overall average usage, present a historical summary over a twelve year period for the use of computers in the core curriculum. As shown in Figure 18, the highest rate of change in computer usage, 20% for the undergraduate and 16% for the MBA programs, occurred in the four year period between the 1985 and the 1989, slowed considerably for the undergraduate programs in the next four year period and declined by eight percent for the MBA, and then increased by six percent for the undergraduate programs and 18% for the MBA in the last four year period between 1993 and this year, 1997, to the highest percent of actual usage of computers in the core curriculum.

**Table 20**
**Required Computer Usage in Core Courses:**
**An Historical Perspective 1985-1997**
**(percent of schools)**

| | Undergraduate | | | | MBA | | | |
|---|---|---|---|---|---|---|---|---|
| **Core Courses** | **1985** | **1989** | **1993** | **1997** | **1985** | **1989** | **1993** | **1997** |
| Accounting | 62% | 86% | 88% | 89% | 55% | 80% | 73% | 81% |
| Business Policy | 42 | 58 | 52 | 65 | 32 | 47 | 48 | 59 |
| Economics | 29 | 49 | 52 | 60 | 32 | 47 | 47 | 60 |
| Finance | 64 | 83 | 83 | 84 | 76 | 80 | 79 | 81 |
| Info Systems | 87 | 93 | 96 | 95 | 78 | 83 | 88 | 83 |
| Mgt Science | 52 | 74 | 79 | 73 | 77 | 77 | 77 | 78 |
| Marketing | 82 | 82 | 76 | 79 | 55 | 70 | 74 | 73 |
| Org Behavior | 20 | 32 | 41 | 54 | 21 | 31 | 38 | 51 |
| Prod/Operations | 78 | 77 | 77 | 78 | 71 | 70 | 74 | 74 |
| Statistics | 76 | 86 | 90 | 89 | 69 | 80 | 82 | 85 |
| **Average** | 60% | 72% | 73% | 77% | 57% | 66% | 61% | 72% |

**Figure 18**
**Overall Required Computer Usage in Core Courses**
**(percent of schools)**




### 6.4 Sources of Course Software

For core courses in which computers were used, the schools were asked to indicate the source of the software. The options included that the software was developed internally, supplied with the textbook, acquired commercially or acquired from another university. Many schools indicated multiple sources for their course software and some listed generic application commercial software such as an office suite (MS Office) or a generic application such as a word processing package or a spreadsheet. Tables 21 and 22 detail this year's data separately for the undergraduate and MBA core courses, and then Figures 19 and 20 present a historical summary of the averages over the twelve year period, 1985 to 1997. The "N" in Tables 21 and 22 are the number of schools which indicated at least some required computer use with each line showing the percentage of schools in each category based on that "N." Both tables indicate that commercial software packages were the dominant source of courseware, followed next by software acquired with a particular course textbook.

The historical perspective as given in Figures 19 and 20 shows that all sources of the course software have remained about the same, with the exception of that internally developed which dropped for both the undergraduate and MBA core classes.

**Table 21**
**Sources of Undergraduate Courseware**
**(percent of schools with required computer use)**

| Undergraduate Core Class | N | Internal | Textbooks | Commercial | Other University |
|---|---|---|---|---|---|
| Accounting | 191 | 18% | 55% | 65% | 4% |
| Business Policy | 140 | 12 | 41 | 59 | 6 |
| Economics | 129 | 15 | 47 | 54 | 5 |
| Finance | 180 | 18 | 49 | 64 | 4 |
| Information Systems | 208 | 25 | 53 | 72 | 7 |
| Management Science | 157 | 16 | 48 | 65 | 6 |
| Marketing | 171 | 15 | 43 | 64 | 2 |
| Organizational Behavior | 116 | 11 | 41 | 57 | 4 |
| Production/ Operations | 168 | 13 | 46 | 64 | 3 |
| Statistics | 190 | 17 | 44 | 72 | 4 |
| Average | | 16% | 47% | 64% | 5% |

**Table 22**
**Sources of MBA Courseware**
**(percent of schools with required computer use)**

| Graduate Core Class | N | Internal | Textbooks | Commercial | Other University |
|---|---|---|---|---|---|
| Accounting | 168 | 15% | 40% | 67% | 2% |
| Business Policy | 123 | 16 | 34 | 63 | 3 |
| Economics | 125 | 19 | 33 | 64 | 4 |
| Finance | 168 | 16 | 39 | 70 | 3 |
| Information Systems | 172 | 21 | 41 | 73 | 4 |
| Management Science | 151 | 18 | 40 | 67 | 5 |
| Marketing | 152 | 14 | 39 | 70 | 1 |
| Organizational Behavior | 106 | 16 | 40 | 59 | 3 |
| Production/ Operations | 153 | 15 | 41 | 66 | 1 |
| Statistics | 176 | 13 | 35 | 77 | 5 |
| Average | | 16% | 38% | 68% | 3% |

### 6.5 Database Usage

Information regarding databases available for instruction and research for the 218 (87%) business schools providing data is summarized in Table 23, ordered by percent of availability. More than 65 other databases were listed, with only a few mentioned by more than one school. Eleven schools did, however, provide extensive lists detailing as many as 29 databases, as well as

**Table 23**
**Databases Available for Research and Instruction**
**(ordered by availability)**
**(percent of schools)**

| Availability | | | | Database | Storage Format | | | Access Method | | | | Primary Users | | | | Level of Support | Support Provider | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1989 (N=163) | 1991 (N=166) | 1993 (N=180) | 1997 (N=216) | | on-line | tape | CDROM | stand alone | terminal dialup | Web interface | via network | Faculty | PhD | MBA | Ugrads | 1= user on-own 5 = extensive support | Library | Computer Staff | Other |
| 37 | 48 | 54 | 69 | Library Catalog | 97 | 2 | 3 | 8 | 24 | 37 | 70 | 88 | 37 | 78 | 81 | 3.4 | 90 | 9 | 5 |
| 17 | 30 | 43 | 61 | ABI Inform | 44 | 1 | 63 | 30 | 14 | 23 | 60 | 84 | 31 | 72 | 66 | 3.1 | 90 | 13 | 4 |
| 74 | 64 | 58 | 55 | Compustat | 35 | 34 | 50 | 23 | 15 | 6 | 65 | 91 | 39 | 50 | 34 | 2.8 | 30 | 50 | 17 |
| 17 | 21 | 37 | 46 | Lexis/Nexis | 95 | 0 | 8 | 12 | 38 | 13 | 51 | 84 | 35 | 76 | 63 | 3.1 | 63 | 29 | 12 |
| 63 | 55 | 49 | 44 | CRSP | 41 | 55 | 13 | 14 | 17 | 8 | 68 | 92 | 47 | 28 | 17 | 2.6 | 12 | 49 | 23 |
| 21 | 28 | 28 | 38 | Compact Disclosure | 24 | 2 | 83 | 43 | 6 | 4 | 48 | 66 | 27 | 69 | 65 | 3.0 | 75 | 13 | 7 |
| 26 | 30 | 29 | 31 | Dow Jones | 96 | 3 | 1 | 6 | 37 | 19 | 51 | 84 | 33 | 70 | 49 | 3.0 | 63 | 23 | 6 |
| | | | 27 | Dialog | 97 | 2 | 7 | 13 | 48 | 15 | 33 | 85 | 35 | 48 | 38 | 3.8 | 92 | 3 | 3 |
| | | | 22 | Econlit | 53 | 2 | 51 | 19 | 11 | 26 | 57 | 75 | 49 | 53 | 49 | 3.1 | 75 | 9 | 11 |
| | | | 20 | NTDB | 42 | | 73 | 40 | 2 | 35 | 42 | 71 | 29 | 77 | 60 | 3.3 | 23 | 4 | 4 |
| 24 | 22 | 21 | 16 | Citibase | 49 | 31 | 20 | 20 | 14 | | 71 | 89 | 51 | 31 | 29 | 2.6 | 23 | 43 | 20 |
| | | | 12 | Bloomberg | 96 | | | 62 | 23 | 4 | 12 | 69 | 46 | 81 | 50 | 2.9 | 38 | 23 | 35 |
| | | | 10 | Investext | 46 | | 54 | 29 | 21 | 46 | 63 | 29 | 71 | 38 | 8 | 3.4 | 79 | 17 | |

**Figure 19**
**Sources of Undergraduate Courseware**
**(average percent per year)**

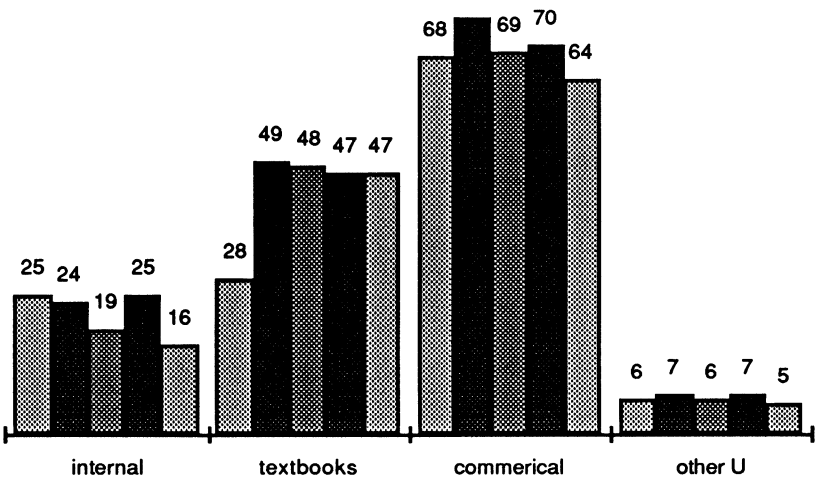
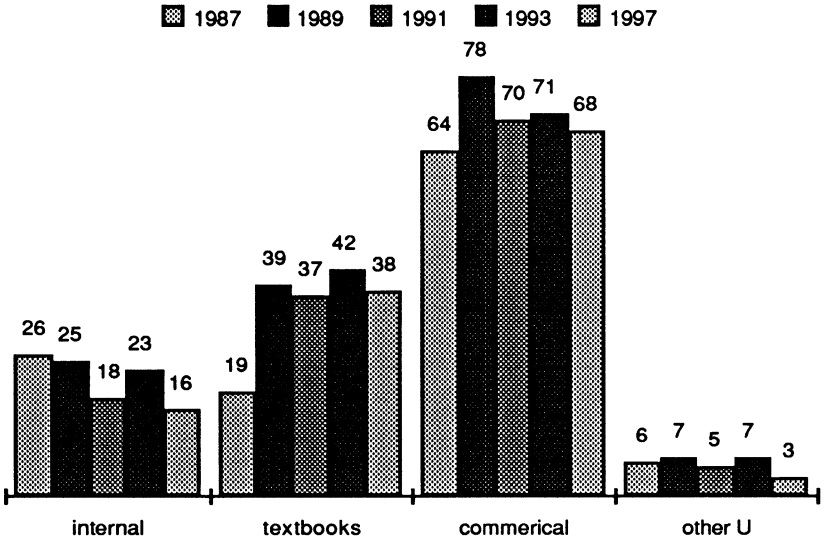



**Figure 20**
**Sources of MBA Courseware**
**(average percent per year)**




referencing the unlimited others available through the Internet/Web. Table 23 differs slightly from the format used in previous surveys. Web Interface was added to "Access Method," Undergraduates was added to "Primary Users" because of the increasing amount of required information searches now required (up to 35% of the 217 schools from 24% previously, see Table 18), "Access Charge" was dropped and "Funding Available" were dropped (only one database, Dialog with 31%, indicated major charges, and the final category of "Support Provider" was added.

The increasing use of information is supported in this table. The highest percentage of of database usage increased to 69% of the schools responding to this question as compared to 58% in the 1993 data. Other than the Library Catalog ranking as the highest used, ABI Inform has now surpassed Compustat in representative level of usage. Lexis/Nexis and Compact Disclosure are also increasing steadily in usage, while CRSP and Citibase are decreasing. The library staff seem to have the most responsibility for database support except for CRSP which is maintained

to a large degree by the computer center staff. "Other" providers of support mentioned included commercial database services, central campus staff, as well as faculty members.

### 6.6 E-mail Usage

Electronic mail (e-mail) is an old information technology application which was first introduced in the late 1960s as an interesting esoteric application on mainframe systems, slowly migrated to minicomputers during the 1970s, and has now became common place as microcomputers became ubiquitous in the late 1980s and were connected via networks. Today, commercial systems are allowing e-mail to become even more of a commodity and an everyday event.

The survey questionnaire again asked the respondents to estimate the percentage of their users who regularly use e-mail, with "regularly" being defined as at least 3 times per week. Table 24 presents this data together with that from several previous years. This table documents the significant growth in e-mail usage over the last four years. For instance, this year, 96% of the responding business schools indicated that their faculty used e-mail and that 84% of them could be considered regular users whereas four year ago 86% of the schools responded that only 47% of their faculty were regular users. This year's data also shows that slightly more of the business school staff than their faculty are perceived to be regular users, 87% versus 84%, and surprisingly that a higher percentage of the undergraduates than the MBAs are perceived to regular users, 75% versus 66%. These data suggest that both the undergraduates and the MBAs are close to their required/ expected graduation target levels of 93% and 91% (from Tables 18 and 19), respectively.

**Table 24**
**E-Mail Usage**
**(percent of schools and users)**

| | 1991 N = 166 | | 1993 N = 180 | | 1997 N = 252 | |
|---|---|---|---|---|---|---|
| | schools have | users participate | schools have | users participate | schools have | users participate |
| Faculty | 76% | 38% | 86% | 47% | 96% | 84% |
| Staff | 69 | 44 | 74 | 54 | 94 | 87 |
| Undergraduates | 36 | 17 | 49 | 17 | 82 | 75 |
| MBAs | 36 | 26 | 58 | 28 | 81 | 66 |

## 7. Software Resources

The business schools identified the major software packages used for 24 different applications categories[3]. Table 25 summarizes this data and compares it with the similar data from the Tenth Survey (1993). Unlike previous surveys, the questionnaire this year did not request the schools to distinguish software used on mini/mainframes from that used on microcomputers, based on the assumption that the majority of the software was microcomputer-based. On the other hand, the schools were asked to continue distinguishing between the software applications primarily used for instruction and for research. In general, these differences are slight, mainly showing that the schools use a fewer number of packages for research than for instruction.

Table 25 shows the percent of schools responding with software for each particular category and the total number of different packages that were identified by the schools, ranked by the percentage of schools providing software information by application category for 1997. In general, the ordering of the software applications stays just about the same as in 1993 with the most common being the microcomputer productivity applications of word processing, presentation graphics, and spreadsheets. Data for two new categories this year, Web browsers and the

[3] The communication software data was unusable this year as some schools listed their e-mail package and others terminal emulation package or other protocols. Accordingly, this category has been omitted from the analysis.

office suites, were also provided by the highest percentage of schools.

Table 25 shows that 82% or more of the business schools utilize the first eight application categories, word processing through database management systems. After that, the utilization rate drops rather sharply for the more specialized applications. Also, several interesting patterns emerge when comparing the percentages of respondent schools and the number of different applications between the four years of data. For instance, the emergence of a strong market leader is illustrated when the number of different packages decreases and the percentage of responding schools stays about the same, as seen in the productivity applications of word processing, graphics, spreadsheets, and utilities. An opposite pattern shows an application for which no package dominates. For example, the number of different packages increased in instructional support, software for statistics, the business games, group decision support systems, and the bibliographic applications although the percentage of responding schools stayed about the same.

**Table 25**
**Summary of Microcomputer Software Usage**
**(percent of schools)**

| | Tenth (1993) N=180 | | Fourteenth (1997) N=252 | |
|---|---|---|---|---|
| | % schools | # packages | % schools | # packages |
| Graphics and presentation | 97 | 24 | 97 | 9 |
| Word processing | 97 | 18 | 97 | 5 |
| Web browser | | | 96 | 5 |
| Spreadsheet | 94 | 8 | 96 | 3 |
| Suites | | | 92 | 3 |
| Statistical | 93 | 22 | 90 | 31 |
| Virus protection | 75 | 17 | 83 | 14 |
| Database management | 94 | 19 | 82 | 19 |
| Programming language | 77 | 17 | 57 | 16 |
| Desktop publishing | 74 | 17 | 48 | 16 |
| Business games | 40 | 25 | 40 | 49 |
| Modeling, optimization | 69 | 22 | 37 | 33 |
| Project management | 28 | 11 | 37 | 7 |
| Simulation | 54 | 16 | 35 | 40 |
| Groupware | | | 32 | 19 |
| Development/CASE tools | 38 | 14 | 29 | 19 |
| Multimedia, hypermedia | 41 | 5 | 27 | 11 |
| Utilities | 30 | 9 | 27 | 5 |
| AI / Expert Systems | 61 | 21 | 25 | 20 |
| Network management | | | 23 | 18 |
| Group decision support systems | 15 | 14 | 16 | 25 |
| Bibliographic | 8 | 10 | 12 | 24 |
| Instructional support | 8 | 9 | 8 | 16 |
| Text analysis | 6 | 5 | 4 | 7 |

### 7.1 Software Details by Application Category

Detailed tables (in alphabetical order) are given for most of the software application categories listed in Table 25. In the detailed tables, the count after a particular software package is the number of times that package was reported by five or more schools. The "other" category reflects the total number of different packages not identified by five or more schools and the number of schools. The "# packages" at the bottom of each table identifies the total number of different packages for that particular year and category. In some instances, no values are specified for 1993 indicating this as a new category or one for which the earlier information was incomplete.

#### Artificial Intelligence

As shown in Table 26, the number of schools identifying software for this category declined from 110 for 1993 to only 64 in 1997. However, although the same two packages for instruction, VP-Expert and Exsys and the same two for research, VP-Expert and Prolog, were the most common again this year, they were the only ones identified by five or more of the 64 schools, in contrast to five packages for the 110 schools in 1993. This pattern of a decrease in number of responding schools is also seen for the modeling/optimization as well as the simulation applications, perhaps indicating that these areas are not being stressed as much as they were previously. However, as can be seen in the table, there were still more schools responding for AI use in

**Table 26**
**Artificial Intelligence, Expert System Software**
**1993 (N=110) 1997 (N=64)**

| Instruction | | | | Research | | | |
|---|---|---|---|---|---|---|---|
| 1993 | | 1997 | | 1993 | | 1997 | |
| VP-Expert | 59 | VP-Expert | 33 | VP-Expert | 33 | VP-Expert | 13 |
| Exsys | 26 | Exsys | 18 | Prolog | 27 | Prolog | 9 |
| Prolog | 23 | Other (14) | 17 | LISP | 20 | Other (9) | 10 |
| Guru | 16 | | | Exsys | 16 | | |
| LISP | 5 | | | Guru | 15 | | |
| Other (16) | 24 | | | Other (16) | 18 | | |
| # packages | 21 | # packages | 16 | # packages | 21 | # packages | 11 |

instruction, 68 schools, as compared to 32 schools for research.

**Bibliographic Software**

Twenty-nine schools identified 24 different software packages being used for bibliographic applications. Of these, only Endnote was identified by more than five schools and then only in the research area. Several databases, ABI Inform and Lexis/Nexis, were identified by several different schools.

**Business Games**

As summarized in Table 27, business games are used primarily for instruction rather than for research at the 102 business schools who provided information for this applications category. Additionally, there are only several games that seem to be in common usage, with Markstrat the only one appearing across the four year period. Of the 43 packages listed by the responding schools, only the Business Strategy Game and Brandmaps were identified by more than five

**Table 27**
**Business Games**
**1993 (N=72) 1997 (N=102)**

| Instruction | | | | Research | | | |
|---|---|---|---|---|---|---|---|
| 1993 | | 1997 | | 1993 | | 1997 | |
| Markstrat | 43 | Markstrat | 43 | | | Other (9) | 10 |
| Marketing Game | 19 | Business Strategy Game | 17 | | | | |
| Other (23) | 23 | Brandmaps | 5 | | | | |
| | | Other (40) | 48 | | | | |
| # packages | 25 | # packages | 43 | # packages | | # packages | 9 |

schools this year. None of the others were identified by more than two other schools, indicating a lot of creativity and innovation by the schools in the use of games for instruction.

**Database Management Software**

Consolidation seems to have taken place for the database management software packages. As shown in Table 28, instead of the eight packages listed by five or more schools in 1993, only four were identified this year by five or more schools for both instruction and research. Access, four years ago at the bottom of the list because it was only identified by eight schools, was the dominant package this year, replacing dBase which came in as the second most commonly identified database management package.

**Desktop Publishing Software**

Table 29 shows that PageMaker has remained as the most commonly identified desktop publishing package for both instruction and research, although for research applications TeX also remained commonly identified. MS Publisher appeared for the first time this year, whereas Ventura dropped out as being listed by five or more schools.

**Table 28**
**Database Management System Software**
**1993 (N=169) 1997 (N=206)**

| Instruction | | | | Research | | | |
|---|---|---|---|---|---|---|---|
| 1993 | | 1997 | | 1993 | | 1997 | |
| DBase | 131 | Access | 133 | dBase | 96 | Access | 66 |
| Paradox | 79 | dBase | 42 | paradox | 69 | dBase | 31 |
| R:BASE | 45 | Paradox | 36 | R:BASE | 39 | Paradox | 21 |
| Oracle | 26 | Oracle | 13 | Oracle | 22 | Oracle | 12 |
| Foxbase | 26 | Other (8) | 12 | INGRES | 11 | Other (8) | 11 |
| Focus | 8 | | | Focus | 9 | | |
| INGRES | 8 | | | Access | 6 | | |
| Access | 8 | | | Other (10) | 19 | | |
| Other (11) | 20 | | | | | | |
| # packages | 19 | # packages | 12 | # packages | 17 | # packages | 12 |

**Table 29**
**Desktop Publishing Software**
**1993 (N=134) 1997 (N=121)**

| Instruction | | | | Research | | | |
|---|---|---|---|---|---|---|---|
| 1993 | | 1997 | | 1993 | | 1997 | |
| PageMaker | 71 | PageMaker | 74 | PageMaker | 76 | PageMaker | 39 |
| Ventura | 16 | MS Publisher | 8 | TeX | 39 | TeX | 23 |
| TeX | 14 | TeX | 5 | Ventura | 31 | MS Publisher | 6 |
| Ready Set Go | 5 | Other (11) | 17 | Other (14) | 16 | Other (11) | 14 |
| Other (7) | 8 | | | | | | |
| # packages | 11 | # packages | 14 | # packages | 17 | # packages | 14 |

**Development/CASE Tools Software**

Development tools, such as Computer Assisted Software Engineering (CASE), are often included as critical software for system analysis and design courses. However, as can be seen in Table 30, while the number of schools has stayed about the same over the past four years, this year four different software packages were identified for instructional use rather than only two four years ago. Excelerator and IEF still remain as the most common, although Oracle and Visible Analyst Workbench were also identified this year by five or more schools. Excelerator is the dominant package for research applications.

**Table 30**
**Development/CASE Tools Software**
**1993 (N=134) 1997 (N=121)**

| Instruction | | | | Research | | | |
|---|---|---|---|---|---|---|---|
| 1993 | | 1997 | | 1993 | | 1997 | |
| Excelerator | 54 | Excelerator | 30 | | | Excelerator | 13 |
| IEF | 5 | IEF | 8 | | | Other (7) | 11 |
| Other (12) | 10 | Oracle | 7 | | | | |
| | | Visible Analyst Workbench | 5 | | | | |
| | | Other (19) | 27 | | | | |
| # packages | 14 | # packages | 23 | # packages | | # packages | 8 |

### Graphics and Presentation Software

Together with word processing, the graphics and presentation software category was the most commonly identified for both this year and four years ago. Again, as in the database software category, consolidation seems to have taken place. Table 31 shows that the number of different packages identified by five or more schools has dropped to only four from nine four years ago. Further, although both Harvard and FreeLance were still listed, PowerPoint has taken over the dominant position for both instruction and research.

**Table 31**
**Graphics and Presentation Software**
**1993 (N=174) 1997 (N=244)**

| Instruction | | | | Research | | | |
|---|---|---|---|---|---|---|---|
| 1993 | | 1997 | | 1993 | | 1997 | |
| Harvard | 109 | PowerPoint | 233 | Harvard | 116 | PowerPoint | 167 |
| Lotus | 103 | Harvard | 31 | Lotus | 97 | Harvard | 30 |
| PowerPoint | 72 | FreeLance | 11 | PowerPoint | 60 | FreeLance | 5 |
| QuattroPro | 69 | WP Presentations | 9 | QuattroPro | 63 | Other (4) | 8 |
| MacDraw | 49 | Other (5) | 6 | SAS Graph | 57 | | |
| DrawPerfect | 32 | | | MacDraw | 45 | | |
| FreeLance | 28 | | | FreeLance | 37 | | |
| Storyboard | 16 | | | DrawPerfect | 36 | | |
| HP Gallery | 8 | | | HP Gallery | 10 | | |
| Other (15) | 31 | | | Chart-Master | 7 | | |
| | | | | Other (9) | 24 | | |
| # packages | 24 | # packages | 9 | # packages | 19 | # packages | 7 |

### Groupware

This applications category is new, indicative of the degree of local area networking that has been accomplished at the business schools for both students and faculty, and the enabling of electronic collaborative work environments. However, as can be seen in Table 32, only 81 (32%) of the schools indicated using groupware applications. For these schools, Lotus Notes was the most commonly listed package. Of the five packages identified for instruction, the first four were designed as group support packages while Netscape is a Web browser. It appears in this table however, because when combined with other packages, it provides many of the features of a groupware application.

**Table 32**
**Groupware**
**1997 (N=81)**

| Instruction | | | Research | | |
|---|---|---|---|---|---|
| 1993 | 1997 | | 1993 | 1997 | |
| | Lotus Notes | 34 | | Lotus Notes | 26 |
| | First Class | 7 | | MS Exchange | 7 |
| | MS Exchange | 6 | | Novell Groupwise | 6 |
| | Novell Groupwise | 6 | | Other (9) | 17 |
| | Netscape | 5 | | | |
| | Other (13) | 14 | | | |
| # packages | # packages | 18 | # packages | # packages | 12 |

### Group Decision Support Systems

The summary table, Table 25, shows that the group decision support systems category, identified by only 41 (16%) business schools, remains among the least commonly used applications. As in the 1993 data, University of Arizona Group Systems was the most often identified

for both instructional and research use with six schools each, although Ventana was also listed by six schools for instructional use and by five for research. Twenty-three other packages were identified, but none with more than just one or two schools.

**Instructional Support Software**

As can be seen in the summary table, Table 25, and like group decision support systems, this applications category is not one of high usage, with applications being identified by only 21 (8%) schools. Gradebook, list three times, was the only package identified by more than one or two schools, although the generic term "spreadsheets" was given several times, as well as Excel, QuattroPro, and Lotus listed one or two times each, as well as Scantron and test banks. Apparently, this category, due to the idiosyncratic nature of each instructor's course syllabus, does not lend itself well to standardization.

**Modeling and Optimization Software**

Table 33 shows that this application category was only addressed by 92 (37%) of the schools this year, down from almost 70% four years ago. However, the total number of different packages increased from 22 to 29 this year, although the number of packages identified by five or more schools dropped from five four years ago to only two this year. LINDO still remains as the most common package. Even though Excel is not specifically an optimization package, it was identified by six schools indicating that they are using its optimization solver capabilities.

**Table 33**
**Modeling and Optimization Software**
**1993 (N=125) 1997 (N=92)**

| Instruction | | | | Research | | | |
|---|---|---|---|---|---|---|---|
| 1993 | | 1997 | | 1993 | | 1997 | |
| LINDO | 69 | LINDO | 58 | LINDO | 64 | LINDO | 46 |
| Storm | 37 | Excel | 6 | IFPS | 25 | Other (20) | 22 |
| QSB | 34 | Other (27) | 33 | What's Best! | 10 | | |
| IFPS | 32 | | | Other (10) | 13 | | |
| What's Best! | 17 | | | | | | |
| Other (17) | 19 | | | | | | |
| # packages | 22 | # packages | 29 | # packages | 13 | # packages | 21 |

**Multimedia and Hypermedia Software**

Although not a very common application category, identified by only 68 (27%) of the schools, this year three separate multimedia software packages were listed by five or more schools. As can be seen in Table 34, Director has replaced both Toolbook and Hypercard as the most commonly listed package for both instruction and research.

**Table 34**
**Multimedia and Hypermedia Software**
**1993 (N=73) 1997 (N=68)**

| Instruction | | | | Research | | | |
|---|---|---|---|---|---|---|---|
| 1993 | | 1997 | | 1993 | | 1997 | |
| Toolbook | 39 | Director | 35 | | | Director | 25 |
| Hypercard | 38 | Hypercard | 15 | | | Hypercard | 7 |
| Other (7) | 9 | Toolbook | 8 | | | Other (7) | 10 |
| | | Other (7) | 13 | | | | |
| # packages | 9 | # packages | 10 | # packages | | # packages | 9 |

**Network Management Software**

This applications category which asks for listings of software used in information technology courses which teach about networking is also new. Only 59 (23%) schools listed specific packages. For instructional usage, Novell Netware was listed by 34 schools, Microsoft NT by 17 schools, and Hewlett-Packard Openview by four schools. For research usage, 13 schools identified Netware, nine NT, and two Openview.

**Programming Languages**

Table 35 shows that programming languages, as distinct from many of the other applications categories, has not consolidated. One hundred forty-four (57%) business schools identified just about the same number of packages as four years ago. However, slight variations appear to have taken place in the specific packages now being used. Versions of BASIC and C, together with COBOL, remain the most common for instruction. Pascal has dropped from an earlier listing by 39 schools for instructional usage to being listed by only seven schools in this year's data. FORTRAN was only listed by one school and Prolog by none. For research usage, FORTRAN dropped to the fourth position this year. Java is a new listing this year for both instruction and research.

**Table 35**
**Programming Language Software**
**1993 (N=139) 1997 (N=144)**

| Instruction | | | | Research | | | |
|---|---|---|---|---|---|---|---|
| 1993 | | 1997 | | 1993 | | 1997 | |
| BASIC | 65 | C | 70 | C | 79 | C | 44 |
| C | 58 | BASIC | 55 | BASIC | 70 | BASIC | 21 |
| COBOL | 45 | COBOL | 29 | FORTRAN | 65 | Visual BASIC | 14 |
| Pascal | 39 | Visual BASIC | 25 | Pascal | 60 | FORTRAN | 12 |
| FORTRAN | 25 | C++ | 14 | COBOL | 21 | C++ | 7 |
| Prolog | 13 | Java | 9 | LISP | 15 | Java | 7 |
| C++ | 5 | Pascal | 7 | Prolog | 14 | COBOL | 5 |
| Other (10) | 14 | Other (8) | 11 | C++ | 5 | Other (5) | 6 |
| | | | | Other (8) | 14 | | |
| # packages | 17 | # packages | 15 | # packages | | # packages | 12 |

**Project Management Software**

The summary table, Table 25, shows that the project management application is one of the categories that had an increase in the percentage of responding schools but a decrease in the number of packages listed. Four years ago, two packages were identified by more than five schools, MS Project with 29 schools and SuperProject with eleven, and nine others were listed by as many as three schools. However this year, only MS Project was identified by more than five schools, specifically listed by 81 schools for instruction and 39 for research. The other six packages were only identified by one or two schools.

**Simulation Software**

As with the project management software, the simulation category has a decrease in percentage of responding schools, down to 35% in 1997 from a high of 57% in 1993. However, the number of different packages listed increased from only eleven in 1993 to forty in 1997. Table 36 summarizes the packages for instruction and research that were identified by more than five schools. For instructional applications, Sim Factory, STELLA, and GPSS remained as the most common, with SLAM dropping out. However, there were 39 "other" packages identified by a larger number of schools than the most common three. For research applications, only GPSS and Siman were identified again by more than five schools.

**Spreadsheet Software**

Ninety-six percent of the schools in this year's survey listed the software package(s) used for spreadsheet applications. Table 37 identifies those listed by five or more schools. Like several of the other application areas, consolidation is also obvious in this category. This year only three

**Table 36**
**Simulation Software**
**1993 (N=98) 1997 (N=87)**

| Instruction | | | | Research | | | |
|---|---|---|---|---|---|---|---|
| 1993 | | 1997 | | 1993 | | 1997 | |
| Sim Factory | 21 | Sim Factory | 18 | GPSS | 23 | GPSS | 16 |
| STELLA | 20 | STELLA | 7 | Siman | 20 | Siman | 13 |
| SLAM | 19 | GPSS | 6 | STELLA | 18 | Other (12) | 16 |
| GPSS | 18 | Other (39) | 49 | SLAM | 17 | | |
| Siman | 18 | | | Simscript | 14 | | |
| Simscript | 12 | | | Other (7) | 7 | | |
| Other (10) | 10 | | | | | | |
| # packages | 16 | # packages | 42 | # packages | 12 | # packages | 14 |

packages were identified by more than five schools, down from five in 1993 and, unlike most other application areas, there was only one other identified for the instructional area and none for research. Excel has emerged as the dominant package.

**Table 37**
**Spreadsheet Software**
**1993 (N=170) 1997 (N=243)**

| Instruction | | | | Research | | | |
|---|---|---|---|---|---|---|---|
| 1993 | | 1997 | | 1993 | | 1997 | |
| Excel | 96 | Excel | 235 | Lotus 1-2-3 | 144 | Excel | 180 |
| QuattroPro | 80 | Louts 1-2-3 | 89 | Excel | 117 | Lotus 1-2-3 | 74 |
| Lotus 1-2-3 | 15 | QuattroPro | 19 | QuattroPro | 88 | QuattroPro | 10 |
| VP-Planner | 8 | Other (1) | 1 | VP-Planner | 9 | Other (0) | 0 |
| SuperCalc | 8 | | | SuperCalc | 9 | | |
| Other (3) | 3 | | | Other (3) | 3 | | |
| # packages | 8 | # packages | 4 | # packages | 8 | # packages | 3 |

**Statistical Software**

Statistical software was another application category identified by a large percentage of schools, 90%, about the same as the 93% response rate four years ago. However, as can be seen in Table 38, although the number of different packages listed increased from 22 to 31 this year, those

**Table 38**
**Statistical Software**
**1993 (N=168) 1997 (N=228)**

| Instruction | | | | Research | | | |
|---|---|---|---|---|---|---|---|
| 1993 | | 1997 | | 1993 | | 1997 | |
| SPSS | 81 | SPSS | 142 | SPSS | 119 | SPSS | 161 |
| Minitab | 79 | Minitab | 98 | SAS | 106 | SAS | 155 |
| SAS | 72 | SAS | 19 | Minitab | 68 | Minitab | 7 |
| SYSTAT | 38 | Excel | 7 | RATS | 53 | Other (17) | 32 |
| TSP | 30 | TSP | 5 | SYSTAT | 53 | | |
| Mystat | 26 | Other (23) | 30 | Gauss | 44 | | |
| RATS | 25 | | | TSP | 38 | | |
| StatGraphics | 21 | | | StatGraphics | 23 | | |
| Microstat | 10 | | | Other (11) | 28 | | |
| Other (13) | 27 | | | | | | |
| # packages | 22 | # packages | 28 | # packages | 19 | # packages | 20 |

listed by five or more schools decreased. SPSS and Minitab are the most commonly listed statistical software for instructional purposes, although for research SPSS shares this leadership with SAS. The large number of "other" packages were only identified by one or two schools.

**Suites**

A new category this year, Table 25 shows that 92% of the responding schools identified three suite packages. MS Office was listed by 216 schools for instructional usage and 179 for research, Lotus by 30 schools for both usage areas, and Corel by 24 for instruction and 18 for research.

**Text Analysis Software**

As can be seen in the summary table, Table 25, this application category was identified by the only four percent of the schools, the least of any category. Although seven different packages were listed, none was by five or more schools. Nudist was identified the most, with four schools giving it as their package for research applications.

**Utilities**

Again this year, less than a third of the schools identified utility applications packages. And of the five packages separately identified, Norton was dominant, listed by 56 schools for instructional usage and 37 for research. Even though four others were identified, none were listed by more than one school.

**Virus Protection Software**

Table 39 shows that the leadership in the virus protection category is shared by the same three packages listed four years ago. Again, Norton, F-Prot, and McAffee Viruscan are the most common packages, although in both the instructional and research areas, SAM and Dr Solomon were identified by more than five schools.

**Table 39**
**Virus Protection Software**
**1993 (N=154) 1997 (N=209)**

| Instruction | | | | Research | | |
|---|---|---|---|---|---|---|
| 1993 | | 1997 | | 1993 | 1997 | |
| McAffee Viruscan | 66 | Norton | 67 | | Norton | 55 |
| SAM | 39 | F-Prot | 56 | | F-Prot | 35 |
| F-Prot | 16 | McAffeeViruscan | 55 | | McAffee Viruscan | 22 |
| Other (14) | 33 | SAM | 15 | | SAM | 10 |
| | | DrSolomon | 13 | | DrSolomon | 6 |
| | | Other (9) | 13 | | Other (4) | 4 |
| # packages | 17 | # packages | 14 | # packages | # packages | 9 |

**Web Browser Software**

The summary table, Table 25, shows that even though Web browser software is a new category for this year's survey, it is one of the most common, with 96% of the schools listing software packages. However, only five packages were identified, and of these, only two were identified by five or more schools. Netscape Navigator, in use at 238 schools, was the dominant package for both instruction and research, followed by MS Explorer, in use at 70 schools.

**Word Processing Software**

The summary table, Table 25, shows that software for this application, word processing, together with graphics and presentation software, was identified by 96% of the business schools participating in this year's survey. Table 40 summarizes these packages and shows that consolidation has taken place in this category, with only three packages being identified by five or more schools, down from nine four years ago. MS Word and WordPerfect were the dominant packages for both instruction and research.

**Table 40**
**Word Processing Software**
**1993 (N=175) 1997 (N=245)**

| Instruction | | | | Research | | | |
|---|---|---|---|---|---|---|---|
| 1993 | | 1997 | | 1993 | | 1997 | |
| WordPerfect | 152 | MS Word | 231 | WordPerfect | 159 | MS Word | 184 |
| MS Word | 95 | WordPerfect | 131 | MS Word | 124 | WordPerfect | 127 |
| MacWrite | 34 | Other (4) | 6 | TeX | 47 | AmiPro | 5 |
| WordStar | 30 | | | MacWrite | 43 | Other (1) | 1 |
| PFS:Write | 9 | | | WordStar | 41 | | |
| PC-Write | 5 | | | PFS:Write | 8 | | |
| Other (9) | 17 | | | DisplayWrite | 8 | | |
| | | | | PC-Write | 7 | | |
| | | | | MultiMate | 6 | | |
| | | | | Other (9) | 14 | | |
| # packages | 15 | # packages | 6 | # packages | 18 | # packages | 4 |

### 7.2 Software Standards

One hundred thirty-seven schools (54%) indicated that they either had or were in the process of developing software standards. Of these, 113 schools briefly identified what differentiates between their standard and non-standard software. The most common response, given by 39 schools, was that standard software was acquired, paid for, installed, and upgraded by school, whereas nonstandard was not. Further, the standard software was supported by training and the availability of consulting. Five schools indicated that their standard software was identified by formal site license agreements and the opportunity for bulk purchases. Fourteen schools indicated the specific packages that were supported such as the MS Office and Corel suites, that which was Windows or Novell network compliant, or that such a list of specific software was available. Five schools indicated that their standard software was available campus wide and four that the standard software was that which was available on the network or in the public labs.

Eight schools indicated that the process of identifying the actual software to become standardized was through a formal process, determined by a faculty, technology, or university wide committee process. Three other schools indicated that the process of determining the standard software was very informal and two schools suggested that their standard software was determined by what was taught in computer literacy courses or was used in the computer center. Four schools indicated that there were no standards and that most application packages were supported. In direct contrast however, two other schools specifically defended the need for specifying standard software, indicating that a higher quality of support could be provided when the number of software packages was limited. Another eight schools suggested that their orientation to what software to standardize on was based on what was being used by business and industry, and market leadership.

## 8. Communications Resources

Information technology connectivity is facilitated through the communication resources, which include both the hardware and software as well as the cabling, conduits, phone lines, and switches. Local area networks (LANs) provide the communication links within a school while wide area networks (WANs) create the links to the Internet and access to the World Wide Web. Overall, 241 (96%) of the schools answered the various questions regarding the nature of their network infrastructure.

### 8.1 Local Area Networks

The schools provided information regarding their network environment protocols and topologies as summarized in Table 41. These are the standard technological formats used on their local area networks for data transmission. Protocols are the "hand shake" rules between computers which allow the passing of data. Topologies describe how the wires are arranged, e.g., as a ring, star, or bus (Ethernet). Ethernet is the overall dominate topology being used at 90% of the responding schools. TCP/IP (Transmission Control Protocol/Internet Protocol), essential for Internet access, has become the dominant protocol. During the past four years, TCP/IP has increased from 54% to 92% and IPX, which is the LAN version of the IP protocol, has moved from 15% to 56%. It should be noted that it is not unusual for an individual school to use more than one protocol and topology. Of the 234 business schools specifying the LAN protocols in use, 86 (37%) listed supporting only one protocol, 98 (42%) supported two different protocols, 50 (21%) support three. Schools with multiple protocols may or may not have bridged them together. Note that ATM (Asynchronous Transfer Mode), the high speed switched network protocol, has achieved a 11% penetration in the two years it has become available.

**Table 41**
**Local Area Network Environment: Protocols/Topologies (percent of schools)**

| Protocol/Topology | 1991 N = 166 | 1993 N =180 | 1997 N =252 |
|---|---|---|---|
| TCP/IP | 4 % | 54 % | 92 % |
| Ethernet | 67 | 76 | 90 |
| IPX | 18 | 15 | 56 |
| Appletalk | 49 | 43 | 26 |
| Token ring | 27 | 20 | 13 |
| ATM | | | 11 |
| Other | 18 | 15 | 3 |

**Table 42**
**Local Area Network File Sharing Software: Network Operating System (percent of schools)**

| File Sharing Software | 1991 N = 166 | 1993 N =180 | 1997 N =252 |
|---|---|---|---|
| Novell Netware | 78 % | 74 % | 70 % |
| NT | | | 60 |
| UNIX | 11 | 16 | 39 |
| Appleshare | 41 | 64 | 16 |
| Other | 16 | 13 | 7 |

After the wires are linked together and the computers attached, the file sharing software, the local area network operating system (NOS) software, facilitates data transmission between the interconnected microcomputers. Table 42 summarizes the responses and indicates that Novell Netware continues as the most common NOS. However, in the past two years, Microsoft NT server has gained adoption by 60% of the respondent schools. UNIX, which has wide spread Web utility, has increased from 16% to 39% over the past four years. Unlike the multiple protocols which can co-exist, schools using more than one file sharing software have them each on a separate network server. Of the 248 business schools reporting LAN network operating system software, 92 (37%) listed supporting only one, 77 (31%) supported two, 46 (19%) supported three, and 20 (8%) schools supported four servers.

### 8.2 Remote Access to Local Area Networks

Given the wide spread personal ownership of computers in addition to the large increase (57%) in laptop ownership by the business school reported in Section 5.3 above, access to the school's network as well as the Internet have become important. One hundred ninety (75%) of the business schools provide network access from home. Of these, 152 (80%) use their University modem pool for access, 53 (28%) have their faculty and students use an Internet Service Provider (ISP), and 49 (26%) have their own school modem pool (with an average of 19 lines). One European school (Erasmus University, Rotterdam, The Netherlands) reported having a modem pool of 60 ISDN lines, thus providing their students with high speed Internet access from home. SLIP (Serial Line Internet Protocol) and PPP (Point-to-Point Protocol) are used by 78% of the schools, with Telnet in use at 65%, and RAS (Remote Access Services) at 12%.

Unlike the general public which must rely upon commercial ISP for Internet access, the business schools are connected to their campus networks and through them to the Internet at large. Only eight schools (3%) indicated subscriptions to the most popular ISP -- three schools subscribe to AOL, three to Microsoft Network, and two to CompuServe.

## 9. Distance Learning and Teleconferencing Resources

The concept of distance learning as used in this survey encompasses an instructor broadcasting classroom programs and interacting with students at remote locations. In contrast, classroom teleconferencing was defined as a means of bringing external speakers into the classroom environment via real-time, interactive video communications, for example, in conducting an interview from a classroom with a guest in another city. This year's survey sought to determine the availability of the technology which supports these activities as well as how it is being used.

### 9.1 Equipment Availability

Two hundred seventeen (86%) of the schools responded to the question "Do you have video teleconference equipment available at your school or university?" As can be seen in Table 43, while about half the business schools (54%) do not have their own equipment, 85% of the universities do. Portable equipment is available at 19% of the schools and 16% via central campus resources. Permanent classroom or studio set-ups are available at 27% of the schools and on 69% of the campuses.

**Table 43**
**Video Teleconference Equipment Availability**
**N=217**
**(percent of schools)**

| | at business school | through central campus |
|---|---|---|
| portable system | 19% | 16% |
| classroom/studio | 27 | 69 |
| none available | 54 | 15 |

Over 20 different manufacturers were listed for the equipment with PictureTel at 23 business schools and 19 central campus units. Vtel was in use at seven business schools and eight campus sites. All the other manufacturers were mentioned only once or twice each.

### 9.2 Utilization

In the Eleventh Survey (1994), 67 (19%) of the 352 participating business schools indicated some application of video teleconference equipment in support of classroom instruction or distance learning. This year, 129 (51%) of the schools indicated use of this technology as summarized in Table 44. The most frequent use (87%) is for the occasional guest speaker to address a class, while 14% of the schools reported regular use for this purpose. Regular and occasional distance learning instruction was reported by 39% and 31%, respectively.

**Table 44**
**Video Teleconference Applications**
**N = 129**
**(percent of schools)**

| % | Usage |
|---|---|
| 87 | Occasionally for teleconferences, guest speakers to classes, etc. |
| 39 | Regularly for class instruction offered at distance location |
| 31 | Occasionally for class instruction offered at distance location |
| 14 | Regularly for teleconferences, guest speakers to classes, etc. |
| 5 | Placement center interviews |
| 14 | Other (e.g., student interviews, staff conferences, demonstrations) |

Of the 129 schools which use video teleconference equipment, 37 (27%) indicated having a permanent partner to whom they were providing video conference courses. Eleven schools said they offer classes statewide, seven to corporate partners, and four with another university. Fifty-nine (46%) indicated that their video conferences were multi-point.

Table 45 summaries the various formats used to support the delivery of the distance learning and teleconference sessions. By far the most common, almost ubiquitous, has been e-mail indicated by 98% of the respondent schools. This is followed closely by Internet based materials, postings and distribution (88%), and then by student chat rooms on-line at 35% of the schools. While these electronic approaches are being utilized, more traditional text-based and correspondence courses are available at 76% and 39% of the schools, respectively. In summary, Table 45 suggests that a wide variety of approaches are in active use to provide educational opportunities to distant learners.

**Table 45**
**Formats Used to Facilitate Distance Learning and Teleconferencing**
**N = 129**

| % | Formats |
|---|---|
| 98 | E-mail correspondence networks for students, professors and tutors |
| 88 | Internet based materials (www) |
| 88 | Course outlines and assignment postings |
| 76 | Text-based instructional materials |
| 71 | Off campus classroom sites with instructors |
| 58 | Lectures posted on-line |
| 51 | Video based courses |
| 46 | Live video broadcast |
| 39 | Correspondence: audio and/or text based materials sent and received by students and professors via regular mail |
| 36 | Video conferencing |
| 35 | Student chat rooms on-line |
| 28 | On-line quizzes or tests |
| 24 | Video tapes: rented, mailed to, and/or purchased by student to view at home |
| 19 | Multimedia (CD-ROM, cases) |
| 12 | Prerecorded lectures transmitted via satellite to extension classrooms or student's home |

## 10. Web Development and Uses

The Internet and World Wide Web are becoming frequently used resources by business school faculty and students. However, use of the Internet and Web can be independent of a school's own Web infrastructure and the content on its Web site. Anyone with a computer and modem can "surf the Web" using numerous access points via an Internet account available from the school, or commercially from Internet Service Providers such as AOL, CompuServe, and many local telephone companies. In order to follow the changes in this rapidly expanding area, this year's questionnaire repeated the questions asked in last year's survey regarding Web content, media, and services.

A Web site can be set up so that access is available to anyone from anywhere, generally referred to as Internet access. On the other hand, access can also be limited to a specific group of

**Table 46**
**Website Content Availability**
**(percent of schools)**

| | 1996 N = 293 | | | 1997 N = 246 | | |
|---|---|---|---|---|---|---|
| | Internet access | Intranet access only | No decision yet | Internet access | Intranet access only | No decision yet |
| Catalog materials | 66% | 4% | 9% | 84% | 1% | 6% |
| Faculty personal pages | 50 | 5 | 17 | 74 | 5 | 8 |
| Faculty resume pages | 48 | 6 | 14 | 73 | 3 | 10 |
| Faculty current research | | | | 70 | 5 | 10 |
| Student club materials | 45 | 6 | 18 | 69 | 6 | 8 |
| Teaching (syllabi, old exams) | 37 | 13 | 17 | 63 | 22 | 5 |
| Student newspapers | | | | 56 | 6 | 11 |
| Alumni news | 33 | 4 | 21 | 52 | 7 | 15 |
| Student personal pages | 31 | 5 | 23 | 45 | 4 | 13 |
| Staff personal pages | 24 | 4 | 21 | 44 | 2 | 16 |
| Job postings | 26 | 10 | 22 | 42 | 11 | 14 |
| Staff resume pages | 19 | 4 | 21 | 33 | 1 | 19 |
| Student resume pages | 27 | 7 | 23 | 20 | 9 | 15 |

individuals or restricted locations, often referred to as Intranet access. Also, since so many of these areas are open to debate within the schools, if the material is not currently available, the respondents were asked if the material would be made available at some future time or if that decision had not yet been made. Table 46 summarizes the content available on the schools' Web sites by Internet and Intranet access for 1996 and 1997. Last year, eleven categories were listed, and this year two more were added. For ten of the eleven categories listed, at least 16% or more of the schools said that the content is now available on the Internet this year than last year. Catalog materials are now available for 84% of the 246 responding business schools, up from 66% a year ago. The availability of teaching materials (syllabi, old exams, reading lists, etc.) increased from 37% to 63% on the Internet, as well as increasing from 13% to 22% on the internal Intranet of the schools. The areas which still appear unclear as to appropriate resource allocation and for which no decision has yet been made are regarding personal pages and resumes for both students and staff.

The schools were also asked to spread one hundred percent across the media (text, graphics, animation, video and sound) used to display their Web pages. Table 47 displays the responses for the past two years. Although the basic distribution of text, graphics, animation, video, and sound has not changed, the number of schools which are including these different media has increased in every category except video, which remained the same. Table 47 also indicates a shift in the range of both text and graphics material. Given that graphics can load very slowly over a modem connection, the decrease in the range in this category may indicate a better understanding of this new technology and how to deploy it.

**Table 47**
**Web Site Media**
**(percent of schools)**

| | 1996 N=293 | | | 1997 N=251 | | |
|---|---|---|---|---|---|---|
| | n | mean | range | n | mean | range |
| Text | 84% | 76% | 5 to 100% | 89% | 73% | 20 to 100% |
| Graphics | 78 | 22 | 2 to 95 | 88 | 23 | 5 to 60 |
| Animation | 10 | 7 | 1 to 20 | 26 | 5 | 1 to 20 |
| Video | 14 | 7 | 1 to 30 | 15 | 6 | 5 to 40 |
| Sound | 14 | 4 | 1 to 20 | 22 | 5 | 1 to 20 |

The survey questionnaire also asked about Web-related services provided by the business schools. Table 48 summarizes these responses for 1996 and 1997. Again there has been an increase in all but one category of service. Three new services were added this year. Training is the most frequently listed services, both for page development and general surfing techniques. Providing chat groups, especially those related to specific courses, provides an instructor with an entirely new tool for extending the classroom discussions. Twenty-six percent of the schools offered this service on their Web site.

**Table 48**
**Web Related Services**
**(percent of schools)**

| | 1996 N=293 | 1997 N=246 |
|---|---|---|
| Access/surfing training | 49% | 67% |
| Page development training | 30 | 55 |
| User guide/documentation | 27 | 43 |
| On-line admissions form | 20 | 28 |
| Commerical server | 9 | 26 |
| Chat groups | | 12 |
| Class registration | | 6 |
| Bookstore purchases | | 5 |

One hundred ninety-seven (80%) of the schools provided the name of the Web development tools being used at their school. In total 578 software packages were named, for an average of 2.9 tools per school. Upon sorting and analysis, there appears to be a staggering 108 different tools in use. The most common packages were text editors which enabled non-programmers to prepare Web materials. Many were database programs used to link Web material to specific data, and some were programming languages used to create interactive Web sites or as part of the database link. Still others were programs specifically designed to edit and work with graphics material. A few schools listed their Web server or site management software.

Table 49 displays the 18 specific programs, languages, or packages identified by 5 or more schools. These tools were categorized into editor, graphics, and programming tools. For editors, MS Frontpage is the overwhelming leader with 52% of the schools, followed by Netscape Navigator Gold at 29%. For working with graphics materials, 11% of the school indicated they use Adobe PhotoShop. Allaire Cold Fusion appears to be the most common Web related database program currently in use at 8% of the schools.

**Table 49**
**Web Site Development Tools**
**N=197**
**(percent of schools)**

| Editor Tools | % |
|---|---|
| MS Frontpage | 52 |
| Netscape Navigator Gold | 29 |
| Hotdog Pro | 15 |
| MS Word/ Internet Assistants | 15 |
| Adobe PageMill | 10 |
| MS Office 97 | 7 |
| Hotmetal | 7 |
| Claris HomePage | 6 |
| Wordperft | 5 |
| BBEdit | 4 |
| **Graphics Tools** | **%** |
| Adobe PhotoShop | 11 |
| Corel Draw Suites | 5 |
| Adobe Acrobat | 3 |
| **Programming/Database Tools** | **%** |
| Allaire ColdFusion | 8 |
| Java | 5 |
| PERL | 3 |
| MS Internet Studio | 3 |
| Visual Basic | 3 |

## 11. Innovations

The schools were asked to describe their innovative and/or exciting uses of computer information technology. Sixty schools provide brief statements, all of which have been included as Appendix 2. Three schools reported two very different activities which are listed as separate entries in the appendix, for a total of 63 activities. These innovative activities were clustered into seven categories, four broad definitions (technological environment, Web use, curriculum initiatives, and development efforts) and three very narrow (distance learning, trading room, and administrative applications). Table 50 lists the number of schools in each category and the defining characteristics as summarized from the descriptions provided by the school. Appendix 2 lists the schools, their description, and the name of a contact to follow up for those who are interested. Perhaps the most interesting innovation related to the report of these activities is that a several schools provided an URL as a pointer for more information on the innovations underway.

**Table 50**
**Innovative Activities at Business Schools**
**N=60**

| Number Schools | Category | Characteristics |
|---|---|---|
| 19 | Technological Environment | Range of activities from a new building to a telecommunications training laboratory. |
| 15 | Web Use | Projects involving the Internet or Intranet for individual courses or overall curriculum support |
| 9 | Multimedia Development | Teaching materials |
| 8 | Curriculum Initiatives | Course specific programs, school wide initiatives |
| 5 | Distance Learning | Specific equipment, course or curriculum initiatives |
| 4 | Administrative Applications | Use of Web to support adminstrative functions |
| 3 | Trading Rooms | Specific activities of real-time, on-line stock market data feeds used by students for trading simulation activities |

# Appendix 1: General Business School Data

| Business school | Type | FTE | | | | | Comp op budget (1000s) | Comp op budget/ stud FTE | Comp op budget/ sch budget | Densities | | | Micro ownership | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Ugrad | MBA | PhD | EMBA | Faculty | | | | stud/ comp stf | stud / micro | fac/ micro | U | M | E |
| U Akron | pub | 1,027 | 225 | | | 77 | | | | 228 | 7.28 | 0.86 | | | |
| U Alabama, Birm | pub | 1,150 | 319 | | | 62 | 265 | 180 | 3.49 | 267 | 20.40 | 1.03 | | | |
| U Alabama, Hunts | pub | 430 | 65 | | | 33 | 125 | 253 | 4.39 | 198 | 7.73 | 1.00 | | | |
| Alverno Col | priv | 700 | | | | 21 | | | | | | 1.62 | | | |
| U Arizona | priv | 2,508 | 494 | 100 | | 183 | 620 | 200 | 0.54 | 177 | 7.11 | 1.08 | rec | rec | rec |
| Arizona St | pub | 2,750 | 600 | 100 | 100 | 195 | 750 | 217 | 4.69 | 314 | 20.29 | 0.93 | | | rec |
| U Arkansas | pub | | 122 | 46 | | 75 | 466 | 2,774 | 6.33 | 48 | 1.05 | 0.47 | | | |
| A D Little | pub | | | | 60 | 5 | | | | | 0.00 | | | | req |
| Ashland U | priv | 980 | | | 250 | 36 | | | | | | | | | |
| Auburn U, Mont | priv | 1,200 | 200 | | | 45 | 30 | 21 | 0.86 | | | 1.10 | rec | rec | |
| U Baltimore | pub | 492 | | | | 60 | | | | 246 | 10.93 | 1.00 | | | |
| Barton Col | pub | 950 | | | | 77 | | | | | | | | | |
| Baylor U | priv | 2,747 | 163 | 11 | 55 | 111 | 252 | 86 | 1.97 | 365 | 19.34 | 0.89 | | | |
| Berry Col | priv | 200 | 50 | | | 19 | | | | 34 | 8.33 | 0.79 | rec | rec | req |
| Boston Col | priv | 2,359 | 556 | 36 | | 102 | | 0 | | 2202 | 86.79 | 1.12 | rec | rec | |
| Boston U | priv | 1,529 | 751 | 65 | 86 | 136 | 614 | 262 | 3.67 | 94 | 15.84 | 0.70 | rec | rec | rec |
| Bradley U | priv | 737 | 71 | | | 49 | | | | | 10.23 | 0.88 | rec | rec | rec |
| UC Berkeley | priv | 500 | 660 | 90 | | 130 | 900 | 720 | 7.50 | 66 | 6.48 | | | | |
| UC Irvine | pub | | 210 | 35 | 206 | 45 | 871 | 3,555 | 5.81 | 15 | 0.41 | 0.42 | rec | | |
| UCLA | pub | | 1,010 | 70 | 130 | 100 | 2,500 | 2,315 | 6.58 | 40 | 11.61 | 0.69 | | req | req |
| Cal St, Pomona | pub | 3,174 | 124 | | | 109 | 180 | 55 | 1.84 | 942 | 109.93 | 0.41 | | req | req |
| Cal St, Dominguez | pub | 850 | 150 | | | 50 | 50 | 50 | 1.35 | 333 | | 0.98 | | | |
| Cal St, Sacramento | pub | 1,970 | 207 | | | 93 | | | | 1742 | 19.79 | 0.93 | rec | rec | |
| Cal St, Fullerton | pub | 4,356 | 206 | | | 142 | | | | 466 | 24.79 | 1.06 | | | |
| Cal St, Long Beach | pub | 3,521 | 336 | | | 95 | 255 | 66 | 4.56 | 184 | 16.41 | 0.92 | | | |
| Cal St, LA | pub | 1,700 | 80 | | | 99 | 240 | 135 | | 890 | 16.79 | 1.29 | rec | rec | |
| Cal St, Northridge | pub | 2,510 | 113 | | | 110 | 250 | 95 | 2.27 | 350 | 11.35 | 0.99 | | | |
| Cal St, Fresno | pub | 1,500 | 100 | | | 79 | 170 | 106 | 2.70 | 640 | 8.04 | 0.92 | | | |
| Cal St, San Marcos | pub | 964 | 87 | | | 28 | 4 | 4 | 1.94 | | | | req | req | |
| Canisius Col | pub | 650 | 220 | | | 54 | | | | | 217.50 | 1.20 | rec | rec | |
| Carnegie Mellon U | priv | 700 | 715 | 110 | | 117 | 870 | 570 | | 117 | 3.90 | 1.05 | rec | rec | |
| Case Western | priv | 154 | 881 | 86 | 134 | 99 | 500 | 446 | 1.56 | 86 | 8.97 | 1.01 | | | |
| Cen Conn St U | priv | 683 | 79 | | | 49 | 30 | 39 | 0.89 | 1524 | | | req | rec | req |
| U Cen Florida | pub | 5,000 | 600 | 5 | 20 | 135 | 350 | 62 | 2.92 | 2107 | 62.28 | 0.90 | | | |
| Cen Michigan U | pub | 2,552 | 376 | | | 82 | 132 | 45 | 1.31 | 300 | 17.96 | 0.94 | | | rec |
| Cen St U, Ohio | pub | 793 | | | | 17 | 25 | 32 | 1.89 | 198 | 11.17 | 0.52 | | | |
| Chapman U | pub | 349 | 163 | | 50 | 25 | | | | 205 | 6.83 | 0.69 | | | |
| U Chicago | priv | | 2,120 | 100 | 170 | 170 | | | | 148 | 16.57 | 0.52 | | | rec |

| Business school | Type | FTE | | | | | Comp op budget (1000s) | Comp op budget/ stud FTE | Comp op budget/ sch budget | Densities | | | Micro ownership | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Ugrad | MBA | PhD | EMBA | Faculty | | | | stud/ comp stf | stud / micro | fac/ micro | U | M | E |
| U Colorado, Denver | priv | 621 | 774 | | | 64 | 100 | 72 | 1.80 | 1395 | 17.88 | 0.72 | | rec | rec |
| Colorado St U | pub | 1,469 | 674 | | 108 | 83 | | | | 226 | 11.71 | 0.64 | | | |
| Columbia U | pub | | 1,500 | 100 | 335 | 125 | 1,300 | 813 | 2.00 | 91 | 66.67 | 0.95 | rec | rec | rec |
| U Conn | priv | 1,550 | 1,197 | 46 | 106 | 90 | 200 | 72 | 1.25 | 657 | 69.83 | 0.57 | | rec | rec |
| Cornell U | pub | | 480 | 28 | | 45 | 1,000 | 1,969 | 5.56 | 39 | 10.16 | 0.71 | | | req |
| Creighton U | priv | 547 | 92 | | | 35 | 80 | 125 | 1.90 | 639 | 7.17 | 0.95 | | rec | |
| Dartmouth Col | priv | | 371 | | | 35 | 619 | 1,669 | 3.28 | 41 | 2.52 | 0.69 | | | |
| U Dayton | priv | 1,062 | 357 | | | 60 | 97 | 68 | 1.57 | 1092 | 22.52 | 1.09 | | req | |
| Delaware St U | priv | 566 | 45 | | | 21 | | | | 623 | 10.18 | 0.84 | | | |
| U Denver | pub | 609 | 501 | | 58 | 79 | 172 | 155 | 1.27 | 141 | 21.76 | 1.07 | | | |
| U Detroit Mercy | priv | 521 | 650 | | | 31 | | | | | 27.88 | 1.00 | | rec | rec |
| Duke U | priv | | 650 | 20 | 300 | 90 | | | | 22 | 11.17 | 0.34 | | | |
| E Carolina U | pub | 541 | 314 | | | 61 | | | | 45 | 9.10 | 0.66 | | req | req |
| E Tenn St U | pub | 795 | 85 | | | 49 | 42 | 47 | | | 12.75 | 0.80 | | | |
| E Illinois U | pub | 1,945 | 153 | | | 60 | 75 | 36 | 1.50 | 2098 | 16.14 | 0.81 | | | |
| E Kentucky U | pub | 1,207 | 110 | | | 62 | 75 | 57 | 1.72 | 239 | 10.13 | 1.27 | | | |
| Edinboro U Penn | pub | 513 | | | | 15 | | | | | | 1.02 | | | |
| Elon Col | priv | 610 | 96 | | | 17 | | | | | 24.34 | | | | |
| Emory U | priv | 300 | 550 | | 100 | 65 | 997 | 1,173 | 4.74 | 43 | 17.71 | 0.77 | | | |
| Emporia St U | pub | 989 | 53 | | | 31 | 90 | 86 | | 347 | 15.10 | 0.97 | rec | rec | rec |
| Fairfield U | priv | 879 | 90 | | | 33 | 40 | 41 | 1.03 | | | 0.96 | | | |
| U Florida | pub | 3,983 | 471 | 79 | 76 | 94 | 377 | 83 | 3.02 | 403 | 29.63 | 0.43 | | | |
| Florida Atlantic U | pub | 3,900 | 590 | 11 | 25 | 168 | 700 | 156 | 8.86 | 3001 | 346.23 | 1.53 | rec | rec | rec |
| George Washington U | priv | 1,000 | 1,900 | 100 | 70 | 120 | 150 | 50 | 0.83 | 1000 | 150.00 | 1.00 | | | |
| Georgetown U | priv | 1,359 | 415 | | 87 | 73 | 802 | 452 | 5.73 | 197 | 17.39 | 0.94 | | | |
| U Georgia | pub | 3,850 | 261 | 88 | | 115 | 318 | 76 | 2.00 | 262 | 18.58 | 0.55 | rec | req | req |
| Georgia Col | pub | 839 | 177 | | | 44 | 5 | 5 | 0.15 | | 18.81 | 0.58 | | | |
| Georgia Southern U | pub | 2,100 | | | | 87 | | | | 75 | 14.00 | 0.98 | req | req | |
| Georgia St U | pub | 3,745 | 1,818 | 104 | 95 | 215 | | | | 567 | 33.73 | 1.05 | rec | rec | rec |
| Georgian Court Col | priv | 3,350 | 85 | | | | | | | | 137.40 | 0.00 | rec | rec | |
| Gettysburg Col | priv | 400 | | | | 11 | | | | | | 0.73 | rec | rec | |
| Golden Gate U | priv | 2,000 | 2,000 | 100 | 100 | | | | | | | 0.00 | rec | | |
| Grand Valley St U | pub | 858 | 158 | | | 60 | | | | | | 12.00 | | | req |
| U Guam | pub | 455 | 34 | | | 41 | | | | 98 | 9.23 | 1.08 | | | |
| U Hartford | priv | 485 | 342 | | | 56 | 71 | 86 | 6.22 | 331 | 11.18 | 2.43 | | | |
| Harvard U | priv | | 1,600 | | 300 | 200 | 6,000 | 3,750 | 3.33 | 32 | 2.91 | 0.89 | | | |
| Hofstra U | priv | 2,331 | 400 | | | 96 | | | | 1366 | 546.20 | 0.97 | | req | |
| U Houston | pub | 3,600 | 110 | 100 | 250 | 80 | 270 | 71 | 1.00 | 363 | 23.81 | 26.67 | | | rec |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| U Illinois, Chicago | pub | 2,097 | 431 | 72 | 61 | 112 | 140 | 54 | 1.19 | 473 | 89.66 | 0.90 | | | |
| U Illinois, Springfield | pub | 808 | 184 | | | 40 | | | | 1984 | 34.21 | 1.05 | | | |
| Indiana U | pub | 3,184 | 598 | 69 | | 139 | 1,670 | 434 | 4.07 | 206 | 38.51 | 0.52 | | | |
| Indiana U, Northwest | pub | 368 | 130 | | | | | | | | | 0.00 | | req | |
| Indiana/Purdue, Fort Wayne | pub | 500 | 155 | | | 31 | | | | | | 0.76 | | | |
| Indiana U Southeast | pub | 420 | 70 | | | 33 | | | | | 12.25 | | | rec | |
| U Indianapolis | priv | 400 | 50 | | 25 | 22 | 150 | 333 | | 75 | 7.26 | 1.57 | | | |
| Iona Col | priv | 850 | 375 | | | 41 | 100 | 82 | 10.00 | 1250 | | 1.17 | | | |
| Jackson St U | pub | 969 | 133 | | | 42 | 60 | 54 | 2.00 | 367 | 14.69 | 1.02 | | | |
| James Madison U | pub | 2,250 | 110 | | | 98 | | | | 2360 | 118.00 | 0.88 | | | |
| Kent St U | pub | 1,828 | 155 | 56 | 36 | 79 | 136 | 67 | 1.45 | 311 | 22.66 | 0.78 | rec | rec | |
| King's Col | priv | 464 | 51 | | | 19 | | | | | 5.15 | 0.93 | | | |
| Lamar U | pub | 1,100 | 100 | | | 35 | 125 | 104 | 6.25 | 800 | 9.60 | 0.70 | | | |
| Louisiana St U | pub | 1,522 | 595 | 88 | 25 | 113 | 157 | 71 | | 735 | 23.21 | 0.86 | | | |
| Louisiana St U, Shreveport | pub | 485 | 66 | | | 31 | 15 | 28 | 1.07 | 245 | 9.18 | 0.86 | | | |
| U Louisville | pub | 604 | 386 | | | 62 | 600 | 606 | 6.74 | 198 | 23.02 | 0.95 | | rec | |
| Loyola Col Maryland | priv | 800 | 200 | | 175 | 60 | | | | | 1000.00 | 0.98 | rec | rec | rec |
| Loyola U Chicago | priv | 969 | 415 | | | 82 | | | | | 15.91 | 1.12 | | rec | rec |
| Lynchburg Col | priv | 227 | 106 | | | 20 | | | | | | 1.18 | | | |
| U Maine | pub | 614 | 69 | | | 19 | 20 | 29 | 0.17 | 342 | 15.18 | 0.90 | rec | rec | rec |
| Mankato St U | pub | 975 | 104 | | | 50 | 62 | 57 | 1.17 | | 30.83 | 0.71 | | | |
| Marquette U | priv | 1,108 | 330 | | 30 | 62 | 75 | 52 | 1.25 | 575 | 41.09 | 0.65 | | | |
| Marshall U | pub | 1,128 | 61 | | 30 | 43 | | | | 4754 | 237.70 | 0.75 | rec | rec | req |
| U Maryland | pub | 3,367 | 539 | 68 | | 113 | | | | | 23.24 | 0.52 | rec | rec | rec |
| Maryville U, St Louis | priv | 320 | 124 | | | 31 | | | | | | 1.72 | rec | rec | rec |
| MIT | priv | 200 | 1,100 | 100 | 100 | 150 | 1,000 | 714 | | 90 | 17.50 | 0.75 | | | |
| Miami U | pub | 3,668 | 110 | | | 140 | | | | 356 | 24.86 | 2.75 | | req | req |
| U Michigan | pub | 565 | 1,905 | 62 | 73 | 175 | 1,600 | 632 | | 83 | 7.63 | 0.78 | rec | rec | |
| Michigan St U | pub | 4,948 | 496 | 185 | | 130 | 120 | 21 | 0.50 | 866 | 51.17 | 0.96 | | | |
| Michigan Tech U | pub | 250 | | | | 27 | 100 | 400 | 4.55 | 71 | 7.14 | 0.79 | | | |
| Millsaps Col | priv | 215 | 93 | | | 18 | | | | | 23.69 | 0.95 | | | |
| U Mississippi | pub | 1,515 | 107 | 62 | | 52 | 40 | 24 | 0.80 | 1123 | 19.81 | 0.68 | rec | req | |
| Mississippi St U | pub | | | | | | | | | | | | | rec | rec |
| U Missouri, Columbia | pub | 2,120 | 140 | 24 | | 70 | 66 | 29 | 0.63 | 1384 | 73.68 | 1.08 | | | |
| U Missouri, KC | pub | 238 | 214 | | 41 | 43 | 10 | 22 | 0.16 | 1370 | | 1.16 | | | |
| U Missouri, St Louis | pub | | | | | | 30 | | 0.60 | | 0.00 | 0.00 | | | |
| U Montana | pub | 1,490 | 130 | | | 38 | 45 | | 1.92 | 432 | 17 | 0.69 | | | |
| Montana St U | pub | 900 | 70 | | | 27 | | | | | 485.00 | 0.84 | | | |
| Montclair St U | pub | 2,086 | 191 | | | | 7 | 3 | 0.12 | | 25.88 | 0.00 | rec | rec | |
| Moorhead St U | pub | 739 | 11 | | | 25 | | | | | 8.33 | 0.89 | | | |
| Naval Postgraduate | pub | | 450 | | | 70 | 500 | 1,111 | | 150 | 5.36 | 0.34 | | | |
| U Nebraska, Lincoln | pub | 2,827 | 105 | 110 | | 90 | 319 | 105 | 12.27 | 239 | 12.12 | 0.80 | | | |

| Business school | Type | FTE | | | | | Comp op budget (1000s) | Comp op budget/ stud FTE | Comp op budget/ sch budget | Densities | | | Micro ownership | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Ugrad | MBA | PhD | EMBA | Faculty | | | | stud/ comp stf | stud / micro | fac/ micro | U | M | E |
| U Nebraska, Omaha | pub | 1,880 | 225 | | 52 | 65 | 167 | 79 | 3.09 | 351 | 20.44 | 0.76 | rec | rec | req |
| U Nevada, Las Vegas | pub | 1,720 | 175 | | | 197 | | | | 379 | 23.40 | 1.99 | rec | rec | |
| U New Haven | priv | 600 | 475 | 38 | 115 | 42 | | | | | 9.20 | 0.84 | | | req |
| U New Mexico | pub | 800 | 250 | | 100 | 50 | | | | 525 | 16.67 | 1.25 | | | rec |
| U New Orleans | pub | 2,533 | 650 | | 40 | | 100 | 31 | | 637 | 33.51 | 0.00 | | rec | req |
| New York U | priv | 2,300 | 2,400 | 150 | 250 | 305 | 4,000 | 825 | 4.00 | 105 | 15.90 | 0.68 | rec | rec | rec |
| Norfolk St U | pub | | | | | | | | | | 0.00 | | rec | | |
| N Carolina Cen U | pub | 366 | 44 | | | 49 | | | | 205 | 8.91 | 1.02 | | | |
| N Carolina St U | pub | 1,885 | 220 | 60 | | 84 | 250 | 115 | 3.09 | 228 | 11.96 | 0.86 | | | |
| U N Florida | pub | 600 | 300 | | | 57 | 75 | 83 | 1.47 | 277 | 7.20 | 0.84 | rec | rec | |
| Northeastern Illinois U | pub | 841 | 29 | | | 28 | 24 | 28 | 1.19 | | | 1.72 | | | |
| Northern Arizona U | pub | 1,676 | 45 | | | 66 | 159 | 92 | 8.95 | 382 | 17.93 | 0.87 | | | |
| U N Colorado | pub | 1,000 | | | | 38 | 350 | 350 | 8.33 | 299 | 8.13 | 0.67 | | | |
| Northern Illinois U | pub | 3,269 | 713 | 19 | 84 | 88 | 220 | 55 | 2.00 | 1000 | 28.58 | 0.62 | rec | rec | rec |
| U Northern Iowa | pub | 2,631 | 77 | | | 80 | 170 | 63 | 2.05 | 1354 | 19.34 | 1.04 | | | |
| Northern Kentucky U | pub | 1,800 | 130 | | | 50 | 2 | 1 | 2.23 | | 66.55 | 1.35 | | | |
| Northern Michigan U | pub | 600 | | | | 33 | | | | | | 0.92 | rec | | |
| Col Notre Dame | priv | | | | | | | | | | | | | rec | |
| Nova Southeastern U | priv | | 1,577 | | | 64 | 422 | 268 | 2.31 | 197 | 27.67 | 1.83 | | | |
| Ohio U | pub | 1,600 | 180 | | 75 | 80 | 250 | 140 | 3.57 | 396 | 11.79 | 1.00 | | rec | rec |
| Oklahoma St U | pub | 3,000 | 500 | 100 | | 120 | 125 | 35 | 1.39 | | 45.00 | 0.95 | | | |
| Oral Roberts U | priv | 450 | 60 | | | 20 | | | | 340 | 12.44 | 0.69 | req | req | |
| Pacific Luthern U | priv | 428 | 72 | | | 20 | 20 | 40 | | 714 | 35.71 | 1.54 | | | |
| U Penn | priv | 2,275 | 1,539 | 177 | 194 | 223 | | | | | 24.94 | 0.80 | rec | rec | rec |
| Penn St U | pub | 4,624 | 296 | 64 | | 273 | 1,517 | 304 | 7.14 | 219 | 20.60 | 1.38 | | rec | |
| Pepperdine U | priv | 381 | 1,294 | | 287 | 82 | | | | 67 | 6.98 | 1.17 | rec | rec | rec |
| Penn St U, Gt Valley | pub | | 200 | | | | | | | | | 0.00 | | | |
| U Pittsburgh | pub | 742 | 596 | 80 | 122 | 65 | 600 | 423 | 3.53 | 142 | 21.16 | 0.90 | | | rec |
| U Puerto Rico | pub | 3,743 | 309 | | | 162 | 247 | 61 | 2.90 | 238 | 19.67 | 5.79 | | | |
| Purdue U | pub | 1,987 | 327 | 110 | 260 | 88 | 400 | 165 | 2.71 | 202 | 12.06 | 0.83 | | | req |
| Ramapo Col NJ | pub | 651 | | | | 27 | | | | | 11.42 | 1.00 | | | |
| U Rhode Island | pub | 1,200 | 200 | 46 | 35 | 52 | | | | 964 | 24.10 | 0.84 | | rec | req |
| U Richmond | priv | 486 | 273 | | | 45 | | | | 759 | | 0.76 | | | |
| Rider U | priv | 1,000 | 255 | | | 66 | | | | | 17.43 | 0.96 | | | |
| Roosevelt U | priv | 500 | 180 | | | 32 | | | | | | | | | |
| Rowan Col NJ | pub | 652 | 49 | | | 47 | | | | 701 | 8.25 | 1.27 | | | |
| Rutgers U, Camden | pub | 349 | 89 | | | 36 | | | | 219 | 8.94 | 0.75 | | | |
| St Bonaventure U | priv | 448 | 148 | | | 23 | | | | | 29.80 | 0.77 | rec | rec | rec |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| St Cloud St U | pub | 2,700 | 175 | | | 85 | | | | | 23.96 | 1.06 | | | |
| St Joseph's U | priv | | | | | 60 | | | | | 0.00 | 1.28 | rec | | |
| St Leo Col | priv | 1,338 | 166 | | | 134 | | | | 752 | 25.93 | 134.00 | rec | rec | |
| St Peter's Col | priv | 920 | 101 | | | 35 | | | | 269 | 5.67 | 0.88 | | | |
| Santa Clara U | priv | 4,201 | 752 | | | 68 | | | | 4953 | 99.06 | 1.13 | | | |
| Coastal Carolina U | pub | | | | | | | | | | | 0.00 | 0 | | |
| U Scranton | priv | 701 | 68 | | | 38 | | | | | 27.46 | 1.37 | | | |
| Seattle U | priv | 500 | 443 | | | 47 | 45 | 48 | 1.13 | 472 | | 0.37 | | rec | |
| Shippenburg U | pub | 775 | | | | 41 | 20 | 26 | | | 11.07 | 0.93 | 4 | | |
| U S Carolina | pub | 2,033 | 981 | 88 | | 133 | 551 | 178 | 3.22 | 270 | 14.77 | 0.88 | rec | rec | rec |
| U S Carolina, Spartanburg | pub | 454 | | | | 18 | 3 | 7 | 0.23 | 1816 | 18.92 | 1.04 | | | |
| U S Florida | pub | 2,390 | 551 | 9 | 111 | 134 | 230 | 78 | 2.00 | 174 | 18.32 | 1.10 | | | rec |
| SE Missouri St U | pub | 798 | | | | 40 | 23 | 29 | 0.62 | 798 | 4.43 | 0.85 | | | |
| Southern Arkansas U | pub | 2,750 | | | | 105 | 110 | 40 | 11.89 | | 91.67 | 7.50 | | | |
| USC | priv | 3,459 | 1,263 | 61 | 120 | 177 | 2,464 | 515 | 3.06 | 204 | 11.61 | 0.75 | | rec | rec |
| U Southern Colorado | pub | 537 | 75 | | | | | | | | | 0.00 | | | |
| S Illinois U, Carbondale | pub | 1,482 | 134 | 56 | | 46 | 80 | 48 | 1.74 | 787 | | 0.74 | | rec | |
| U Southen Maine | pub | 364 | 57 | | | 30 | 20 | 48 | 0.85 | | 421.00 | 1.00 | | | |
| Southwest Texas St U | pub | 2,438 | 192 | | | 85 | | | | 376 | 27.98 | 0.88 | | | |
| U SW Louisiana | pub | 1,590 | 115 | | | 67 | 241 | 142 | 5.27 | 426 | 13.32 | 0.83 | | | |
| Binghamton U | pub | 813 | 223 | 10 | | 35 | | | | 697 | 74.71 | 0.78 | | | |
| U Buffalo, SUNY | pub | 1,000 | 562 | 52 | 72 | 59 | 391 | 242 | 5.28 | 371 | 16.30 | 0.68 | | | req |
| S F Austin St U | pub | 1,840 | 53 | | | 66 | 160 | 84 | 4.65 | 1893 | 9.23 | 4.09 | | | |
| Stephens Col | priv | 84 | | | | 4 | 1 | 12 | 0.81 | | | 1.00 | | | |
| Suffolk U | priv | 957 | 578 | | 55 | 84 | 400 | 261 | 1.93 | 307 | 18.95 | 0.70 | | | |
| Syracuse U | priv | 1,078 | 380 | 31 | 36 | 72 | 428 | 287 | | 248 | 70.90 | 0.69 | rec | rec | rec |
| Tennessee Tech U | pub | 1,194 | 87 | | | 44 | | | | 854 | 9.35 | 0.89 | | | |
| U Texas, Arlington | pub | 5,000 | 900 | | | 20 | 230 | 39 | 9.20 | 184 | 43.70 | 0.24 | | | |
| U Texas, Austin | pub | 4,600 | 900 | 130 | | 150 | | | | 171 | 18.52 | 0.76 | | | rec |
| U Texas, Dallas | pub | 650 | 575 | 55 | 40 | 49 | 220 | 172 | 3.79 | 427 | 23.27 | 0.89 | | | rec |
| U Texas, San Antonio | pub | 2,023 | 358 | | | 78 | 77 | 32 | 1.28 | 2381 | 29.76 | 0.91 | | | |
| Texas A&M Intl U | pub | 751 | 386 | | | 31 | | | | | 31.58 | 0.91 | | | |
| Texas Christian U | priv | 986 | 251 | | | 41 | 100 | 81 | | 353 | 14.55 | 0.89 | | rec | |
| Southern Utah U | pub | | | | | 33 | | | | | 0.00 | 0.70 | rec | | |
| Texas Tec U | pub | 3,632 | 273 | 71 | | 100 | | | | 361 | 30.58 | 0.87 | | | |
| Towson St U | pub | 1,835 | | | | 71 | | | | | | 1.31 | rec | | |
| Col New Jersey | pub | 900 | | | | 37 | | | | | 18.00 | 1.12 | | | |
| Tulane U | priv | 301 | 264 | 16 | 152 | 42 | 500 | 861 | | 25 | 4.97 | 0.18 | | | req |
| U Tulsa | priv | 865 | 206 | | | 45 | 250 | 233 | 5.00 | 397 | 24.91 | 0.94 | | | |
| US Coast Guard Acad | pub | 90 | | | | 10 | | | | | 90.00 | 0.83 | req | | |
| Utah St U | pub | 2,150 | 305 | | 50 | 100 | 225 | 92 | 4.50 | | 11.31 | 1.23 | | | |
| Valparaiso U | priv | | | | | | | | | | 0.00 | 0.00 | rec | | |

| Business school | Type | FTE | | | | | Comp op budget (1000s) | Comp op budget/ stud FTE | Comp op budget/ sch budget | Densities | | | Micro ownership | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Ugrad | MBA | PhD | EMBA | Faculty | | | | stud/ comp stf | stud / micro | fac/ micro | U | M | E |
| U Vermont | pub | 301 | 33 | | | 29 | 150 | 449 | 5.02 | 42 | 15.90 | 0.81 | req | | |
| U Virginia | pub | | 500 | 10 | | 65 | 1,400 | 2,745 | 7.78 | 19 | 5.43 | 0.89 | | req | |
| Virginia Polytechnic | pub | 2,835 | 695 | 53 | | 93 | 240 | 67 | 2.76 | 1433 | 48.42 | 0.81 | rec | rec | |
| Virginia St U | pub | | | | | | | | | | 0.00 | 0.00 | | | |
| Wake Forest U, Bab | priv | | 450 | | 111 | 40 | | | | 113 | 1.65 | 0.78 | | req | |
| Washington U | priv | 678 | 603 | 25 | 130 | 70 | 500 | 383 | 2.59 | 187 | 16.74 | 1.13 | | rec | rec |
| Washington & Lee U | priv | 140 | | | | 36 | 100 | 714 | 3.33 | | 4.83 | 0.80 | | | |
| Wayne St U | pub | 1,110 | 1,615 | | | 78 | 506 | 186 | 6.23 | 189 | 19.60 | 0.72 | | | |
| West Virginia U | pub | 713 | 94 | 33 | 200 | 85 | 388 | 462 | 5.29 | 73 | 12.00 | 0.71 | | rec | req |
| West Virginia Grad Col | pub | | 190 | | | | 5 | 26 | 0.55 | | 7.60 | 0.00 | | | |
| W Conn St U | pub | 738 | 50 | | | 36 | | | | | | 0.84 | | | |
| W Illinois U | pub | 1,500 | 50 | | | 68 | | | | 1240 | 51.67 | 0.78 | | | |
| W Michigan U | pub | 2,054 | 317 | | | 97 | 197 | 83 | 1.85 | 474 | 9.33 | 1.30 | | | |
| Widener U | priv | 710 | 460 | | | | | | | | 292.50 | 0.00 | | | |
| Williamette U | priv | | | | | | | | | | 0.00 | 0.00 | | | |
| Col William & Mary | pub | 416 | 281 | | 75 | 48 | 192 | 275 | 2.82 | 176 | 36.68 | 0.80 | rec | req | req |
| Winston-Salem St U | pub | 320 | | | | 17 | 50 | 156 | 5.00 | 213 | 24.62 | 1.21 | | | |
| Winthrop U | pub | | | | | | | | | | 0.00 | 0.00 | | | |
| U Wisconsin, EauClaire | pub | 2,000 | 28 | | | 55 | | | | 1159 | 1.88 | 0.63 | | | |
| U Wisconsin, GreenBay | pub | 947 | | | | 20 | 5 | 5 | 0.45 | | 31.57 | 1.00 | | | |
| U Wisconsin, Madison | pub | 1,226 | 450 | 94 | 60 | 140 | 1,028 | 581 | 5.20 | 253 | 9.83 | 0.60 | | req | req |
| U Wisconsin,Whitewater | pub | 3,131 | 274 | | | 80 | 50 | 15 | 1.00 | 6810 | 42.56 | 0.84 | | rec | |
| Worcester Polytech | pub | 141 | 200 | | | 21 | | | | 341 | 8.74 | 1.31 | | rec | |
| U Wyoming | pub | 919 | 81 | 90 | | 58 | 50 | 46 | 1.31 | | 31.14 | 1.20 | 0 | 0 | 0 |
| U Alberta | pub | 1,800 | 150 | 25 | 15 | 80 | 250 | 127 | 2.50 | 376 | 98.75 | 0.65 | | | |
| U Calgary | pub | 1,000 | 350 | 32 | 64 | 110 | 400 | 289 | 5.56 | 173 | 9.60 | 0.69 | rec | rec | rec |
| Concordia U | priv | | | | | | | | | | 0.00 | 0.00 | | rec | rec |
| McGill U | pub | 1,404 | 418 | 16 | | 46 | 310 | 169 | 5.93 | 368 | 12.01 | 0.63 | | | |
| McMaster U | pub | 1,423 | 346 | 23 | | 53 | 80 | 45 | 1.33 | 1054 | 16.44 | 0.59 | rec | rec | |
| Memorial U, Newfoundland | pub | | 180 | 29 | | 34 | 225 | 1,076 | | 16 | 3.27 | 0.62 | | | |
| U Toronto | pub | 850 | 392 | 42 | 41 | 96 | 265 | 207 | 2.27 | 321 | 20.05 | 1.30 | rec | rec | rec |
| U Victoria | pub | 600 | 43 | | | 23 | | | | 322 | 128.60 | 0.88 | | rec | |
| U Windsor | pub | 1,630 | 134 | | | 51 | | | | 1764 | 25.94 | 1.28 | | | |
| Copenhagen Bus Sch | pub | 6,537 | 5,451 | 60 | 100 | 590 | 2,500 | 208 | 3.57 | 251 | 33.01 | 0.56 | rec | rec | |
| Helsinki Sch Econ | priv | 460 | 60 | | | 162 | | | | | 2.89 | | | | |
| U Paris-Dauphine | pub | | | | | | | | | | | | | | |
| Groupe HEC | pub | | 1,600 | 70 | | 299 | | | | 98 | 12.28 | 2.06 | | rec | rec |
| ESSEC | priv | 600 | 1,180 | 60 | 30 | 70 | 1,500 | 815 | | 230 | 14.84 | 0.52 | rec | | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Groupe ESC Lyon | priv | 950 | 140 | | | 85 | | | | 218 | 15.57 | 1.06 | | rec | | |
| Groupe ESC Normandie | pub | | | | | | | | | | 0.00 | | | | | |
| European Bus Sch | priv | 300 | 400 | | | 40 | | | | 165 | 23.33 | 1.25 | rec | rec | | |
| Irish Mgmt Inst | priv | 80 | 80 | | | 30 | | | | 29 | 5.33 | 1.50 | 0 | 0 | 0 | |
| U Col Dublin | pub | 1,935 | | | | 90 | | | | 645 | 10.63 | | | | | |
| Higher Sch Bus, Poland | priv | 1,882 | 46 | | | 115 | 125 | 65 | 5.00 | 643 | 26.78 | 6.05 | | | | |
| Erasmus U | priv | 3,550 | 240 | | 150 | 275 | 1,500 | 396 | 10.00 | 281 | 21.66 | 0.79 | rec | rec | rec | |
| Ashridge Mgmt Col | priv | | | | 150 | 43 | | | | | | | | req | | |
| Open U, UK | priv | 5,000 | 4,500 | 10 | | 80 | | | | 2378 | | 4.71 | rec | rec | | |
| U Tech, Sydney | pub | 3,238 | 834 | 28 | | 189 | 1,100 | 268 | 8.87 | 1025 | 47.67 | 9.95 | rec | rec | rec | |
| Hong Kong U Sci&Tech | pub | 2,165 | 247 | 39 | | 150 | 69 | 28 | 3.11 | 272 | 8.78 | 0.67 | rec | rec | rec | |
| Keio U | priv | | 180 | | | 28 | 200 | 1,111 | 2.50 | 90 | 3.60 | 0.40 | | rec | | |
| King Faud U | pub | | | | | | | | | | 0.00 | 0.00 | rec | rec | rec | |
| EAESP-FGV, Brazil | priv | 1,604 | 1,639 | 165 | | 169 | 1,000 | 293 | | 162 | 49.39 | 1.21 | | rec | | |
| U Sao Paulo | pub | 998 | 262 | 75 | 282 | 103 | 640 | 479 | | 83 | 166.88 | 0.73 | | | | |
| ESAN | priv | | | | 280 | 35 | 400 | | 3.48 | | 0.00 | 1.17 | | rec | | |

# Appendix 2: Innovations

## Administrative Innovations

| | |
|---|---|
| Central Michigan University<br>Christopher McBride<br>(517)774-2452<br>christopher.g.mcbride@cmich.edu | SAP academic alliance and a Novell education academic partner (NEAP). CMU is becoming a SAP university on our administrative systems. The College of Business is joining in a SAP academic alliance to provide our students with hands-on SAP training integrated into the curriculum. The College of Business is also authorized to teach certified Novell courses as part of its NEAP agreement with Novell. The Novell classes will be included in the curriculum for Fall 1997. |
| State University of New York at Buffalo<br>Joseph Mantione<br>(716)645-3210<br>mantione@mgt.buffalo.edu | Student Information System -Integrated administration system in Access 7.0 which tracks students from recruitment to admissions, internship, academic program, career placement to alumni status. One integrated database accessible by every administrator, contains the whole history of each student. Students and administrators provide key information which is entered once, and remains permanently with the student's record. The end result is increasingly successful placements of our students and the ability to remain in contact with our students after graduation. In addition to benefits for academic programs and internship offices, we've gained more effective corporate contacts, improved development efforts and placements. |
| University of Vermont<br>Mike Chittenden<br>chittenden@bsadpo.emba.uvm.edu | On-line technology survey questionnaire to be used to gather AACSB info for reaccreditation - alumni connection - on-line course evaluation questionnaire |
| Erasmus University<br>Michael van Wetering<br>+(31)10 4082030<br>mww@fbk.eur.nl | Large scale network access via ISDN - Home-PC project for all first year undergraduates with full helpdesk support and on-site service - Educational & administrative projects using combinations of database and Web-technology |

## Curriculum Innovations

| | |
|---|---|
| University of Arizona<br>Melissa Glynn<br>(520)621-2640 | Center for the Management of Information (CMI): Leading research center specializing in electronic meeting and groupware<br>http://www.cmi.arizona.edu |
| University of Arizona<br>Jonathan Kent<br>(520)621-4288 | Economic Science Laboratory (ESL): Explores innovative ways to create markets, address deregulation and instruct students in economics theory<br>Http://fido.econlab.arizona.edu |
| University of California, Irvine<br>William Armour,<br>WDARMOUR@uci.edu | In 96/97 UCI's Graduate School of Mgmt launched a separate cohort of MBA students that focused on information technology. Five MBA core courses are accompanied by an IT Lab, where IT-focused students use their notebook computer in electronic classrooms to complete projects in SAPIR3 and other complex, "real-life" environments. |
| University of California, Los Angeles<br>Jason L. Frand<br>(310)825-2870<br>jason.frand@anderson.ucla.edu | Comprehensive integration of laptop computers throughout the complex. 100% networked environment with every seat in every classroom, team study room, and library wired with both 10 BaseT and electric outlet. Every student must bring a laptop computer for use in this environment.<br>http://www.anderson.ucla.edu |
| California State University, Dominguez Hills<br>Julia A. Britt<br>(310) 243-3583<br>jbritt@dhvx20.csudh.edu | Use of interactive CD-ROM case material for development of managerial skills.; R. .B. Dunham, "The Manager's Workshop: Motivation," HaperCollins Interactive |

| | |
|---|---|
| Colorado State University<br>D. E. Costello, Dean<br>Fort Collins, CO 80523 | Our undergraduate program is a technology-based program where each class/student is required to integrate with ongoing, up and coming technology. Our distance MBA programs are moving to a new level with live Webcasting, real audio/video, on-line real-time chat groups, etc. |
| University of Georgia<br>John Barrack<br>Rwatson@uga.cc.uga.edu | ACC 540/740 Federal Income Tax - using a TurboTax individual income tax return preparation program set up on the Terry College of Business computer network, each student is required to complete a tax return project. Virtual Corporation Learning environment. Creation of Sanford Hall and complete installation of college-wide Fast Ethernet network between 4 buildings. |
| University of Hartford<br>marx@uhavax.hartford.edu<br>(801)797-2341 | Asynchronous dialogue for classes |
| Utah State University<br>John Vinsonhalen | Researching desktop video, developing computer databases on medical diagnostics for outlying areas such as the Ute Indian reservation, classes for installation and developing Internet sites. |

## Distance Learning Innovations

| | |
|---|---|
| Golden Gate University<br>Glefferts@ggu.edu | Developing a cyber campus to deliver on-line instruction. |
| Louisiana State U-Shreveport<br>Charlotte Jones<br>(318)797-5383<br>cjones@pilot.lsus.edu | Desktop Video Conferencing System for classroom instruction |
| Suffolk University<br>Nancy Croll<br>(617)573-8659<br>ncroll@suffolk.edu | We have just installed a 4' x 7' foot ImageTel VisionWall Video Conferencing system. First installation in New England. |
| Texas Christian University<br>Beata Lobert Jones<br>blobert@tcu.edu | Virtual learning environment project (at MBA level) |
| West Virginia University<br>Carol Herny<br>CHENRY2 @WVU.EDU | Executive MBA program offered though our new Distance Learning Network. For info on the technology. |
| PSPEAKER@WVU.EDU | For info on the EMBA program |

## Environment

| | |
|---|---|
| California State U, Long Beach<br>TCLab@csulb.ed | Telecommunications and Networking Laboratory. The CBA Computer Center is a large modern facility with 120 Pentium computers, 50 486/50Mhz, and 44 386 machines. Desktop operating systems used are Windows 95 and Windows 3.1. Network operating systems are Windows NT 4.0/Novell Netware 3.12/Banyan Vines 5.5x. Each classroom in the Computer Center has a high resolution ceiling mounted projection system. One hundred seventy desktops have access to the Internet via Web browsers, all others access the Internet via Telenet/FTP. The CBA also makes use of FAST Ethernet Switching Technology, Token Ring Fiber Backbone, plus FDDI at the campus level. |
| Emory University<br>Barbara Maaskant<br>BARBARA_MAASKANT@Bus.em<br>ery.edu | AT&T WAVELAN experiment for radioreceive access to the networks. Experiments with notebook checkout program Fall'97. |
| Georgia College<br>jojones@mail.gac.peachnet.edu<br>(912) 453-5497 | Eight multi-media equipped classrooms, one multi-media production facility, and a model classroom. In addition, we have five distance learning systems. |

| | |
|---|---|
| Iona College<br>Donald R. Moscato<br>(914)633-2555<br>dmoscato@iona.edu | High tech multimedia, videoconferencing classroom. Innovative MBA first course. |
| University of Louisville<br>Ted Strickland<br>(502)852-4794<br>tjstri01@ulkyum.louisville.edu | CIS Lab for students - business funded |
| Marquette University<br>Don Hoy<br>(414)288-7188<br>HOYD@VNS.CSD.MU.EDU | Five fully integrated "high tech" classrooms. Two of these rooms are in the executive education center which also has a suite of six breakout rooms, each with computer connectivity. EMBA students have a private chat room and email through EMBANET. |
| Miami University<br>Dan Teccio<br>teerriodm@muohio.edu | ECO 201 - Web based class, P&G Communication and Information Center technology/teaching facilities multimedia development facilities. |
| Michigan Technological University<br>Paul E. Ahi<br>(906)487-2587<br>peahi@mtu.edu | Extensive use of facility for classroom and out-of-classroom instruction. |
| University of Nebraska - Lincoln<br>(402)472-0733 | Writing Lab designed to help CBA faculty incorporate language instruction into selected courses |
| University of Nebraska at Omaha<br>John Fiene<br>(402)554-1649<br>fiene@unomaha.edu | 1) Completing a migration to switched fast Ethernet. Last summer re-wired the entire building with cat 5 UTP pulling about 15 miles of cable using student workers<br>2) Assembling our own computers for upgrades to labs and faculty.<br>3) Engaged in computer controlled televideos conferencing project.<br>4) Have established Windows NT workstation as our standard 32 bit platform using Windows NT server, Novell 4.11 Intranetware, and UNIX servers.<br>5) Migrating our mail and scheduling to Lotus Notes and are taking a close look at Learning Space. |
| University of North Florida<br>Jeff Michelindy<br>jmichelin@unf.edu | Brand new building computerized auditorium, computerized classrooms w/44 student workstations, skills training rooms. |
| Pepperdine University<br>(310)568-5687<br>or dsadlow@pepperdine.edu | To support growing need for computer classroom use - Business computer school is setting up mobile computer classroom model which includes mobile hub, laptops, 1 network connection. This is an inexpensive alternative to establishing hardwire network access 1:1 student/computer connections in older unwired classroom until wireless technology is affordable, stable, decent speed, and level of quality is acceptable to faculty. |
| University of Puerto Rico<br>Edgardo Rodriguez<br>(787)764-0000, ext 3142 | Data Communications Laboratory. The laboratory is used by the students of the Data Communications and Local Area Network courses to practice the topics discussed in class. The laboratory is equipped with several microcomputers, with LAN and data communications equipment, and with LAN and data communications programs. Among other things, the students use this laboratory to gain proficiency in the use of LAN programs such as Microsoft NT Server and Novell Netware. They also gain significant experience in the installation, configuration, and administration of a Local Area Network. The results of this project have been very positive. It has even attracted the attention of the industry. At present, several people from the industry are taking, or planning to take, the courses that uses the Data Communications Laboratory to provide hands-on experience. |
| University of Richmond<br>Dean Randolph New<br>289-8549<br>jnew@richmond.edu | The E. Clairborne Robins School of Business is about to undergo a major renovation which will result is redesigned classrooms, study lounges, and group discussion rooms with high-tech equipment in each |

| | |
|---|---|
| Santa Clara University<br>Edward F. McQuarrie<br>(408)554-6960<br>emcquarrie@mailer.ecu.edu | "E*Xlass" link at http://LSG.SCU.EDU |
| Seattle University<br>mcgraw@seattleu.edu | The ASBE has a number of multi-media systems in case-rooms & computer labs. |
| Tulane University<br>Tom Gerace<br>(504)865-5651<br>Tom.gerace@tulane.edu | Student lab with the latest in technology. The recent renovation (summer 1997) created a student work environment that is bright and efficient, and is unsurpassed on this campus. |
| Virginia State University<br>S. R. Gregory<br>(804) 524-5166 | resources: 3 networked labs consisting of 90 workstations, 2 ceiling mountable projectors supporting video text, graphics and studio. |
| Western Connecticut State University<br>Mark Fisher<br>(203)837-9340 | Voice recognition in classroom. |
| Memorial University - Newfoundland<br>mfurey@morgan.ucs.mus.ca | We have a super classroom that is equipped with 3 gun lighting and multimedia capabilities - also a satellite feed. |

**Multimedia Innovamions**

| | |
|---|---|
| University of Baltimore<br>Al Bento<br>ABENTO@UBMAIL.UBALT.EDU | Teaching materials, information sources, instructional materials for software. |
| University of California at Berkeley<br>Richard Henderson<br>(510)642-6913<br>richard@haas.berkekey.edu | Multi-media development. |
| Creighton University<br>Juli-Ann Gasper<br>jgasper@creighton.edu | Class materials.<br>http://gentel.creighton.edu |
| East Carolina University<br>Scott Belaw<br>(919)328-4856<br>belows@mail.ecu.edu | Multimedia Finance Workbook. |
| University of Missouri - Columbia<br>franzl@bpa.missouri.edu<br>(573) 882-8372 | Computer based training creation for low-end machines (Gateway Pentiums & 486s). We storyboard and develop training CDs for the Department of Labor which have excellent video and audio. |
| Northeastern Illinois University<br>Mark McKernin<br>(773)794-2922<br>M_McKernin@neiu.edu | Instructional technology group to help us using computers for instruction purposes. |
| Tennessee Technological University<br>(615)372-6333 | Production center that does Multimedia development, CD masters, and some WWW work. |
| Groupe Esc Lyon<br>Michael Gardner<br>(33)78.33.78.60 (Fax)<br>tarder@groupe.esc_lyon.fr | We have the NTE lab which promotes the use and the production of CD ROM and on line pedagogical service. |
| The Open University<br>g.k.salma@open.ac.uk | On-line training and conferencing. |

## Trading Room Innovations

| | |
|---|---|
| Carnegie Mellon University<br>meena@cmu.edu<br>(412) 258-2713 | Trading floor. |
| Case Western Reserve University<br>R. Kauer<br>(216) 368-2938 | Financial Room - Bloomberg, Telerate, Newswires, Lotus One, Pointcast Server, Bulletin Board, Event updates, University-wide ATM, fiber backbone. |
| Columbia University<br>dkeown@claven.gsb.columbia.edu | We have just completed a multi-media classroom as a prototype for the lecture rooms in our new building (to be completed in 1998). We also have a Dow Jones Telerate trading room with live data feeds from DJ. |

## Web Innovations

| | |
|---|---|
| California State U - San Marcos<br>David Janlowski<br>(760)750-4235<br>doctorj@csusm.edu | All based on WWW. One of first in world to place course material on the Web (Fall 94). |
| University of Central Florida<br>R. A. Hofler<br>P.O.Box 161991<br>Orlando, FL 32816 | We have two pilot projects that will be conducted in the fall. Use of Web based instruction to utilize classroom space more efficiently. In this case a 300 student section will utilize a 100 seat classroom. Each 1/3 of the class meets the instructor one day per week. The other 2/3 are conducted using the Internet. Two instructors will share a classroom and time slot. Part will be done in class. The rest of class will be done using the Internet. |
| University of Chicago<br>steven.stern@gsb.uchicago.edu | We will soon have migrated several applications to the Web - alumni contact database and placement bidding. Demos might be conducted. |
| Harvard University<br>srogers@hbs.edu | The entire curriculum is on-line, and made up entirely of applications Web-based. Briefing and demo the last Friday of every month at 11AM (EST). |
| Mankato State University<br>John Kaliski<br>johnk@krypton.mankato.msus.edu | Intranet for the on-line classroom which includes chat rooms, on-line syllabus, office hours, etc. |
| Naval Postgraduate School<br>Shu S. Liao<br>(408)656-2505<br>ssliao@nps.navy.mil | 1) Internet as a teaching tool.<br>2) Spreadsheet as a teaching tool.<br>3) Simulation modeling for decision making. In addition, we have curriculum in Information Technology Management, which is heavily into software engineering. |
| University of Northern Colorado<br>rlynch@mail.univnorthco.edu<br>(970) 351-2764 | 1) Tod Sedbrook: classroom intranet (course)<br>2) John Cinebell: student managed fund - course - 500K under management<br>3) N Young: Web site for classroom activities<br>4) Elton: Freshman Web development requirement |
| Ohio University<br>Hau Lou<br>(614)593-1799<br>lou@oak.cats.ohiou.edu<br>John Day<br>(614)593-2065<br>day@oak.cats.ohiou.edu | Lotus Domino used to support problem-based, action learning courses in undergraduate core curriculum. |
| Purdue University<br>jordon@mgmt.purdue.edu<br>(765) 494-4370 | In the process of developing dynamic Web pages using MS Active Server Page technology. These pages include a context searchable resume database, updates curriculum and faculty information, and user feedback forms. |

| | |
|---|---|
| Coastal Carolina University<br>B. Juliano<br>803-349-2144 fax (803)349-2455<br>juliano@ccucs.coastal.edu | 1. CS Dept. Web pages on-line at CCU since 1995: www.coastal.edu/academics/bus.<br>2. Wall School pages under construction/renovation.<br>3. CSCI courses on-line: see www.coastal.edu/njuliano.<br>4. Faculty workshop on Using Web in Teaching, also on-line help on programming & using CCUCS DEC ALPHA: www.coastal.edu/~juliano/help.<br>5. On-line help for writing intensive CS courses: www.coastal.edu/~juliano/paper |
| State University of New York at Buffalo<br>Stacy Snyder<br>(716)645-3210<br>slsnyder@mgt.buffalo.edu | Web-based Course Management. We are able to electronically create a course tree structure from the University's 'UB InfoSource' Oracle Database on our NT Web Server. We then grant permission for faculty to be able to drag and drop their own course materials to their course page on our Web site. Faculty can edit the materials directly on the Web. Students can use any Web browser from on or off campus to access their syllabi, assignments, spreadsheets and solutions. Our Web site gets 46,000 hits per month and the course materials represent 62% of all the activity. |
| University of Vermont<br>Mike Chittenden<br>chittenden@bsadpo.emba.uvm.edu | We have developed several intranet applications that could interest other schools, i.e. electronic timesheets, remote access data analysis output generator. These can be viewed/downloaded at our Web site: http://bsad.emba.uvm.edu/projects/ |
| Hong Kong University of Science and Technology<br>Bmkwanwh@uxmail.ust.hk | We are embarking on a development project to construct an internal Intranet for the Business School. |