THE JOHN E. ANDERSON GRADUATE
SCHOOL OF MANAGEMENT AT UCLA

Tenth Annual UCLA Survey of Business School Computer Usage: A Global Perspective

September 1993

Tenth Annual UCLA Survey of Business School Computer Usage: A Global Perspective

September 1993

Jason L. Frand
Julia A. Britt
Alvin Ng

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 center directors from around the country who reviewed the draft questionnaire and report. A very special thank you is given to Research Assistants Michael Lin and Stacy Frand for data entry and the data analyses.

Apple Computer Incorporated, Digital Equipment Company, and International Business Machines underwrote this year's survey project. Their continuing commitments have made this research and its dissemination possible.

The John E. Anderson Graduate School of Management
University of California
Los Angeles, CA 90024-1481
(310) 825-2870

Executive Summary

This tenth year of the UCLA surveys is a major milestone in tracking the growth of computer, communication, and information technology in business schools. Accordingly, this is an opportunity to reflect back on the period and then speculate forward on the role and opportunities of technology in business education over the next few years. The Executive Summary then concludes with the major finding of this year's survey.

Ten Year Retrospective

Ten years ago personal computers could rarely be found in a business school. Today, for the 180 schools responding to the *Tenth Annual UCLA Survey*, there is an average of 239 microcomputers per school. Not only have schools invested heavily in microcomputers and labs, schools are also connecting them together and exploring creative curriculum applications such as multimedia, group decision support systems, CD-ROM databases, presentation software, and Window-based courseware. For example, 59 schools indicated that they have a multimedia lab and a very broad array of specialized support equipment. Seventy-seven schools have ABI Inform CD-ROM databases and 67 provide dial-up services into Dow Jones and Nexis for even more up-to-the-minute information access. Eighty-six percent of the schools reported availability and increased usage of e-mail systems.

A review of the Annual Survey data coupled with reflections on interviews and discussions with many faculty, students, and staff at over three dozen business schools revealed two major observations regarding the impact of microcomputerization of our schools. First, *while the rate of introduction of technology is occurring at a faster pace at some schools, the use of technology is not different!*

Schools purchasing equipment today, whether it is their very first computers or their fourth upgrade, obtain the most current hardware and software incorporating the newest technologies. The life-cycle data obtained from the *Fifth* and *Ninth Surveys* indicated that schools were at different stages along the learning curve associated with the introduction of technology, but the end results appear to be the same, namely, the acquisition and use of a set of computer skills to enhance the teaching, learning, and research processes.

Second, there is a major differentiating factor between schools which have invested heavily over the years to create a comprehensive technological infrastructure and those that have not. *Where the environment is saturated by the availability and use of computer, communication, and information technologies, then an Information Age Culture emerges!*

This information age culture reflects new values, changed attitudes, and modified behaviors on the part of faculty, students, and staff. It differentiates individuals who are oriented toward a paper-based, typewriter dependent environment from those who are oriented toward an electronic-based, computer enhanced one. In a school with an information age culture, faculty, students, and staff expect:

- Access to information technology as a "right"
- State-of-the-art hardware and networks
- Effective software tools for solving problems
- Data and information available in electronic formats
- Ability to work with large and complex problems
- Training and consulting
- Immediacy in response

These new cultural attributes reflect changes in our perception of ideas such as time, space (including physical location of work), and products from an earlier era. They place enormous burdens on resources and in particular, on those responsible for acquiring and supporting them. Furthermore, they help explain some of the many resource conflicts which business schools face.

A major issue that has emerged from these studies is the disparity between "rich" and "poor" schools in terms of technological infrastructure investments. While this gap is closing with respect to equipment and software, differences remain in critical support areas. For example, in better endowed schools, staff personnel are available to teach basic computer skills and provide consulting support. Faculty in these schools are able to use class time to focus on concepts, applications, and strategy. But faculty in the less well endowed schools use classroom time to provide instruction on computer fundamentals, thus raising the question of "what are they not teaching?" Both computer skills and concepts are important for our students, who will spend most of their working lives in the computer intensive twenty-first century.

Ten Year Prospective

We live in an age of images and sounds. Our students enter the university with a breadth of knowledge -- an exposure to people, places, and things -- unattainable by previous generations. Television as a window into the world around us enables us to witness in real time the full range of current events from revolutions to humanitarian relief, and instantaneously change to see comedy or drama or sports.

Neil Postmen in his book *Amusing Ourselves to Death* (Penguin, 1985) speaks of wisdom as a function of one's command of the primary means of conveying ideas and knowledge. Solomon was wise in a "oral" age as he could convey in a few words difficult concepts and ideas. Over the past few hundred years those who were able to express themselves effectively (and efficiently) in the written media have been deemed wise. However, we are now in the electronic age, and with that may come a new definition of wisdom that reflects the ability to express ideas via multimedia (pictures, sounds, motion, graphs, numbers, and text). There is a major caveat: Postman warns that in television, style overwhelms substance, with the result that material is over simplified and trivialized. Accordingly, we must guard against this trivialization in the educational environment. We must stride to reduce the "fluff-to-content" ratio so that the effort goes into the substance rather than the form of the presentation of material.

Individuals who watch MTV see hundreds of images in the course of a three minute video, but they come away with a gestalt of what was presented. Our capacity to process information using the combination of audio and visual clues may be significantly greater than using either media alone. Individuals who spend hours with Nintendo know that the route to winning is through repeated failures and trial-and-error explorations. Innovative educators need to build on these ideas, seeking meaningful ways to bring multimedia and new technologies into the educational arena so as to create opportunities for students to explore ideas rather than absorb them.

The single greatest challenge facing business school deans and computer directors over the next few years will be to demonstrate the educational gains achieved by the ongoing investments in computer and information technology. This issue will probably resolve itself in one of two ways: the computer will be viewed as a utility like a telephone, and access and use will be considered as a natural part of our lives. Nothing special or spectacular will be expected or will come of it.

An alternative is that the potential for computers to enhance our abilities for insight, creativity, and synthesis of ideas will be realized. Teaching and learning will move from the traditional (industrial) models to new structures (yet undefined). Innovative approaches will incorporate and build upon the potential offered through computer-based home entertainment centers which will sweep the country and provide access to libraries of on-line information. Our students will require skills with a "knowledge-worker's tool kit" -- a collection of software applications which can be applied to all aspects of their lives. Our curriculum need to incorporate life-long-learning (the 3Ls) skills which focus on how to engage complex situations, use information filtering strategies to obtain the needed information, apply models and simulations to test alternatives, and have interpersonal management skills to implement solutions.

This scenario creates a host of new challenges for business schools. A high quality technological infrastructure with accompanying support staff is a definite requirement. Schools will need to find (and retain) the right mix of technical and user support personnel who will be re-

sponsible for installing and maintaining the computers and networks, training users, and supporting faculty as they implement their instructional plans. Even more challenging will be to build consensus among faculty on the need for a new agenda. And, for deans, the ultimate challenge will be to figure out how to pay for all of these ideas in light of the financial realities facing our institutions today.

Major Findings of the Tenth Survey

The 1993 *Tenth Annual UCLA Survey of Business School Computer Usage* extends the focus of previous surveys by providing a comprehensive overview of the business school computing, communication, and information environment. This year, an international sample of 180 schools from 24 countries completed the 12 page questionnaire on hardware, software, and resource commitments. The sample is demographically very similar to samples from previous surveys even after adding 30 schools outside of North America. Seventy-seven percent of the schools reported that all instruction was in English only, while 18% used English and another language. Only 5% did not use English at all. Three U.S. schools offer at least one course in a language other than English.

Over the past eight years the participating business schools' computer operating budget as a percentage of the total school budget has gradually increased from about 3% in 1985 to about 4.6% in 1993 (Section 3.1). This increased support was reflected most notably in the number of microcomputers as well as the number of computer support staff. The average number of microcomputers per school grew from 80 per school in 1985 to 239 per school in 1993 (Section 4.2). Similarly, the average student to computer staff ratio has improved from approximately 418 students supported by a single computer staff member in 1985 to 354 in 1991 (Section 3.2). However, due to continuing fiscal constraints, schools are increasingly looking to students as a source of funds; the number of schools charging a student computer fee has doubled over the past four years to 57% and 64% for the undergraduate and MBA programs, respectively (Section 3.1).

Data on microcomputer densities, i.e., the number of individuals who must share a computer, suggests that schools are approaching a sufficient number to meet their needs (Section 4.2.3). Eighty-eight percent of the schools reported that their faculty never have to wait for a system. For undergraduate students, 16% of the schools report that they never had to wait and 75% reported an occasional wait; for MBA students, 18% had no waiting and 78% an occasional wait. Even though only 2% of the undergraduate and 5% of the MBA programs require computer ownership by students, 33% of the undergraduate programs and 69% of the MBA programs estimated that at least one-third of their students own a system (Section 4.2.4).

As schools acquire more equipment, a shift in the mix of systems can be seen. The survey data indicate that 79% of the schools have at least five different microcomputer models. This complicates support requirements; e.g., software may not run across all systems, breakage requires different knowledge and expertise for each system, and since different models are not plug compatible, when something breaks, only other systems of similar vintage can be used to swap parts or test components (Section 4.2.1). In contrast to the growing diversity in microcomputer models, there is a convergence on Windows as the operating system of choice (Section 4.2.2). Eighty-eight percent of the schools reported using Windows, although only on about one-third of their computers (essentially all 386 and 486 microcomputers available). OS/2 is being used in about one-fourth of the schools, but on less than 5% of their computers.

An impressive growth area over the past several years has been in local area networks. While the average number of microcomputer systems has increased threefold since 1985, the number of schools with more than two-thirds of their microcomputer systems networked has increased almost six fold (Section 5.1). This increase in conductivity allows the implementation of various network-dependent applications, with electronic mail (e-mail) leading the way. This year's data indicates that for those schools with the capacity for e-mail (i.e., extensive conductivity), over one-third of the faculty and staff, one quarter of the MBAs and one-sixth of the undergraduate students are regular users, using a mail system at least three times per week (Section 5.4).

Another trend over the past eight years is the gradual increase in the number of schools which rely on their own mini/mainframe systems for overall computational support, growing from 4% in 1985 to 10% in 1993. This self sufficiency is in part due to schools using their local area networks as the "computer" along with "large" microcomputers (e.g., 486 systems) serving as mini/mainframe surrogates. However, business schools also see a role for mini/mainframe systems in their computing environments as 25 schools indicated plans to purchase a new mini/mainframe system in the coming year (Section 4.1). Notwithstanding such plans, schools have reported a decrease in the use of mini/mainframes for required instructional use (Section 7.2).

Business schools are supporting a very large variety of applications software (Section 6). Unlike two years ago when mini/mainframe software was dominant in a few application categories, this year schools named microcomputer software in every category and for nine areas, at least two-thirds of the schools named a package. Software packages for the mini/mainframe environment were name in only six categories b y at least one-third of the schools. These data suggest a clear preference for microcomputers as the computer environment of choice.

Twenty-two percent of the undergraduate and 28% of the MBA programs have computer entrance requirements. These requirements included a computer oriented course and a computer "driver's license" in application software (word processing, spreadsheets, and databases). Computer oriented graduation requirements were more stringent, with 86% and 72% of the undergraduate and MBA programs, respectively, requiring a computer/information systems course. When evaluating the extent of required computer usage across the curriculum, the survey data over the past eight years suggests that the undergraduate programs have achieved a "steady-state" at about 73% required use across core courses while the MBA programs are at about 66% across core courses.

In the area of database availability, library catalogs, Nexis, Lexis, and Dow-Jones are most frequently available on-line, while the traditional research databases such as CRSP and Compustat are primarily available in tape format. ABI Inform and Compact Disclosure were listed as primarily available in CD-ROM format. Irrespective of type or format, faculty members are still the most frequent users of databases, on-line and tape-based, while MBA students were the most frequent users of CD-ROM databases (Section 8).

Table of Contents

Appendices

List of Tables

List of Figures

1. Introduction

The goal of this, the *Tenth Annual UCLA Survey of Business School Computer Usage*, is to continue to monitor the changing nature of the business school computing environment. The purpose over the past ten years has remained the same — to provide deans and other policy makers with information that may assist them with computer allocation decisions and program plans. The reader is cautioned that this survey reflects what the schools report they are doing and is not an endorsement of what they should be doing.

For each of the past nine years, the *Annual UCLA Survey* has presented a report on the AACSB accredited business schools in the United States, including a sample of Canadian schools. In 1992, the *First UCLA Global Survey of Business School Computer Usage* was conducted and a separate report published[1]. The global survey was motivated by growing international interest in the North American data and requests for data on an international sample. To provide some of that data, a sample of schools outside North America was invited to participate this year.

Conducting an international survey presents many obstacles. Which schools should be included? How are cultural factors, educational structures and traditions, language barriers, funding sources, governmental policy, and numerous other factors, to be handled? How do we take into account the fact that business schools, as well as the university structures in general, are very different inside and outside of North America? In light of these concerns, a major issue in preparing an international report is related to data presentation. Specifically, should the data be presented from the perspective of a country, or from a regional, or global perspective?

Many of these questions were explored in the *1992 First UCLA Global Survey* and were not resolved due to the limited sample size. Since this year's sample is 15% non-North American schools from 22 different countries, the decision was made to present the data from a global perspective. That is, the data from all the responding schools is being treated as if it is drawn from a homogenous sample, and regional factors and country of origin are being ignored. Detailed information on individual schools are presented in the appendices. Individuals interested in a specific country, or in regional patterns, can compare the schools in question against the overall trends presented in this report.

The *First, Second, Fourth, Sixth,* and *Eighth Surveys* gathered information on the hardware, software, and other computer resources of the schools, while the *Third Survey* addressed issues of concern to the deans. The *Fifth* and *Ninth Surveys* focused on business school computerization in terms of process, recognizing that the introduction and use of technology is ongoing and that the schools may not only be approaching computerization differently, but also at different rates. The *Seventh Survey* detailed the operating budgets and computer-related services to provide the costs of these services.[2]

This survey, the *Tenth,* returns to the focus of hardware, software, and other computer resources, updating with current data these specifics of the business school computer environment. However, more emphasis has been given to the section dealing with instructional support resources with expanded discussions regarding entrance and graduation requirements and expectations, the impact of information technology on the curriculum, and classroom electronic equipment.

For several categories (budget expenditures, staff support, and student and faculty microcomputer densities), the data are divided into quartiles to give a more detailed picture of the distribution across the schools. For each quartile, the median value for the variable is reported

---

[1] Copies of the *First Global UCLA Survey of Business School Computer Usage* and the other survey reports can be obtained for U.S. $30 each from Computing Services, Anderson Graduate School of Management, UCLA, Los Angeles, CA 90024-1481.

[2] The *Second, Fourth, Fifth,* and *Sixth Surveys* have been published in the Communications of the ACM, Volume 29, No 1 (1986), Volume 31, No 7 (1988), Volume 32, No 1 (1989), and Volume 33, No 5 (1990). The *Seventh* has been accepted for publication in CACM.

rather than the mean, to avoid the skewing problems that occur when there are extremely high or low values in the distribution. The sample size ("N" value) varies across many of the tables and figures in this report because of missing data.

Additionally, throughout this report, where appropriate and available, comparable data from the *Second* (1985), *Fourth* (1987), *Sixth* (1989), and *Eighth* (1991) Surveys are also included. 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 wish to add their data. The accuracy of comparisons between years is therefore a function of a changing sample. However, given the overall consistency of the sample and its structure as described in the next section, the identification of some general trends seems appropriate.

This report is divided into eight sections: Introduction, Profile of Surveyed Schools, Support Resources, Hardware Resources, Communications Resources, Software Resources, Instructional Support Resources, and Data Resources. Three appendices detail the demographics, mini/mainframe and microcomputer systems, and computer labs by school.

2. Profile of Surveyed Schools

The population for the *Tenth Survey* was the 283 schools currently accredited by the American Assembly of Collegiate Schools of Business (AACSB), 10 Canadian business schools which had participated in previous surveys, and the 95 business schools in 36 countries around the world which were identified in last year's *First UCLA Global Survey of Business School Computer Usage.* Of the 388 schools sent questionnaires, 180 completed the 12 page questionnaire, a 46% response rate. The questionnaires were completed primarily by computer center directors (33%), faculty members (24%), and assistant deans (14%). The entire sample of schools that participated in this survey are identified in the appendices. For comparative purposes, 105 (58%) of the North American schools in this survey participated in the *Eighth Survey*, which was the last survey specifically focused on the hardware, software, and other computer resources.[3]

For the 1992 first global business school survey, a comprehensive list of over 150 universities with business schools or programs in Europe, Asia, South America, the Middle East, Africa, and India were compiled. This list was circulated via electronic-mail to twelve scholars in seven countries who were asked to indicate those schools they considered as comparable to a sample of "leading" U.S. business schools. Nine lists were returned. Schools which received two or more recommendations were considered for inclusion in the sample. Based on this imperfect feedback mechanism, a sample of 95 schools in 36 countries were invited to participate. This sample consists of 45 European schools, 30 schools along the Pacific Rim region, 9 South American schools, and 11 schools from the Middle East, South Africa, and India.

Table 1 displays general demographic information about the 180 schools in this year's sample together with data from previous survey samples. For most of the categories given in Table 1, the data has been consistent over the past several years. For example, participation by type of school, public versus private, has remained approximately two-thirds public and one-third private. The type of degrees offered and enrollment categories have also stayed about the same. Business school supported mini/mainframe facilities, however, continue fluctuating across the time period.

Given that this year's sample included schools from 24 different countries, a question regarding language of instruction was also included in the survey. For 77% of the responding schools, all instruction is in English. However, 18% had instruction in both English and usually one other language (French was the second most frequently mentioned language). Three U.S. schools

---

3 The complete SAS files of the *Second, Fourth, Fifth, Sixth, Seventh,* and *Eighth* raw data will be available beginning January, 1994, via FTP only. Contact the author via e-mail for additional information, jfrand@agsm.ucla.edu.

indicated that they offer at least one class in a foreign language within the business school: Duke (German and Japanese), University of Michigan (Chinese, French, and German) and University of Pennsylvania, Wharton (French). Of the 24 schools in the international sample, only 9 had instruction in just their native language. For the other 15 schools, English was the second language of instruction.

Table 1
Demographics of Participating Schools
(percent of schools)

	Second 1985 N=125	Fourth 1987 N=128	Sixth 1989 N=163	Eighth 1991 N=166	Tenth 1993 N=180
Type of school: Public	69%	67%	68%	68%	71%
Private	31	33	32	32	29
Degrees offered:					
Undergraduate only	2	2	3	5	6
Undergraduate & graduate	86	85	89	86	81
Graduate only	12	13	7	7	10
No data			1	2	3
Student enrollment (FTE):					
Less than 1000 students	22	25	22	22	18
Between 1000 and 2000	22	27	26	29	34
Between 2000 and 3000	26	24	20	20	19
More than 3000 students	30	24	31	27	26
No data			1	2	3
Language of instruction					
English only					77
English and other					18
Other only					5
Mini/mainframe facilities:					
Both school & university	27	29	31	27	20
School only	4	7	6	8	10
University only	64	60	59	60	64
No data	5	4	4	5	6

3. Support Resources

Successful implementation of information technology requires hardware, software, data, communication links, and most importantly, staff support which enables all the pieces to work together. This section examines the financial and staff resources of the business schools supporting the computerization effort.

3.1 Budgets

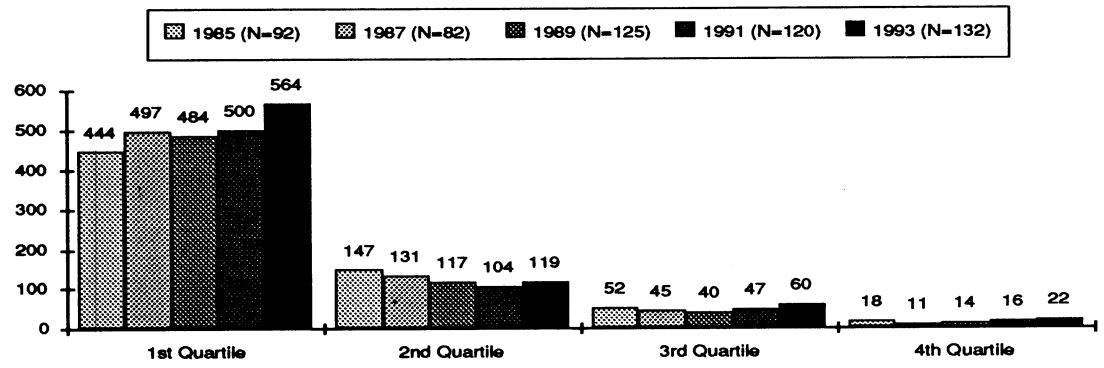
Two budget items continue to be tracked in the surveys: the total annual business school operating budget and the total annual business school computer operating budget. The computer operating budget includes staff salaries, benefits and support, equipment maintenance and services, software and data acquisition and licenses, supplies, operating overhead, and computer recharge funds. It does not include major capital expenditures where list value is greater than $2000 and depreciation is 3 years or more (e.g., microcomputer purchases), lease payments, and faculty salaries. Several schools noted some changes in what was included or excluded from their computer operating budget. One hundred twenty-seven (71%) schools reported their total school budget, which ranged from $85,000 to $100,000,000, with a median of $2,980,000. One hundred thirty-four (74%) reported their computer

operations budget, which ranged from $10,000 to $4,700,000 with a median of $82,700. Some of the schools not answering these questions indicated that the data was confidential, not available at this time, unknown, or that the budget was controlled by the university and not the business school.

For the 123 (68%) business schools providing data for both budgets, on average, the computer operating budget was 4.6% of the total school budget, continuing the trend of increasing allocations to this area. Over the past several years the budgets have grown from 3.0% in the *Second Survey* (1985), 3.3% in the *Fourth* (1987), 3.8% in the *Sixth* (1989), and 4.2% in the *Eighth* (1991), to the current 4.6%.

To provide another basis of comparison of the budget data across the business schools, the annual computing operating budget was converted into a per student statistic by dividing the reported computer operating budget by the total student full-time equivalent (FTE). For the 120 schools providing both the computer operating budget and the student enrollment data, the median quartile expenditures per student were $564, $119, $60, and $22, respectively, as shown in Figure 1. These expenditures represent an increase across all four quartiles of 13%, 14%, 28%, and 38% respectively. Three of the four quartiles are at their highest allocations inthe history of the survey data.

Figure 1
Median Computer Operating Budget Expenditure by Quartiles



(dollars per student FTE)

The business schools also provided details regarding computer usage charges and fee structures. Tables 2 and 3 summarize this information for undergraduate and MBA programs, respectively. This year's data indicate that more schools are asking their students to assume the costs associated with computer usage. Over the past four years, the percentage of schools requiring a fee has doubled from 29% to 57% at the undergraduate level and from 31% to 64% at the MBA level. The charge breakouts summarized in the tables are quite similar for both programs, with the exception of slightly higher charges per semester and per year for the MBA programs. Charges other than those specifically listed in the table included per course charges for certain majors, one-time mandatory charges, and differential charges by residence (state/non-state), by student status (part-time/full-time), by system used (PC, MAC, mini/mainframe), and by service (full or selective, e.g., e-mail only).

3.2 Computing Support Staff

An extremely important dimension of a business school's computing environment is its support staff. One hundred fifty-four (86%) of the schools indicated that they had their own computing support staff, autonomous from other campus facilities and supported out of the business school computer operating budget. Data from past surveys indicate that the percent of schools with their own computer staff has increased each year: 71% reporting autonomous staff in 1987, 80% in 1989, and 81% in 1991.

Table 2
Undergraduate Computer Usage Charges at Business Schools
(percent of schools)

	1989 N = 149	1991 N = 150	1993 N = 157
Computer charges	29%	45%	57%
No computer charges	71	55	43
Charges per course	10% Range: $1-50 Median: $15	16% Range: $6-50 Median: $20	23% Range: $1-50 Median: $13
Charges per semester or quarter	5% Range: $15-165 Median: $25	9% Range: $4-65 Median: $30	22% Range: $2-100 Median: $30
Charges per year	7% Range: $10-300 Median: $60	10% Range: $11-250 Median: $70	4% Range: $19-250 Median: $75
Charge for output (most schools indicated for laser output only)	10% Range: $.04-.50 Median: $.14	11% Range: $.05-.30 Median: $.18	22% Range: $0.01-1.00 Median: $.15.

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

	1989 N = 157	1991 N = 154	1993 N = 164
Computer charges	31%	44%	64%
No computer charges	69	56	36
Charges per course	8% Range: $1-50 Median: $15	12% Range: $6-50 Median: $20	17% Range: $1-50 Median: $13
Charges per semester or quarter	5% Range: $15-165 Median: $25	9% Range: $4-65 Median: $30	15% Range: $2-126 Median: $50
Charges per year	10% Range: $10-345 Median: $90	8% Range: $16-350 Median: $75	9% Range: $4-475 Median: $250
Charge for output (most schools indicated for laser output only)	11% Range: $.04-.50 Median: $.15	11% Range: $.05-.30 Median: $.20	16% Range: $0.01-1.00 Median: $.15.

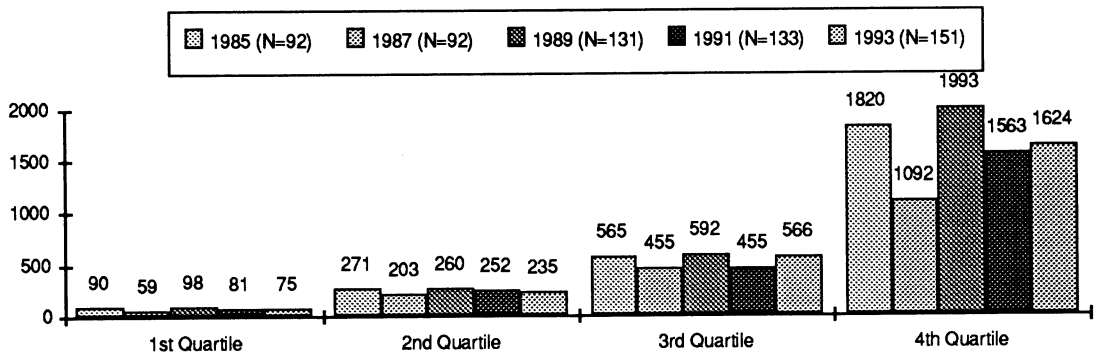
The total number of staff ranged from 0.2 to 67 FTE. Table 4 details the business schools' staff allocations among four categories: technical (hardware and network), academic user support, administrative user support, and computer facilities management. Based on quartile medians, schools in all except the last quartile employ approximately twice as many academic user support personnel as technical staff. Administrative support levels seem to match computing service management levels.

Table 4
Median Computing Staff Support Categories by Quartiles
N=154

FTE Allocations	Quartile 1st	2nd	3rd	4th
Technical support	4.2	2	1	0.4
Academic user support	9	4	2	0.5
Administrative user support	3	2	1	0.3
Management	3	1.2	1	0.5
Total staff FTE	19.2	9.2	5	1.7

The ratio of student FTE to total staff FTE was calculated to compare the computing support staff across the business schools. Figure 2 displays this ratio by quartile for the 151 schools providing both the staff and student enrollment data. The median ratios for each quartile were 75, 235, 566, and 1624, respectively with a sample median of 354. The first and second quartiles showed improvements in staff support from the 1989 and 1991 data. Even though the third and fourth quartiles improved over 1989, they lost ground compared to 1991.

Figure 2
Median Staff Support of Computing by Quartiles
(student FTE per staff FTE)



4. Hardware Resources

The options for business school computer hardware resources continue to expand to include scanners, optical storage, and facsimile systems, as well as the traditional computers, printers, and telecommunications equipment. As networks become more pervasive, with all categories of computer systems becoming network nodes, the distinction between minicomputers, 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, some schools are removing their traditional transaction-oriented minicomputers and replacing them with client/server systems, and distributing computation and database tasks as appropriate.

This broadening use of systems was reflected on the questionnaire. In previous surveys there was a category labeled "32-bit graphic workstations." However, all 486-based microcomputers would fit this category. Furthermore, last year many respondents listed workstations as part of their school's minicomputers and some as part of their microcomputers, based on their view of

the function of these systems. Within this context, this year, the computer hardware is being presented in three categories rather than four, namely, workstations are being combined with the microcomputer category. Mini/mainframe and laptop computers will continue to be reported as in previous years.

4.1 Mini/Mainframe Computer Systems

One hundred sixty-nine (94%) business schools indicated that their users had access to mini/mainframe computer systems. Eighteen of these schools indicated that they used only their own mini/mainframe, 36 schools accessed both their own and university-wide systems, and the remaining 110 schools relied exclusively on access to the university-wide systems. The respondents indicated that these systems are used to support coursework, research, and administrative activities, and as communication servers or gateways to other computer systems on the network. Appendix 2 provides detailed information on the make and model of the mini/mainframe systems as reported by each school.

The 54 business schools which maintained their own mini/mainframe systems listed 140 separate computers. Although 13 different vendors were represented, only 7 had systems supported by at least 3 or more of the schools. Table 5 displays the make, model, and number of these mini/mainframes. Digital Equipment Corporation had the largest number, 63 (45%) of the total 140. Table 5 shows a decrease in number for many of the models but at the same time an increase in diversity of models for several of the vendors. Many schools are now simply listing "VAX" rather than specifying the model, and hence the "other Digital" category has been added to specify that these systems are from Digital (rather than adding them to the "Other" category). Also, older models, e.g., DEC 10 systems, listed in earlier surveys, are captured in this "other Digital" category. The "other IBM" and "other Sun" reflect similar information.

Table 5
Business School Mini/Mainframe Systems Installed by Model
(number of systems)

Make (at least three systems)		Second 1985 N=39	Fourth 1987 N=46	Sixth 1989 N=61	Eighth 1991 N=58	Tenth 1993 N=54
AT&T	3Bx		3	15	9	3
Data General			2	3	3	3
Encore						3
Digital	VAX 3xxx				6	8
	VAX 4xxx				4	12
	VAX 6xxx				6	12
	VAX 8xxx		4	8	9	4
	MicroVAX		5	16	6	10
	other Digital	10	17	18	5	17
Hewlett-Packard						
	HP3000s	8	11	12	5	4
	HP9000s				4	21
IBM	43xx	9	13	17	9	5
	AS400				6	7
	RS6000					6
	other IBM	1	3	7	10	4
Sun	Sparcstations					5
	other Sun					8
Others (1 or 2 each)		31	22	26	13	8
Total		**59**	**80**	**122**	**95**	**140**
Average per school		1.5	1.7	2.0	1.7	2.6

Viewing the data from an average number of systems per school, there was a steady increase between 1985 and 1989, and a dip in 1991 when the average number of systems per school decreased. This year, however, with schools including workstations as part of their mini/mainframe count, the average number of systems per school has reached its highest level in the history of the survey, 2.6 systems per school.

This year 25 business schools indicated that they plan to acquire a new mini/mainframe system within the coming year. These included 6 Sun Sparcservers, 5 HP 9000s, 4 IBM RISC 6000s, 2 IBM AS/400, and several single items. One school indicated plans to purchase a 486 system, thus reinforcing the idea that a "microcomputer" can assume that role in a networked environment.

4.2. Microcomputers

Since the surveys began tracking data on microcomputer availability in 1985, there has been a 350% increase in the number of systems within business schools. This year, the total number of microcomputers reported by the 180 participating business schools was 42,989. There was an average of 239 microcomputers per school, ranging from 31 to 1015 per school, and with quartile medians of 360, 241, 160, and 87 microcomputers per school for the first through fourth quartiles, respectively. Appendix 2 presents the microcomputer information detailed by school.

4.2.1 Models and Market Penetration

Table 6 details the microcomputer models for which at least 200 systems were reported. The average number of systems per school grew 11% this year over 1991, continuing the slowing growth rate since 1987, as schools get closer to acquiring all the systems they need.

This year, the dominant microcomputers are still the 286-based IBM PC/ATs, PS2/30s, 50s, and 60s, but with only a slightly larger market share than the 386 clones (which increased by 146% since 1991). The still older, resilient 8088-based IBM PC/XT moved from second position in 1992 to fifth this year, being displaced by 486 clones and Macintosh Plus, SE, and Classics. The 486 clones, introduced just two years ago, now hold 8% of the market, reflecting their significant price performance opportunities. Macintosh Plus, SE, and Classics remained in fourth position. Essentially all other systems reported by name in previous surveys did not gain market share. Furthermore, of the 15 clone manufacturers listed by respondents, 3 gained sufficient market share to be reported by name this year, specifically Gateway, Dell, and ICL.

In the *Fifth* (1988) through *Ninth* (1992) *Surveys*, high performance 32-bit graphics UNIX workstations were broken out and listed in a separate table. This year, workstation data was collected along with the microcomputer models, and is listed in Table 6 as UNIX Workstations. The respondents listed 553 systems, about 1% of the total systems being used. The specific workstations systems listed this year were 190 Sun, 114 NeXT, 112 IBM RISC/6000s, 96 Digital Vaxstations, and 37 HP Apollos.

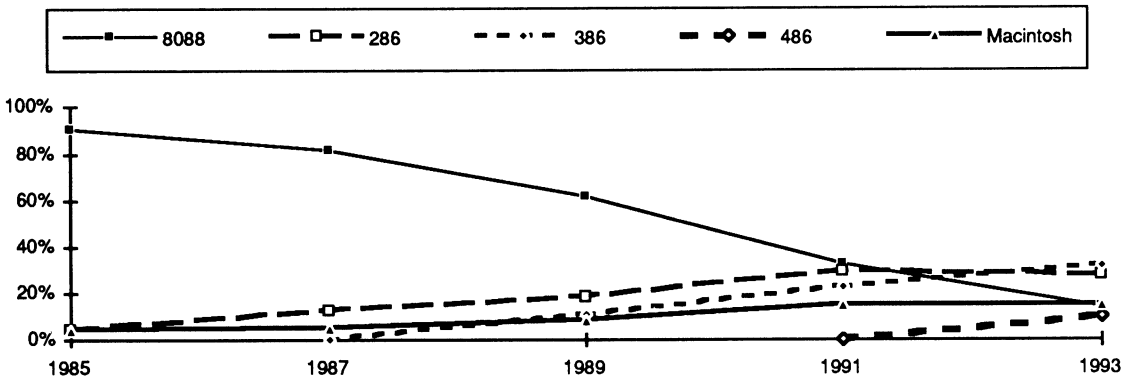
Table 6 displays over 21 microcomputer models from 10 manufacturing companies. The schools listed an additional 25 models from 12 other identifiable manufacturing companies. These various models extend across two or three generations of microprocessor chips. For example, a single vendor school may have IBM PCs with 8088 chips, PC/ATs with 80286 chips and PS/2s with 80386 or 80486 chips. To better understand what computer platforms are available the models were grouped based on their microprocessors. Figure 3 displays the business school market share based on the microprocessor information provided by the schools. The 8088-based technology has shrunk from about 90% in 1985 to a current 14%. Apple Macintosh systems have grown from about 5% to 16% of the business school market during this same period. Still dominant is 286 and 386 technology with 28% and 32% of the market, respectively. In just two years, 486 technology has grown to 10% of the business school systems.

The vast variety of microcomputer models and chip sets have direct implications for software

Table 6
Business School Microcomputers by Model
(number of systems)

Model (>200 systems)	Second 1985 N=119		Fourth 1987 N=128		Sixth 1989 N=161		Eighth 1991 N=164		Tenth 1993 N=180	
	Count	%	Count	%	Count	%	Count	%	Count	%
IBM AT, PS2 30,50,60	259	3	1194	7	1827	6	4916	14	6604	15
Clones 386							2650	8	6518	15
Clones 486									3286	8
Mac Plus, SE, Classic	457	5	925	5	2165	7	3412	10	3255	8
IBM PC/XT, PS2/25	5120	54	7509	45	9286	30	6543	19	3169	7
Clones 286					1055	3	2303	6	2708	6
IBM PS2/70,80					2393	8	2545	7	2173	5
Macintosh IICI							977	3	1729	4
HP Vectra 386					632	2	886	3	1509	4
Macintosh II					444	2	868	2	1387	3
Clones 8086					2714	9	2070	6	1362	3
HP Vectra 286	40	0	349	2	1194	4	1328	4	1133	3
Zenith 386							760	2	999	2
Zenith 150	411	4	1791	11	3923	13	1484	4	908	2
UNIX Workstations					316	<1	355	<1	553	1
AT&T 386									546	1
Gateway 486									479	1
Zenith 286							722	2	438	1
IBM PS/90									358	1
Unisys	544	6	593	4	881	3	731	2	329	1
ICL 386									290	1
AT&T 6300							678	2	280	1
Mac FX									274	1
AT&T 286					1043	3	550	1	227	1
Dell 386									224	1
Gateway 386									213	<1
other	2725	28	4364	26	3183	10	1805	5	2038	5
Total	**9556**	**100**	**16725**	**100**	**31056**	**100**	**35583**	**100**	**42989**	**100**
Average systems per school	**80**		**131**		**191**		**215**		**239**	
Average percent growth			**64%**		**46%**		**13%**		**11%**	

Figure 3
Market Share by Microprocessor
(percent of systems)



and support. As schools acquire new technology, the older technology trickles down to those who do not have systems. Thus individual schools become responsible for maintaining an ever widening range of microcomputer systems and models. Table 7 documents this change. While 21% of the schools support 5 or fewer models, 41% support 10 or more different microcomputer models. In the table, 4% of the schools (7 schools) reported only 2 models. In reviewing individual questionnaires, these schools chose to classify all their computers as 286 and 386 only, or as DOS and Mac only, suggesting that they have so many different models that they are only counting by generic categories.

Table 7
Different Microcomputer Models Supported by School
(percent of schools)

Number of different microcomputer models	1987 N=128	1989 N=161	1991 N=164	1993 N=180
1	17%	1%	-	-
2	35	6	1%	4%
3	24	11	1	2
4	12	15	10	7
5	7	18	15	8
6	3	14	8	11
7		10	11	9
8		7	12	11
9		8	9	7
10	1	5	9	7
11-14		4	21	27
15-20			4	5
21-26				2

4.2.2 Microcomputer Operating Systems

The issue of which operating system should be used to support the breadth of computing equipment is as prevalent an issue in the business school as in the market place. The respondents were asked to indicate the operating system used for their IBM and IBM-compatible microcomputers as a percentage of the total systems in the school. Table 8 displays this data. Over the past two years, there was a 35% increase (from 65% to 88%) in the number of schools who reported using Windows, and the very significant growth of 131% in the number of systems using this operating system (from 16% to 37%). In the 1991 survey, no school indicated that 100% of their systems used Windows, while this year 6 schools did so. On the other hand, while the number of schools with OS/2 has doubled, this operating system is only used in less than 5% of their systems.

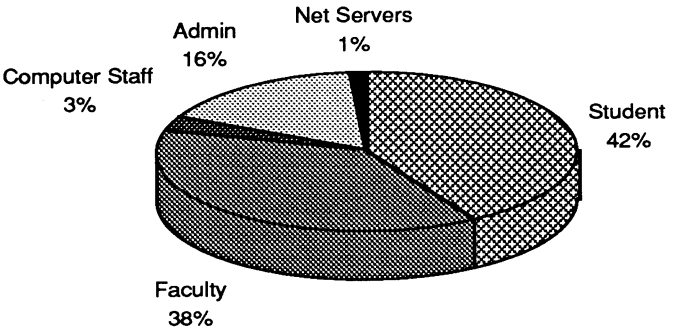
Table 8
Operating System Availability and Use in Business Schools
(percent of schools and percent of microcomputer systems)

	1991 N = 166		1993 N = 180	
	% schools have	% systems use	% schools have	% systems use
MS DOS	90%	88%	93%	68%
MS DOS with Windows	65	16	88	37
OS/2	14	5	27	4
UNIX (AIX, etc)	14	5	16	7

4.2.3 Microcomputer Densities

Figure 4 displays the distribution of the 42,989 microcomputers across five user groups: students (both undergraduate and MBAs), faculty, administrative staff, computer support staff, and as network servers. As can be seen from the figure, the largest share is available to students in computing labs (see Section 4.4 below). Faculty and staff systems are primarily located on individual desks.

Figure 4
Microcomputer Distribution by User Group
(n = 42,989 systems)



Two ratios were calculated to provide further understanding of the penetration of microcomputers into the business school computer environment. The first ratio, student-per-microcomputer, was calculated by dividing the total student FTE by the number of the school's microcomputers available for student use. This density measure thus reflects the number of students who share access to a single microcomputer. For example, a student microcomputer density of 29 is interpreted as 29 students sharing access to a single microcomputer system. The second ratio, faculty-per-microcomputer, was calculated by dividing the faculty FTE by the number of the school's microcomputers available exclusively for faculty use. As these ratios do not take into consideration any microcomputer systems that might be owned privately by the students or the faculty, the actual number of students or faculty who share access to microcomputer systems is probably lower (i.e., better) than reported.

Of the 164 schools who provided the necessary data, the median student-per-micro density, by quartile, are 10, 17, 29, and 48, respectively, as shown in Figure 5. Of the 167 business schools providing the necessary data, the median faculty-per-micro densities are 0.7, 0.9, 1.1, and 1.4, as shown in Figure 6. These figures again reflect the continuing, but slowing, growth of microcomputers into the business school computer environment. Furthermore, the data shows a continuing decline in the disparity between the quartiles. For example, the ratios between student microcomputer density in the first and fourth quartiles in 1985 were 1:16, while in 1993 they were 1:5. For the faculty, the ratio has improved even more dramatically, improving from 1:13 in 1985 to 1:2 in 1993.

Figure 5
Student Microcomputer Density by Quartiles
(students per microcomputer)

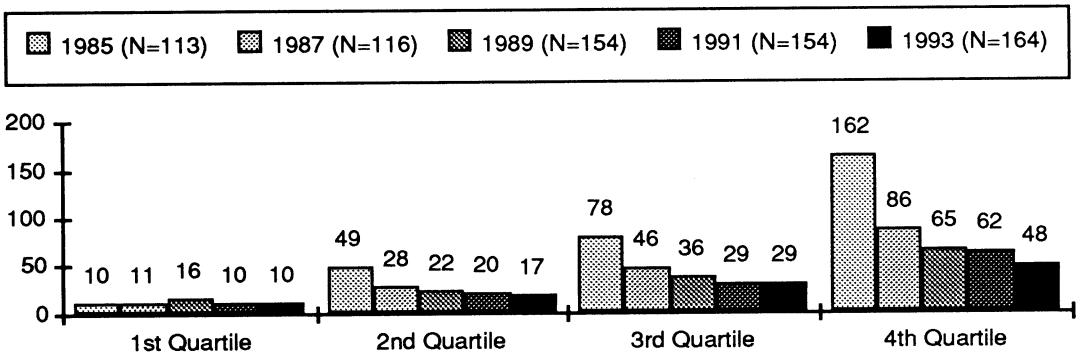
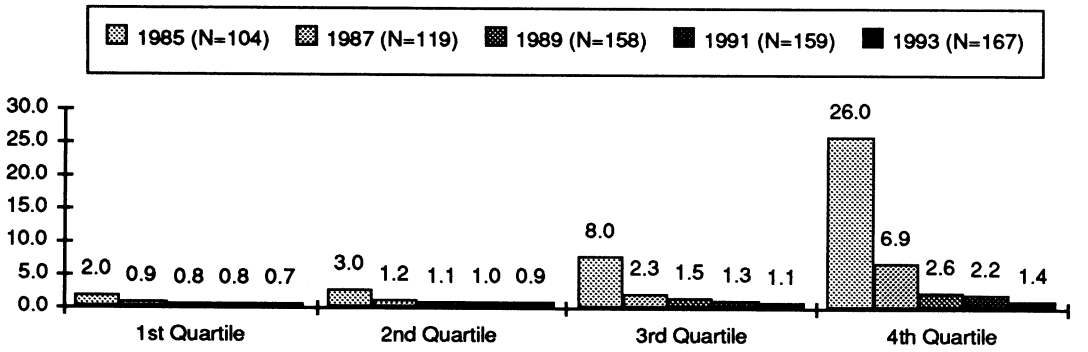


Figure 6
Faculty Microcomputer Density by Quartiles
(faculty per microcomputer)



Another measure of the availability of microcomputers in the business school environment is the general perception of the sufficiency of microcomputers to meet the schools' current demands, excluding exam times or at the end of the term. Table 9 presents the sufficiency responses, together with the microcomputer densities for each group. Independent of the density numbers, only a very few schools now report that there is "always a wait" for access to a microcomputer. Ninety-eight, 91, and 96 percent of the schools report "never" or "occasional" waits for their faculty, undergraduate, and MBAs, respectively.

Considering faculty access to microcomputers, the data indicates that a mean faculty-to-micro density of 1.6 or less provides the faculty with a "never any waiting" access, while a mean density of 2.9 provides an "occasional waiting" access. Regarding microcomputer sufficiency for students, the mean density statistics were quite confusing and very difficult to interpret. As can be seen in Table 9, the mean densities for "never any waiting" were higher than for "occasional waiting." In reviewing the data, a few outliers skewed the means. Accordingly, the median were also calculated and are reported in the table. These median scores indicate that a density of 16 undergraduate students per computer or 15 MBA students per computer achieves a "never any waiting" access. Similar, median densities of 22 and 21 provide an "occasional waiting" access for undergraduate and MBA students, respectively. Median densities over 31 and 108 suggest there is "always a wait".

Table 9
Microcomputer Sufficiency by User Group
(percent of schools)

	Faculty Density N = 161			Undergraduate Density N = 142			MBA Density N = 153		
Availability	**%**	**mean**	**median**	**%**	**mean**	**median**	**%**	**mean**	**median**
Never any waiting	88%	1.6	0.9	16%	64	16	18%	54	15
Occasional waiting	10	2.9	1.2	75	56	22	78	53	21
Always a wait	2	5.7	2.7	8	98	31	4	159	108

4.2.4 Acquisition and Estimated Ownership

One hundred forty-five schools offering undergraduate programs and 153 offering MBA programs provided data regarding their student microcomputer purchase requirements for the 1992-93 academic year. Eighty-seven percent of the undergraduate schools do not require student ownership at this time. For the remaining schools, 8% said they were recommended, 2% said they were planning to require ownership next academic year, 1% said systems are required for finance and accounting majors. Two of the undergraduate programs (Drexel and University

of Vermont) reported requiring microcomputer ownership by all of their students. At the MBA level, 82% did not require ownership, 12% recommended it, 1% planned requiring ownership next year, and 3% required systems for their executive MBA students. Again, two schools (Rollin College and Groupe ESC Toulouse in France) reported requiring ownership by all their MBA students. Table 10 summarizes student-required ownership and indicates the number of schools requiring either Intel-based or Macintosh systems.

Table 10
Student Microcomputer Ownership Requirements
(percent of schools)

	Undergraduate N = 145		MBA N=164	
No	87%		82%	
No, but recommended.	8%	6 Intel based 6 Intel or Mac	12%	11 Intel based 8 Intel or Mac
No, planned for next year (1993-94).	2%		1%	2 Mac PowerBooks
Yes, some students only	1%	Finance and accounting majors	3%	Executive program students 3 Intel or Mac 1 Mac
Yes, for all students.	1%	1 PS/2 1 Mac	2%	2 Intel based 1 Intel or Mac

Regardless of formal requirements, many individual students own a microcomputer. One hundred forty-six (93%) of the undergraduate schools and 153 (93%) of the MBA schools provided estimates of the percentages of their students owning microcomputers. Table 11 gives these estimated percentages. More schools reported data and a greater portion of the student body at both the undergraduate and MBA levels owns their own system.

Table 11
Estimated Student Microcomputer Ownership
(percent of schools)

	Undergraduate			MBA		
Student Ownership	1990 N=129	1991 N=151	1993 N=157	1990 N=138	1991 N=159	1993 N=164
No data	14 %	13 %	7 %	16 %	19%	7 %
Less than 1/3	71	71	59	39	33	25
1/3 to 2/3	13	14	31	32	32	48
More than 2/3	2	2	2	13	15	21

4.2.5 Maintenance

One hundred forty-one (78%) of the business schools provided information regarding maintenance of their school-owned microcomputers. Twelve (8%) of these schools responded that they had no definite policy regarding maintenance. Ninety-one (65%) of the schools responded that they used their own staff for maintenance, 49 (35%) contracted with outside vendors, and 53 (38%) contracted with university services. Seven (5%) of the schools provided other responses to the maintenance question, indicating that maintenance was provided by a combination of in-house and contractors as required, often without formal contract arrangements and on a time and materials basis.

4.3 Laptop and Portable Systems

For several years, laptops and portable microcomputer systems have been considered a new area of potential growth and expansion. The popular press indicates that laptops and the new light weight notebook systems are the fastest growing segment in the computer market today. However, the survey data presented in Table 12 shows a different picture with respect to business schools. This may reflect the fact that schools are creating computer lab environments where desktop systems are more appropriate. Laptop systems may be more appropriate for individual rather than business school ownership.

Both the percentage of schools that have laptops and the average number of laptop systems per school has been increasing annually between 1987 and 1993. However, the mix of systems has changed dramatically. While the Hewlett-Packard 110 systems dominated the market for the past several years, this year they have all but disappeared, and an entirely new line of systems has entered the market place. Although there is a growing number of different models available on the market from each vendor, the survey data was collected by vendor category and is so reported in Table 12. Toshiba, Zenith, and Apple are the market leaders with 57% of the market share between them.

Table 12
Laptop and Portable Systems by Vendor
(number of systems)

Vendor	Fourth 1987 N=82		Sixth 1989 N = 135		Eighth 1991 N = 143		Tenth 1993 N =164	
	n	%	n	%	n	%		
Toshiba	13	1	153	3	227	7	760	24
Zenith	77	5	502	11	637	19	572	18
Apple					29	1	463	15
IBM	226	14	236	5	218	6	286	9
Compaq	151	9	315	7	292	9	250	8
Olivetti							210	7
AST							165	5
Dell							128	4
NEC	28	2	29	<1	20	1	35	1
Hewlett-Packard	1,076	66	3,226	69	1602	49	22	1
Compuadd							19	<1
Tandy	7	<1	113	2	126	4	17	<1
Everex							16	<1
Gateway							15	<1
Other	49	3	126	3	133	4	201	6
Total	**1,627**	**100%**	**4,700**	**100%**	**3284**	**100%**	**3159**	**100%**
Average systems per school	19.8		34.8		23.0		19.3	
% schools with laptops	64		83		86		91	

4.4. Computer Labs

Data on computer labs was provided by 169 (94%) of the business schools. Table 13 summarizes the computer lab data and compares it with the data from 1989 and 1991. Five hundred ninety-four separate computer labs were identified with an average of 3.5 computers labs per school. Of the total microcomputers reported in this year's survey, 16,449 (38%) are available in labs, with 6% of these labs used exclusively by faculty and staff and 51% used for regular classroom instruction.

The major difference between the 1993 survey and the surveys from previous years is in the area of communications. The data indicates that the number of systems with communications capability has doubled in the last four years with 93% of the labs networked and 82% of the systems also linked to a host computer. Another difference is in consultant availability, which has returned to the level in 1989, once again reflecting the difficult budgetary situation for many business schools.

Table 13
Business School Computer Labs

	1989 N = 157	1991 N = 159	1993 N =169
Number of labs	490	527	594
Average per school	3.1	3.3	3.5
Range	1-12	1 - 10	1-12
Total lab micros	12,450	13,782	16,449
% of total micros reported	40%	39%	38%
Average micros per lab	25.4	26.2	29.6
Range	1-84	10 - 100	2-158
User group dedication (number of labs)	477	509	584
Faculty or faculty/staff only	11%	10%	6%
All users	86%	90%	94%
Usage			
Regular classroom instruction	49%	48%	51%
Communications			
% labs networked	48%	70%	93%
% labs linked to host	41%	54%	82%
Output devices			
Average dot matrix printers per lab	8.9	9.1	6.4
Range	(.33-43)	(.2-48)	(.2--60)
Average laser printers per lab	.98	1.58	1.62
Range	(.14-4)	(.2-11)	(.2-.8)
Average plotters per lab	.7	.62	.59
Range	(.17-2)	(.16-3)	(.1-4.5)
Consultant availability (number of labs)	432	474	534
less than 1/3 time	31%	24%	31%
1/3 to 2/3 time	10%	11%	12%
greater than 2/3 time	59%	65%	57%

4.5 Multimedia Labs

With the growth of interest in multimedia, respondents were asked to indicate if their school had a multimedia lab, and if so, what equipment was available. Fifty-nine (33%) of the schools indicated that they had a multimedia lab and all these schools reported having a CD-ROM system. Also, 48 schools reported that they had scanners, 40 had color printers, 38 had both video and sound cards, and 9 schools reported having additional items such as film recorders, digital cameras, slide scanners, still video cameras, videodisks, and VCR equipment. As for software, 39 schools indicated that they use Toolbook and 38 named Hypercard. Seven other packages were mentioned once or twice.

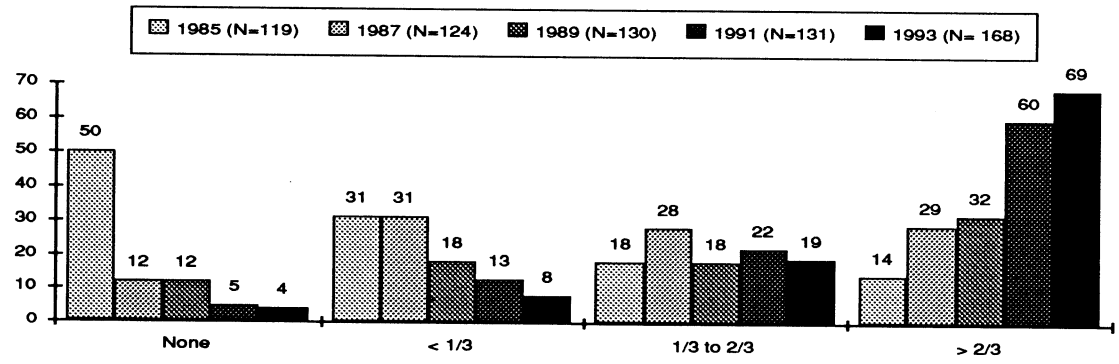
5. Communications Resources

Information technology connectivity is facilitated through communication resources which include both hardware and software as well as the cabling, conduits, phone lines, and switches. Ninety-three percent of business schools provided local area network data this year, as compared to 79% in 1991, 80% in 1989, 66% in 1987, and 39% in 1985. This increase corresponds to the impressive growth in the number of microcomputers with network connectivity.

5.1 Microcomputer Communications

Network data provided by 168 of the business schools for 39,986 microcomputers (93% of the total 42,989 reported by the schools in this year's survey) showed that only 9297 (23%) of the microcomputers were stand-alone, not linked to any other computer systems. The remaining 77% were linked: 6072 (15%) to a host only, 3484 (9%) to other microcomputers, 20,063 (50%) to both a host and other microcomputers, and 1070 (3%) as network servers. Figure 7 displays this data aggregated by school. For the 168 schools reporting data this year, only 4% indicated that all their systems were stand-alone. The vast majority of schools, 69%, reported that at least two-thirds of their computers were networked, which is three times the number of schools in this category four years ago.

Figure 7
Microcomputers with Communications Connectivity
(percent of schools)



5.2 Local Area Networks

The schools provided information regarding their network environment protocols and topologies, 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. Table 14 summarizes the responses and indicates that Ethernet is the overall dominate protocol, while TCP/IP (Transmission Control Protocol/Internet Protocol), Appletalk, and Token Ring are also widespread. It should be noted that it is not unusual for an individual school to use more than one protocol and topology. Of the 163 business schools reporting LAN protocols: 40 (25%) listed only one protocol, 42 (26%) listed two different protocols, 39 (24%) listed three, and 42 (26%) listed four or more. Schools with multiple protocols may or may not have bridged them together.

After the wires are linked together and the computers attached, it is the filesharing software, the local area network operating system software, that facilitates data transmission between interconnected microcomputers. Table 15 summarizes the responses and indicates that the Novell Netware and Appleshare were the most commonly occuring network operating systems used at 74% and 64% of the school respectively. Unlike the multiple protocols which can co-exist, schools using more than one file sharing software have them each on a separate network. Of the 166 business schools reporting LAN file sharing software: 80 (48%) listed only one, 56 (34%) listed two, and 30 (18%) listed three or more.

Table 14
Local Area Network Environment Protocols
(percent of schools)

Protocol/Topologies	1991 N = 166	1993 N =180
Ethernet	67%	76%
Appletalk	49	43
Token ring	27	20
PC LAN/PC Network	18	11
DecNet	17	14
Arcnet	15	9
SNA	7	6
Starlan	5	3
TCP/IP	4	54
Other	6	6

Table 15
Local Area Network File Sharing Software
(percent of schools)

File Sharing Software	1991 N = 166	1993 N =180
Novell Netware	78%	74%
Appleshare	41	64
NFS	11	16
MS Lan Manager	6	11
OS/2 file server	7	8
TOPS	10	4
Starlan	7	2
Other	16	13

Of the schools with microcomputers connected to host mini/mainframes, 49 indicated using a data switch, port selector, or PABX (a reduction from the 73 schools in 1989 and 65 schools in 1991). Twenty-two schools identified their data switch by name: 3 indicated using AT&T, 7 Gandolf, 6 Micom, 2 Northern Telecom, and 4 Rolm.

5.3 Network Management Problems

One hundred-one schools provided descriptions of their major network management problems. These could be categorized into eight general areas. Cabling/bandwidth problems led the list (mentioned by 27 schools) and included physical breaks in cables, connector failures, insufficient bandwidth for applications, network too slow, poor drivers for some network cards, printing conflicts, and lack of the upgrading of equipment to meet network demands.

Twenty-three respondents indicated that their major problems were related to network management, including absence or lack of a decision making/planning body, backup procedures, monitoring of the network, keeping track of what is on the network (hardware and software), lack of network management expertise, disk management, students altering the setups on the server, and administrative load.

The next category of concern, explicitly mentioned by 20 schools, was related to staff issues. Comments which cited insufficient staff, too few people, and staff too inexperienced were very common. One respondent wrote "a network of 25 micros is not being used because of lack of staff to set up and operate." Only six schools explicitly said "funding" was their problem, but almost all the staff problems were a result of inadequate funding. Also, five schools listed end-user training as their major network problem, which usually indicates the lack of adequate staff to provide these services.

Fourteen schools indicated that integration of the various components of the network was their major problem, including cross-platform integration, network interface card incompatibility, the connection of different machines to run the software, and the integration of DOS, Windows, Macs, UNIX, and IBM mainframes on the same network. Also related to integration were problems resulting from linking to the central campus network and/or the setting of standards by the central campus network which were incompatible with the direction of the business school.

5.4 Electronic Mail Systems

One hundred twenty (66%) schools provided the name of their electronic mail system. Approximately 20 different systems were listed. Of those, only 6 were given by 10 or more schools: DEC VAX Mail (23), Pegasus (20), Word Perfect Office (11), MS Mail (11), IBM Profs (10), and Lotus :cc Mail (10). All of the other e-mail systems were identified by four or fewer schools. Fourteen schools indicated that they are using internally developed or university systems, and seven indicated using some form of UNIX mail.

In 1991 and 1993 the schools were asked to estimate what percentage of their faculty, students, and staff used e-mail at least three times each week. Table 16 reveals that more schools have made e-mail available across all user categories, with the greatest increase in use for MBA students (a 22% increase from 36% to 58% of the schools). On the other hand, even though more schools have it available, the number of active users (at least three times each week), has only increased for faculty (from 38% to 47% participation) and staff (44% to 54%).

Table 16
Electronic Mail Availability and Usage
(percent of schools and percent of participants)

	1991 N = 166		1993 N = 180	
	% schools have	% user participate	% schools have	% user participate
Faculty	76%	38%	86%	47%
Staff	69	44	74	54
Undergraduates	36	17	49	17
MBAs	36	26	58	28

Some schools have made a major commitment to the use of e-mail and a critical mass of users now exists. Thus, at 16% of the schools, 90% or more of the faculty use e-mail. Similarly, at 24% of the schools, at least 90% of the staff use e-mail. At the MBA level, 5% of the schools have this level of usage and only 1% of the undergraduate programs reported at least 90% usage.

6. Software Resources

The principal software packages for twenty-one different categories used by the participating business schools were identified separately by computer system implementation (mini/mainframe and microcomputer) as well as by usage (instruction and research). Table 17 summarizes the software usage as reported by the schools for each of these categories and is sorted by number of schools reporting microcomputer software packages. This table emphasizes the variety of packages in each category. For example, for word processing on mini/mainframe systems, 7 different packages were identified as used for instruction and 12 for research. Within the microcomputer category, 15 different packages were identified for use with the instructional programs and 18 for research support.

Table 17 also clearly identified those applications which are dominantly mini/mainframe or microcomputer oriented. In every software application area, more schools named software for the microcomputer than for the mini/mainframe environment. Only six application's areas had at least one-third of the schools (60 or more) name a mini/mainframe software package for that application area, and for four areas, there were no packages named. On the other hand, microcomputer software was listed for every area, and for nine areas at least two-thirds of the schools

named a package. Furthermore, communications packages which enable microcomputers to link with mini/mainframe systems were the most frequently named mini/mainframe software area. These data suggest a clear preference and focus on microcomputers as the environment for most computer applications within the business school environment.

Table 17
Summary of Computer Software Usage
(ordered by number of schools reporting microcomputer software usage)
N = 180

	Mini/mainframes			Microcomputers		
		# of Packages			# of Packages	
	# Schools	Instruction	Research	# Schools	Instruction	Research
Word Processing	46	7	12	175	15	18
Graphics/Presentation	108	3	6	174	24	19
Spreadsheets	8	4	2	170	8	8
Database Mgmt Sys	87	12	8	169	19	17
Statistical	136	10	12	168	22	19
Communications	142	8	12	164	26	18
Prog Languages	118	13	10	139	17	16
Virus	0			135	17	17
Desktop Pub	29	4	1	134	11	17
Modeling/Optimization	69	5	9	125	22	16
AI/Expert Sys	31	6	5	110	21	21
Simulation	41	5	5	98	16	12
Multimedia / Hypermedia	0			73	5	5
Business Games	19	10	2	72	25	12
Dev Tools	6	3	3	69	14	7
Utilities	1	1	0	54	9	8
Project Mgmt	0			50	11	4
Group Decision Support	5	3	2	27	14	11
Bibliographic	14	10	9	14	10	8
Instructional Programs	3	3	0	14	9	4
Text Analysis	0			11	5	5

When compared to the data from 1991, the distribution of software was approximately the same both in terms of the number of schools naming packages and the breadth of software available. Using the average number of microcomputer instructional software packages per category as a indicator of the variety of software available, there is a very broad selection available to instructors. In 1989, the average was 28 per category, while in 1991 it was 14 per category and 15 per category in 1993. The stability of the number over the past two years suggests that users may be less willing to adopt new or different packages as the switching cost may be too high.

6.1 Software Details by Application Category

Detailed tables are given for the software application categories listed in Table 17 in the subsections which follow. The subsections are organized alphabetically. The count after a particular software package name reflects the number of times that package was reported by five or more schools. The "other" category reflects the total number of schools reporting software packages not listed by name (i.e., named by less than five schools). The "different packages" at the bottom of each column in the tables gives the total number of different software packages reported by the schools.

All the software packages named by five or more schools in 1991 were named by five or more schools again this year. On the other hand, this year only three software categories (Database Management Systems, Development Tools, and Programming Languages) added a software package to their list of those named by five or more schools, and of these, only one (Access) was a new product on the market. It is interesting that these three categories are all part of what might be considered the computer programmer or specialist areas rather than typical "end-user" software packages.

Artificial Intelligence, Expert Systems

This software application area is summarized in Table 18 and shows that three times as many packages were specified for microcomputers as for mini/mainframe systems. While LISP was the only package identified by five or more schools for the mini/mainframes, VP-Expert, Exsys, Prolog, Guru, and LISP were the most commonly named microcomputer packages. VP-Expert remained especially strong for instructional use.

Table 18
Artificial Intelligence, Expert System Software
(N = number of schools reporting software package)

Mini/mainframes (N=31)				Microcomputer (N=110)			
Instruction		Research		Instruction		Research	
LISP	17	LISP	23	VP-Expert	59	VP-Expert	33
Other	7	Other	6	Exsys	26	Prolog	27
				Prolog	23	LISP	20
				Guru	16	Exsys	16
				LISP	5	Guru	15
				Other	24	Other	18
Different Packages	6		5		21		21

Bibliographic Software

Fourteen schools indicated using ten different microcomputer-based bibliographic software packages, with PRO-CITE, EndNote, and ABI Inform receiving two mentions each. On the mini/mainframe side, 14 schools listed 14 different packages, with no package being listed more than once.

Business Games

As in the previous surveys, this application software area has more instructional than research use, reflecting the integration of computers through the business games into the curriculum. Furthermore, the games seem to support the marketing curriculum more than any other area. Markstrat was the dominant business game in both the mini/mainframe and microcomputer environments, listed by 10 and 43 schools, respectively. The Marketing Game was listed by 19 schools and was the only other game named by 5 or more schools. The word "marketing" was part of the name of 7 of the other 23 games which were each listed once. Four other games had the word "policy" or "strategy" as part of their title, suggesting support for this course area. The other titles suggested games for a variety of courses.

Communications

As shown in Table 19, KERMIT is the most common communications package used for connecting a microcomputer to a mini/mainframe and for transferring files between computers, and was reported by two-thirds of the schools across all four categories. Procomm is a distant

second on the mini/mainframe side while FTP/TELNET occupied the second position on the microcomputer side. The total number of different packages listed for mini/mainframes decreased by an average of 33% since 1991, and there was a similar decrease for research support packages for microcomputers. However, for instructional support, the number of packages listed this year was the same as in 1991.

Table 19
Communications Software
(N = number of schools reporting software package)

Mini/mainframes (N=142)				Microcomputer (N=164)			
Instruction		Research		Instruction		Research	
KERMIT	94	KERMIT	98	KERMIT	107	KERMIT	102
Procomm	39	Procomm	43	FTP/TELNET	78	FTP/TELNET	89
YTERM	9	YTERM	9	Procomm	50	Procomm	71
Other	6	Other	10	YTERM	9	Crosstalk	22
				Other	20	YTERM	10
						Other	13
Different Packages	8		12		26		18

Database Management Systems

Table 20 lists the different database management systems software packages used in business schools. As shown in the table, about twice as many schools reported microcomputer software than mini/mainframe software. dBase was once again the most dominant microcomputer package. For the mini/mainframe systems, SQL and Oracle were most prevalent. Access, the new database management system, was added to the list for both instructional and research microcomputer use.

Table 20
Database Management System Software
(N = number of schools reporting software package)

Mini/mainframes (N=87)				Microcomputer (N=169)			
Instruction		Research		Instruction		Research	
SQL	36	Oracle	27	dBase	131	dBase	96
Oracle	32	SQL	24	Paradox	79	Paradox	69
RDB	13	INGRES	12	R:BASE	45	R:BASE	39
INGRES	12	Focus	7	Oracle	26	Oracle	22
Informix	9	RDB	7	Foxbase	26	INGRES	11
Other	10	Other	3	Focus	8	Focus	9
				INGRES	8	Access	6
				Access	8	Other	19
				Other	20		
Different Packages	12		8		19		17

Desktop Publishing

As may be seen in Table 21, desktop publishing is primarily a microcomputer application, with over four times as many schools responding with software listings for the microcomputers as for the mini/mainframes. The most popular package for the microcomputers remained

PageMaker, again followed by Ventura, and TeX. For mini/mainframe oriented research support, TeX was the only package listed.

Table 21
Desktop Publishing Software
(N = number of schools reporting software package)

Mini/mainframes (N=29)				Microcomputer (N=134)			
Instruction		Research		Instruction		Research	
TeX	8	TeX	25	PageMaker	71	PageMaker	76
Other	3	Other	0	Ventura	16	TeX	39
				TeX	14	Ventura	31
				Ready Set Go	5	Other	16
				Other	8		
Different Packages	4		1		11		17

Development Tools

Development tools, such as Computer Assisted Software Engineering (CASE) tools, are an important part of the instructional environment for system analysis and design courses. However, as can be seen from Table 17 (page 19), few schools use these systems to support these courses. Only 6 schools list 3 mini/mainframe packages and 69 schools (39%) named 14 different microcomputer packages. One reason for the minimal use may be the complexity of these systems, and on the mini/mainframe side, minimal use may be a result of users frequently requiring system programmer support for implementation. This may also explain why 11 times as many schools use microcomputer-based packages as mini/mainframe systems. Excelerator continues to be the dominate CASE package used in business schools with 54 of the 69 (78%) schools naming this package. For the first time, however, a second CASE tool, IEF, was named by five schools for microcomputer instructional support.

Graphics and Presentation Software

Microcomputer-based graphics and presentation application software was the most volatile of the 21 categories that were tracked. Each of the 11 microcomputer instructional packages listed in Table 22 has changed position since the 1991 survey. Harvard Graphics and Lotus switched first and second positions. PowerPoint use increased 700% moving it from eighth to third position. QuattroPro grew 1000% moving from tenth to fourth position. The other packages which were named by at least five schools all moved down. On the mini/mainframes side, there was essentially no change since the 1991 survey.

Group Decision Support Systems

Group decision support system software expanded from 19 to 27 schools during the last two years, a 42% increase. Vision Quest and University of Arizona Group Systems were again the major packages named, each being mentioned by six schools. The other packages were all listed once.

Instructional Support Software

Nine different instructional support software packages which assist instructors with keeping class rosters and grades, were listed by fourteen schools. Only one package, Gradebook, was named by two schools.

Table 22
Graphics and Presentation Software
(N = number of schools reporting software package)

Mini/mainframes (N=108)				Microcomputer (N=174)			
Instruction		Research		Instruction		Research	
SPSS	63	SPSS	84	Harvard	109	Harvard	116
SAS Graph	57	SAS Graph	81	Lotus	103	Lotus	97
Other	1	Other	4	PowerPoint	72	PowerPoint	69
				QuattroPro	69	QuattroPro	63
				MacDraw	49	SAS Graph	57
				MacPaint	39	MacDraw	45
				DrawPerfect	32	Freelance	37
				FreeLance	28	DrawPerfect	36
				Storyboard	16	HP Gallery	10
				HP Gallery	8	Chart-Master	7
				Chart-Master	3	Other	24
				Other	28		
Different Packages	3		6		24		19

Modeling and Optimization

In the 1989 survey, approximately the same number of schools listed modeling and optimization software packages for their mini/mainframe and microcomputer environments. As shown in Table 23, almost twice as many schools listed microcomputer as mini/mainframe packages. LINDO has remained the leading package, being named almost twice as frequently as the next package. The relative position of the other packages has remained the same.

Table 23
Modeling and Optimization Software
(N = number of schools reporting software package)

Mini/mainframes (N=69)				Microcomputer (N=125)			
Instruction		Research		Instruction		Research	
LINDO	49	LINDO	48	LINDO	69	LINDO	64
IFPS	29	IFPS	23	Storm	37	IFPS	25
Other	3	Other	10	QSB	34	What's Best!	10
				IFPS	32	Other	13
				What's Best!	17		
				Other	19		
Different Packages	5		9		22		16

Multimedia and Hypermedia

As was mentioned in the discussion of Multimedia Labs (Section 4.5), 39 schools indicated they use Toolbook and 38 named Hypercard. Seven other packages were mentioned once or twice. In the 1991 survey, Hypercard was reported by 11 schools and Toolbook by 6.

Programming Languages

This year C++ was added to the list of programming languages used by five or more schools for both microcomputer-based instruction and research. Details of programming language usage reported this year is presented in Table 24. Not only was C++ added to the list, but the overall use of C has grown, moving into second position in three categories and first position in the

fourth category, representing about a 50% growth in each area. COBOL continues as the dominant mini/mainframe instructional language and BASIC maintained its dominance on the microcomputer side.

Table 24
Programming Language Software
(N = number of schools reporting software package)

Mini/mainframes (N=118)				Microcomputer (N=139)			
Instruction		Research		Instruction		Research	
COBOL	77	FORTRAN	78	BASIC	65	C	79
C	54	C	51	C	58	BASIC	70
BASIC	47	Pascal	42	COBOL	45	FORTRAN	65
Pascal	43	COBOL	43	Pascal	39	Pascal	60
FORTRAN	43	BASIC	33	FORTRAN	25	COBOL	21
PL/1	15	PL/1	14	Prolog	13	LISP	15
Other	10	Other	4	C++	5	Prolog	14
				Other	14	C++	5
						Other	14
Different Packages	13		10		17		16

Project Management

Project management software is a software application used almost exclusively for instruction in a microcomputer environment. Fifty schools reported using project management software packages, twice the number as in 1991. However, the same two packages continue to dominate the market: MS Project (for instructional usage) was mentioned by 29 schools (up from 7 in 1991) and SuperProject was mentioned by 11 (up from 5). Nine other packages were named, with MacProject and Timeline each mentioned three times.

Simulation

The simulation category has shown several shifts from being primarily a mini/mainframe application in 1987, to being used about equally in both computer environments in 1989, to now being primarily in the microcomputer environment. The software packages and counts presented in Table 25 have remained essentially the same this year as in 1991. However, there have been changes in the "other" category. For mini/mainframes, these categories decreased slightly,

Table 25
Simulation Software
(N = number of schools reporting software package)

Mini/mainframes (N=41)				Microcomputer (N=98)			
Instruction		Research		Instruction		Research	
GPSS	19	GPSS	19	Sim Factory	21	GPSS	23
SLAM	18	SLAM	18	STELLA	20	Siman	20
Simscript	13	Simscript	15	SLAM	19	STELLA	18
Other	3	Other	4	GPSS	18	SLAM	17
				Siman	18	Simscript	14
				Simscript	12	Other	7
				Other	10		
Different Packages	5		5		16		12

Table 26
Spreadsheet Software
(N = number of schools reporting software package)

Mini/mainframes (N=8)				Microcomputer (N=170)			
Instruction		Research		Instruction		Research	
20/20	6	20/20	3	Lotus 1-2-3	156	Lotus 1-2-3	144
Other	3	Other	1	Excel	96	Excel	117
				QuattroPro	80	QuattroPro	88
				VP-Planner	8	VP-Planner	9
				SuperCalc	8	SuperCalc	9
				Other	3	Other	3
Different Packages	4		2		8		8

but on the minicomputer side, there was a 50% increase in the number of additional packages named. For example, for instruction this year, ten additional packages were each named once.

Spreadsheet Packages

As shown in Table 26, 170 schools are using only 8 different microcomputer spreadsheet packages, the same ones as listed in 1991. Lotus 1-2-3 continues to dominate, being specified by about 87% of the schools. All of the other microcomputer software packages listed have remained the same. In the mini/mainframe category, 20/20 was the only package to meet the criteria of being identified by more than five schools for inclusion in the table.

Statistical Packages

The statistical software area was the last vestige of mini/mainframe strength over the capabilities of the microcomputer. In the 1989 and earlier surveys, mini/mainframe statistical software packages were clearly dominant. In the 1991 survey, there were about an equal number of schools listing mini/mainframe and microcomputer statistical software packages. This year, as seen in Table 27, about 25% more schools listed microcomputer packages than mini/mainframe packages. The table shows that the major mini/mainframe packages have been successfully adapted to the microcomputer environment, with SAS, SPSS, and Minitab the most common packages in all categories. However, many new packages were developed specifically to take

Table 27
Statistical Software
(N = number of schools reporting software package)

Mini/mainframes (N=136)				Microcomputer (N=168)			
Instruction		Research		Instruction		Research	
SAS	92	SAS	121	SPSS	81	SPSS	119
SPSS	88	SPSS	121	Minitab	79	SAS	106
Minitab	63	Minitab	57	SAS	72	Minitab	68
BMPD	14	LISREL	49	SYSTAT	38	RATS	53
Other	7	BMPD	25	TSP	30	SYSTAT	53
		TSP	20	Mystat	26	Gauss	44
		Other	7	RATS	25	TSP	38
				StatGraphics	21	StatGraphics	23
				Microstat	10	Other	28
				Other	27		
Different Packages	10		12		22		19

advantage of the microcomputer environment. In total, 22 different microcomputer-based statistical packages were used to support the instructional program and 19 different packages to support research. However, only half of these met the qualifications of at least five schools. On the mini/mainframe side, there was no change in approximate numbers and use of the various packages since the last survey.

Text Analysis Software

Eleven schools reported using five different microcomputer-based text analysis software packages. The most popular microcomputer package was Grammatik, being listed by four different schools.

Utility Software

Utility software for microcomputers was listed by 54 schools, with 32 naming Norton Utilities. The other eight packages were listed once or twice, although PC Tools was named by three schools.

Virus Protection Software

One hundred thirty-five schools named their virus protection software: McAffee Viruscan by 66 schools, SAM by 39, FProt by 16 and 14 other packages by less than five schools.

Word Processing

As shown in Table 28, 175 business schools listed 15 different microcomputer word processing packages for instruction and 20 for research. WordPerfect has again remained the dominant package, and in both areas, the order of the most frequently used packages remained essentially the same as in 1991. This suggests that individuals become satisfied with the package they are using and are worried about the high switching costs when moving to another package, especially in light of the convergence of functionality of the various packages.

Table 28
Word Processing Software
(N = number of schools reporting software package)

Mini/mainframes (N=46)				Microcomputer (N=175)			
Instruction		Research		Instruction		Research	
Other	11	XEDIT	22	WordPerfect	152	WordPerfect	159
		TeX	17	MS Word	95	MS Word	124
		Script	4	MacWrite	34	TeX	47
		Other	11	WordStar	30	MacWrite	43
				PC-Write	5	WordStar	41
				PFS: Write	9	PFS Write	8
				Other	17	DisplayWrite	8
						PC-Write	7
						MultiMate	6
						Other	14
Different Packages	7		12		15		18

6.2 Software Standards

Ninety-four (52%) of the schools indicated that they have a software standard. Forty-four schools chose their software standard based on what software was supported by the computer staff, either within the school or from a central campus group. Some of these schools indicated

that automatic upgrading occurred when new versions became available. Five schools were very pragmatic in their choice of a software standard and chose those packages most commonly used in the the business environment. Four schools indicated that their standard software was the software that the policy committee determined would be supported. The other schools chose software which would run on the local area network, on any Windows packages, or software for which the school had site licenses.

It is clear that when the word "standard" is used with regard to software, there are a multitude of interpretations of what is meant. Therefore, whenever discussing software and standards, it is probably helpful to clarify which definition of standard is being used.

6.3 Software Language

Given the international nature of the sample, a question was added to this year's survey regarding the language in which the software used by faculty, students, and staff appears on the screen. Specifically, the respondents were asked if software is available in the dominant language of instruction at their business school. One hundred thirty-one schools (73%) replied that it was. Twelve schools indicated that there were problems due to the lack of software in the dominant language of instruction at their school. Eight schools said the problems were minimal, three indicated the problems were moderate, while only one school reported the problem was acute. Software was reported to be available in Chinese, Japanese, Korean, and Portuguese.

7. Instructional Support Resources

This section discusses business school instructional support resources including computer entrance and graduation requirements/expectations, penetration of computers into the curriculum as indicated by hands-on computer use in the core courses, sources of courseware, classroom electronic equipment, and computer-related training for various computer user groups.

7.1 Entrance Requirements/Expectations

Of the 157 business schools offering undergraduate business programs, 36 (22%) indicated that there were computer literacy entrance requirements for their students. The requirements were usually a passing grade in an introductory computer course or a computer literacy exam in which knowledge of basic applications (word processing, spreadsheet, graphics, and communication software) was demonstrated. This year, unlike 1991, computer programming was not listed as one of the requirements although this may have been included in the content of the introductory course.

Of the 164 schools with MBA programs, 46 (28%) stated that there were computer literacy entrance requirements, a decrease from the 38% with such a requirement in 1991. These requirements included prerequisite courses in computer concepts, MIS and applications, a general computer "driver's license" in application software (word processing, spreadsheets and database management systems), and proficiency with DOS and Windows. One school indicated proficiency in either Pascal or C programming languages was required.

7.2 Graduation Requirements/Expectations

Tables 29 and 30 summarize the computer requirements and/or expectations upon graduation from business school for both the undergraduate and the MBA programs, respectively, and compare the 1993 data with that of 1991 and 1989. As shown in the tables, the order of importance of the requirements as suggested by the percentage rankings, remains the same for both the undergraduate and the MBA programs. Furthermore, a larger percentage of the undergraduate programs than MBA programs specify requirements.

The data continues to show the emphasis on microcomputer systems over mini/mainframes in the business school environment. The largest increase in the computer-related graduation

Table 29
Undergraduate Computer Requirements and Expectations Upon Graduation
(percent of schools)

Requirements/Expectations	1989 N=149		1991 N=150		1993 N= 157	
	Required	Expected	Required	Expected	Required	Expected
Computer/Info Sys course	91%	3%	82%	5%	86%	7%
Microcomputer use	83	12	77	13	76	19
Spreadsheet use	81	14	75	15	76	19
Word Processing use	71	20	63	25	68	25
Database use	58	19	52	19	61	20
Programming language	41	16	23	11	32	17
Mini/mainframe use	50	25	27	19	31	28
Online database retrieval	18	25	13	22	24	34
Pass Computer literacy exam	11	10	9	11	16	14

Table 30
MBA Computer Requirements and Expectations Upon Graduation
(percent of schools)

Requirements/Expectations	1989 N=157		1991 N=154		1993 N= 164	
	Required	Expected	Required	Expected	Required	Expected
Computer/Info Sys course	75%	10%	67%	13%	72%	15%
Microcomputer use	76	17	62	23	68	27
Spreadsheet use	72	21	60	25	66	30
Word Processing use	51	37	47	37	54	37
Database use	41	29	36	32	40	35
Mini/mainframe use	38	30	20	31	21	30
Online database retrieval	17	29	15	29	24	39
Pass Computer literacy exam	12	11	9	18	15	16
Programming language	19	15	10	17	9	20

requirements for both the undergraduates and the MBAs was in the use of on-line database retrieval (e.g., use of Nexis or Dow Jones). This growth corresponds to the wider availability of these databases, as discussed in Section 8 below.

7.3 Penetration into the Curriculum

As a measure of penetration of computers into the curriculum, the business schools indicated whether hands-on use of computing was required in their undergraduate and MBA core courses. 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 8 summarizes the responses for the undergraduate core courses and Figure 9 for the MBA core courses. For the undergraduate programs, over 70% of the schools indicated that computer usage was required for seven of the core courses and for the MBA programs, for only six core courses.

To see the aggregation of required computer usage across the curriculum, the data for Figures 8 and 9 was compared with that from 1985, 1987, 1989, and 1991, as shown in Table 31. As can be seen in the table, for most of the courses, the level of required use since 1989 has remained within a few percentage points. Furthermore, the fluctuations within a given course

Figure 8
Required Computer Use in Undergraduate Core Courses
N = 157

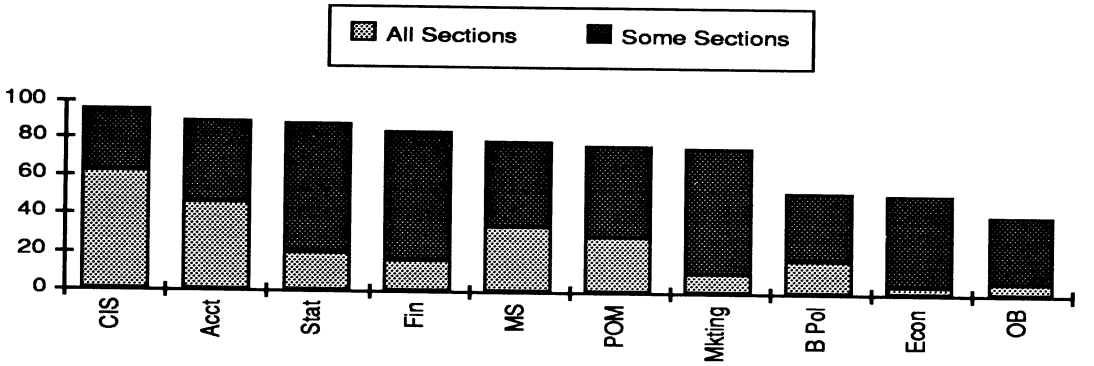
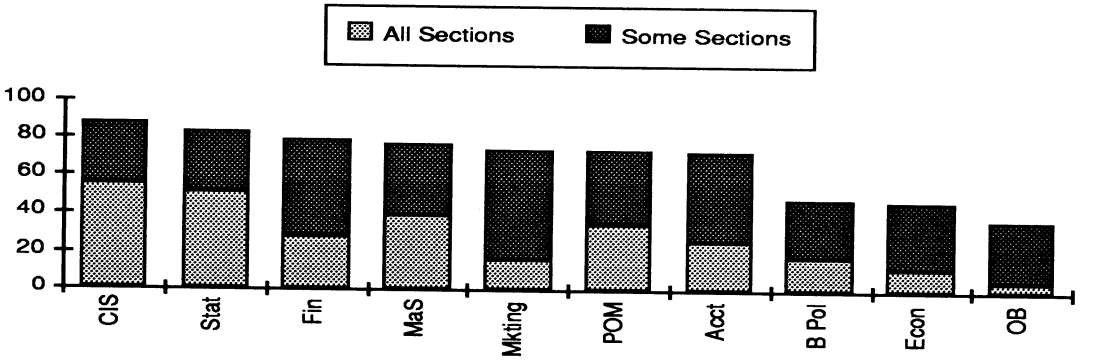


Figure 9
Required Computer Use in MBA Core Courses
N = 164



from year to year are "leveled out" when the average required use figures are calculated. As can be seen from Table 31, the undergraduate programs have achieved a "steady-state" at about 73% required use across the core courses, while the MBA programs are at about 66%.

Table 31
Required Computer Usage in Core Courses
(percent of schools)

	Undergraduate					MBA				
Core Courses	**1985**	**1987**	**1989**	**1991**	**1993**	**1985**	**1987**	**1989**	**1991**	**1993**
Accounting	62%	84%	86%	88%	88 %	55%	70%	80%	77%	73%
Business Policy	42	47	58	58	52	32	44	47	47	48
Economics	29	37	49	48	52	32	31	47	46	47
Finance	64	81	83	83	83	76	75	80	77	79
Info Systems	87	94	93	98	96	78	78	83	87	88
Mgt Science	52	69	74	81	79	77	74	77	77	77
Marketing	82	81	82	73	76	55	58	70	64	74
Org Behavior	20	26	32	37	41	21	22	31	32	38
Prod/Operations	78	74	77	79	77	71	75	70	73	74
Statistics	76	81	86	85	90	69	72	80	82	82
Average	60%	67%	72%	73%	73%	57%	60%	66%	66%	61 %

7.4 Impact on the Curriculum

This year, as in 1991, the schools were asked "to what degree has computer technology positively impacted the curriculum at your business school?" The response to this question was on a zero to five scale, with zero being "none," and with one indicating the "somewhat" responses, and five indicating the "extensively." One hundred fifty-six (99%) of the undergraduate program schools and 165 (99%) of the MBA program schools responded. These responses are shown in Figures 10 and 11.

Figure 10
Impact of Computer Technology on the Undergraduate Business Curriculum

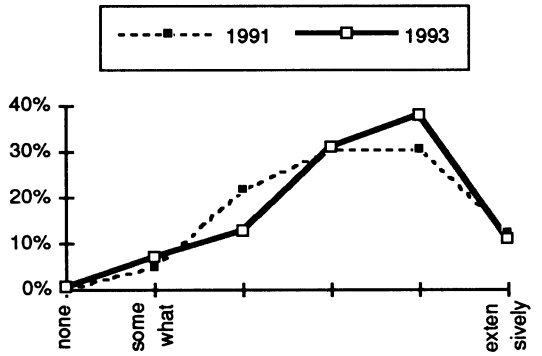
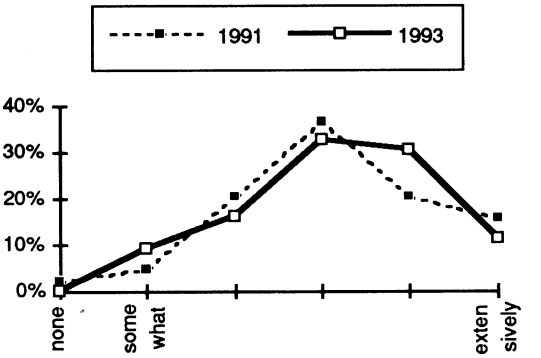


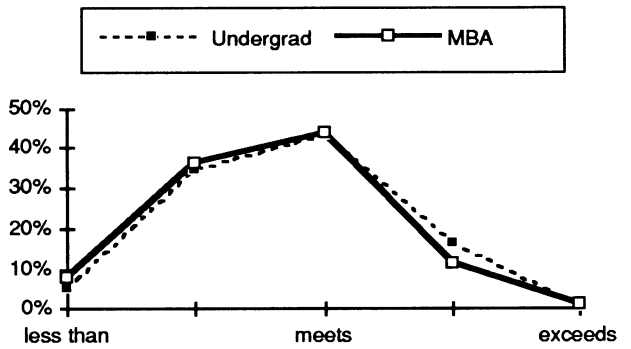
Figure 11
Impact of Computer Technology on the MBA Curriculum



As shown in the figures, for both programs there was a slight shift to the right suggesting a more positive impact of the technology in the curriculum than existed two years ago. At the undergraduate level, 49% indicated that the impact was "extensive" (4 or 5) as compared to 42% in 1991. At the MBA level, these scores were 42% in 1993 and 36% in 1991.

To gain further insight into the extent or reach of computer technology into the business school curriculum, the respondents were asked, "Given the resources available at your business school, to what degree is computer integration into the curriculum meeting your school's 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." Figure 12 displays the responses of the 155 (99%) schools with undergraduate programs and the 163 (98%) schools with MBA programs.

Figure 12
Computer Integration into the Business School Curriculum



As can be observed from Figure 12, the ability of the schools to integrate technology was independent of whether the program was undergraduate or MBA. Overall, the respondents indicated that 43% of the undergraduate and 44% of the MBA programs meet expectations. However, 40% and 42%, respectively, felt their programs should be able to do more with the resources at hand, by indicating that the level of integration was less than expected.

7.5 Sources of Courseware

For core courses in which there was at least some required computer use, the source of the courseware was requested. Courseware sources included those developed internally, those acquired with the textbook, those acquired from commercial sources, or from another university.

Many schools indicated multiple sources for a particular course, and some listed commercial packages such as Lotus 1-2-3 as the courseware. Tables 32 and 33 summarize this data separately for the undergraduate and graduate core courses. The "N" values in these tables are the number of schools which indicated at least some required computer use with each line showing the percentage of schools in each cell based on that "N." An average was calculated to give a general sense of the primary sources of courseware.

Table 32
Sources of Undergraduate Courseware
(percent of schools with required computer use)

Undergraduate Core Class	N	Internal	Textbooks	Commercial	Other University
Accounting	138	28%	57%	75%	7%
Business Policy	82	21	45	52	7
Economics	82	28	49	61	10
Finance	131	33	44	76	6
Information Systems	150	33	46	83	9
Management Science	124	26	52	70	10
Marketing	120	26	48	69	8
Organizational Behavior	64	23	44	64	5
Production/ Operations	121	20	45	65	7
Statistics	141	17	43	84	3
Average		25%	47%	70%	7%

Table 33
Sources of Graduate Courseware
(percent of schools with required computer use)

Graduate Core Class	N	Internal	Textbooks	Commercial	Other University
Accounting	120	25%	48%	69%	5%
Business Policy	79	24	47	54	10
Economics	77	25	40	73	10
Finance	130	30	37	73	8
Information Systems	144	24	38	83	8
Management Science	128	21	48	71	9
Marketing	121	17	37	72	7
Organizational Behavior	62	27	42	68	6
Production/ Operations	122	21	43	68	6
Statistics	135	19	40	81	3
Average		23%	42%	71%	7%

Both tables indicate that commercial software packages were the dominant source of courseware. Figures 13 and 14 display the average values over the past six years. From the figures, it appears that all sources have been relatively stable, with the exception of textbooks. Materials internally developed by faculty account for about one-quarter of all courseware, text book included supplements account for about half, and commercial packages account for about two-thirds. Courseware shared among universities accounts for a very small portion of the overall selection of packages

7.6 Classroom Electronic Equipment

Of the 171 schools reporting on their use of interactive computer output display technology, 134 (78%) of the schools had permanently installed equipment, an increase from 69% in 1991. One hundred seventeen of these schools delineated the percent of all of their classrooms that

Figure 13
Sources of Undergraduate Courseware
(average percent per year)

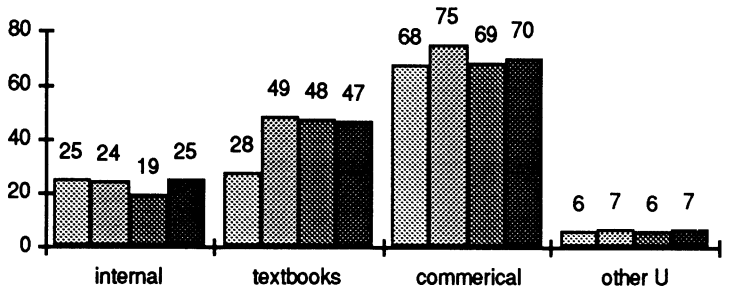
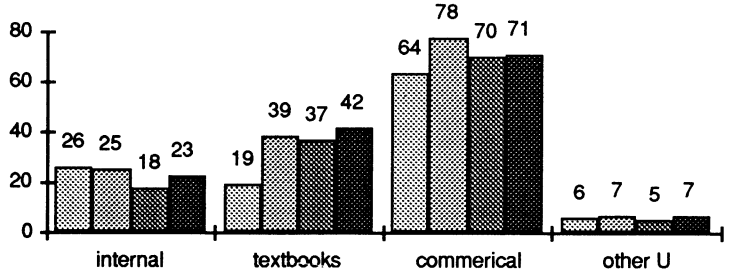


Figure 14
Sources of MBA Courseware
(average percent per year)



were permanently equipped: 93 (79%) of the schools reported permanent equipment in less than one-third of their classrooms, 13 (11%) in from one-third to two-thirds of their classrooms, and 11 (10%) in more than two-thirds of their classrooms. Six schools indicated that 100% of their classrooms have permanent equipment to display interactive computer output.

A heavy dependency was seen again on mobile units which could be wheeled between classrooms. One hundred forty-six (81%) of the schools reported using mobile units: with 21 schools reporting 1 mobile unit; 46 schools, 2; 20 schools, 3; 7 schools, 4; and 29 schools, 5 or more. For these schools, 58% responded that these units were picked up and returned by the faculty and 37% responded that these units were delivered to the classroom by staff or teaching assistants.

For both the permanently equipped classrooms and the mobile units, the video projectors that were specifically identified ten or more times by the schools included Sony (41), Barco (22), Electrohome (11), and NEC (11). The LCD devices used with the overhead projectors that were specifically identified ten or more times included Datashow (58), Sharp (30), Infocus (24), nView (16), and Proxima (11). None of the other three video projector or six LCD brands were mentioned by more than five schools.

One hundred seventy-three (96%) of the schools responded to the question regarding the general sufficiency of classrooms equipped with display devices. Twenty percent of these schools indicated that they never had any scheduling problems, 57% indicated that they had occasional problems with scheduling, and the remaining 23% indicated that they usually or always had scheduling problems. These figures show slight improvement in scheduling from 1991 when they were 16%, 59%, and 25%, respectively.

The lack of appropriate equipment combined with the difficulties associated with the equipment currently available are seen as obstacles in integrating information technology into the curriculum.

7.7 Training

The respondents were also asked to identify the different types of computer-related training programs provided to their students, faculty, and staff and rate the effectiveness of each type. The response to this question 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." Overall, the types of training offered were consistent with past years.

Table 34 displays the data relating to the eight different training approaches by user group. Classroom instruction was shown to be 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 used for both faculty and staff. The table also shows that training as part of classroom instruction was considered to be the most effective type of training for the undergraduates, that workshops prior to the beginning of classes were the most effective for the MBAs, and that individual training was the most effective for both faculty and staff. CAI/video training was considered to be the least effective for the students, as well as for the faculty and staff.

Table 34
Effectiveness of Computer-Related Training By User Group
(percent of schools)

Type of Training	Undergrad N = 157		MBA N = 164		Faculty N = 180		Staff N = 180	
As part of classroom instruction	89%	3.0	86%	3.0	21%	2.3	21%	2.7
University-provided workshops	45	2.4	43	2.4	74	2.5	74	2.6
University provided one-on-one training	15	2.2	13	2.4	30	2.4	31	2.3
Business school workshops (prior to the beginning of classes)	18	2.5	40	3.1	16	2.3	17	2.5
Business school workshops (during the academic year)	33	2.7	37	2.9	35	2.6	36	2.8
Business school individual training	16	2.7	20	2.8	47	3.0	45	3.1
Handouts, workbooks, and other documentation	74	2.8	77	2.8	69	2.7	66	2.6
CAI, video training	20	2.2	22	2.2	17	2.2	16	2.2

* Average effectiveness, scaled

1 = inadequate
3 = adequate for most users
5 = exceptionally effective in meeting user needs

8. Data Resources

Information regarding databases available for research and instruction for at least 9% of the 180 business schools is summarized in Table 35. The table is ordered by percent of availability. Forty-seven other databases were listed, with only a few mentioned by more than one school. Several schools stated "several others" but did not list them by name.

Compustat again remains the most widely used database and is available in 104 (58%) of the schools. Thirty-one (30%) of the schools reported storing the Compustat database on-line, 46 (44%) of the schools used tape storage, and 43 (41%) of the schools reported having Compustat available on CD-ROM. Some schools indicated that Compustat was available on all three storage media. Network access for Compustat was the most common access method reported by 56 (54%)

of the schools, with faculty the primary users. As indicated in Table 35, Compustat users were reported to be given "some support" by the schools, on average. Only ten (10%) of the schools indicated an access charge for using the database.

In terms of the availability of the various databases, Library Catalogs has now become the second most used database, replacing CRSP. Nexis has moved from ninth position to tie for fifth. Four of the databases are primarily available in an on-line format: Library catalog, Lexis, Nexis, and Dow Jones. On the other hand, CRSP is primarily available on tape, with ABI Inform and Compact Disclosure primarily available on CD-ROM. The faculty as a group were the primary users across all databases. The least support to users was provided for Value Line and CRSP, with the greatest support provided for Nexis. For approximately one-third of the schools with Nexis, Lexis, and Dow Jones databases, users are charged an access fee. These same databases receive the greatest level of school funding to support their availability.

Table 35
Databases Available for Research and Instruction
(ordered by availability)
(percent of schools)

Availability			Database	Storage Format			Access Method			Primary Users			Level of Support for Users	Access Charge	Funding Available
1989 N=163	1991 N=166	1993 N=180		on-line	tape	CD-ROM	stand-alone	terminal dialup	via network	Faculty	Ph.D.	MBA	1=users on own 5=extensive support		
74%	64%	58%	Compustat	30%	44%	41%	36%	23%	54%	83%	22%	24%	3.0	10%	20%
37	48	54	Library catalog	96	2	4	6	32	83	74	24	51	3.2	2	6
63	55	49	CRSP	33	66	5	13	32	59	83	26	10	2.9	8	19
17	30	43	ABI Inform	21	5	85	55	10	46	55	18	63	3.2	10	15
17	21	37	Lexis	94	0	6	9	46	54	64	12	49	3.0	39	36
	14	37	Nexis	94	0	6	8	47	55	61	15	59	3.7	36	38
26	30	29	Dow Jones	81	6	13	15	55	40	58	4	51	3.1	34	30
21	28	28	Compact Disclosure	12	6	86	63	6	37	47	8	55	3.3	8	12
24	22	21	Citibase	49	41	11	16	24	68	84	14	16	2.8	11	27
13	13	9	Value Line	29	41	29	18	41	47	47	6	41	3.0	12	29

TENTH ANNUAL UCLA SURVEY: 1993
GENERAL SCHOOL DATA

INSTITUTION	TYPE	UGRAD (FTE)	MBA (FTE)	PHD (FTE)	XMBA (FTE)	NON-D (FTE)	FAC (FTE)	COMP OP BUDGET	COMP BDGT/ STUDENT($)	COMP/TOT BUDGET(%)	STUD/COM STAFF
U OF AKRON	PUB	2200	700	.	.	.	110	100000	34	1.3	.
U OF ALABAMA	PUB	3350	130	.	.	.	109	250000	72	1.7	193
U OF ALASKA, FAIRBANKS	PUB	600	75	.	.	.	31	70000	104	2.3	338
AMERICAN U	PRIV	.	.	.	.	.	.	.	.	.	.
ARIZONA STATE U	PUB	4000	800	100	.	.	170	400000	82	3.1	.
U OF ARKANSAS	PUB	2500	110	64	.	25	104	250000	93	3.8	5398
ARKANSAS STATE U	PUB	5169	738	145	.	.	190	.	.	.	24208
AUBURN U	PUB	3300	309	55	.	.	95	.	.	.	.
BABSON COLLEGE	PRIV	1679	807	.	.	80	132	4335000	1689	6.9	71
BOISE STATE UNIV	PUB	2478	209	.	.	.	111	167000	62	0.3	448
BOSTON UNIV	PRIV	1730	834	38	.	31	121	420000	159	3.7	125
BOWLING GREEN STATE UNIV	PUB	2754	393	.	.	.	111	30000	10	7.5	.
BRIGHAM YOUNG UNIV	PRIV	1500	700	.	200	.	130	.	.	.	2200
UNIV OF CALIF, IRVINE	PUB	.	222	61	175	.	48	365150	1290	3.4	26
UNIV CALIF, LOS ANGELES	PUB	.	800	100	240	38	95	750000	800	3.2	59
CAL POLY STATE UNIV	PUB	2022	110	.	.	.	66	200000	94	3.2	355
CAL STATE U, CHICO	PUB	2600	35	.	.	.	65	75000	28	2.0	1757
CAL STATE UNIV, SACRAMENTO	PUB	2400	190	.	.	.	100	.	.	.	2590
CAL STATE UNIV, FULLERTON	PUB	4907	237	.	.	.	133	200000	39	133.3	686
CAL STATE UNIV, LONG BEACH	PUB	3052	406	.	.	.	90	222582	64	3.8	238
CAL STATE UNIV, NORTHRIDGE	PUB	3914	110	.	.	.	147	150000	37	1.9	1150
CAL STATE UNIV, FRESNO	PUB	1923	84	.	.	.	95	82700	41	1.4	201
CANISIUS COLLEGE	PRIV	1208	228	.	.	.	60	125000	87	.	.
CARNEGIE MELLON UNIV	PRIV	750	470	100	.	15	110	575000	431	6.1	172
CASE WESTERN (WEATHERHEAD)	PRIV	200	714	85	75	23	85	500860	490	2.7	74
UNIV OF CENTRAL FLORIDA	PUB	.	.	.	.	.	.	.	.	.	.
CENTRAL MICHIGAN UNIV	PUB	2051	421	.	.	.	94	25200	10	10.3	247
COLLEGE OF CHARLESTON	PUB	800	.	.	.	.	30	10000	13	0.7	.
UNIV OF CINCINNATI	PUB	2245	227	64	.	63	95	225000	87	3.8	217
CLEMSON UNIV	PUB	2650	650	32	.	13	200	.	.	.	1338
CLEVELAND STATE UNIV (NANCE)	PUB	2200	635	50	.	.	127	328000	114	3.0	412
UNIV OF COLORADO, BOULDER	PUB	2430	416	77	.	.	80	0	.	.	365
COLORADO STATE UNIV	PUB	898	365	.	.	6	69	380000	299	3.9	123
COLUMBIA	PRIV	.	1700	100	.	.	150	1300000	722	2.6	75
UNIV OF CONNETICUT	PUB	1045	1450	48	.	.	78	.	.	.	339
CORNELL UNIV (JOHNSON)	PRIV	.	527	40	.	12	51	700000	1210	5.8	36
CREIGHTON UNIV	PRIV	5700	200	.	.	.	400	.	.	.	1180
DARTMOUTH (TUCK)	PRIV	.	340	.	.	32	35	185000	497	1.5	53
U OF DAYTON	PRIV	1600	560	.	.	.	60	.	.	.	270
UNIV OF DELAWARE	PUB	1850	440	.	.	.	100	.	.	.	573
DEPAUL UNIV	PRIV	2768	1965	.	.	72	.	950000	198	19.8	
UNIV OF DETROIT MERCY	PRIV	591	740	.	.	.	54	82050	62	3.1	

Appendix 1 - 2

DREXEL UNIV	PRIV	2004	720	50	.	.	117	.	.	.	2774
DUKE UNIV (FUQUA)	PRIV	.	830	43	.	113	79	.	.	.	68
EAST CAROLINA STATE UNIV	PUB	841	243	.	.	.	70	50000	46	1.0	108
EMORY	PRIV	259	319	.	98	22	57	510000	850	4.3	72
UNIV OF FLORIDA	PUB	1978	566	90	25	.	112	226900	86	15.1	351
FLORIDA INTERNATIONAL UNIV	PUB	2236	485	60	.	.	119	48000	17	5.1	1589
FLORIDA STATE UNIV	PUB	2675	226	118	.	.	102	250000	83	14.7	216
FORDHAM UNIV	PRIV	1125	1750	.	.	.	82	.	.	.	359
GEORGE MASON UNIV	PUB	1600	400	.	.	30	74	125000	62	1.6	1624
GEORGETOWN UNIV	PRIV	1150	368	.	.	27	.	520000	337	6.6	129
UNIV OF GEORGIA, ATHENS	PUB	4140	156	122	.	.	115	.	.	.	239
GEORGIA SOUTHERN UNIV	PUB	3000	200	.	.	.	90	100000	31	1.4	3200
GEORGIA STATE UNIV	PUB	5760	2084	139	100	19	197	505437	63	2.8	1600
GONZAGA UNIV	PRIV	499	87	.	.	.	48	87000	148	.	65
UNIV OF ILLINOIS AT URBANA	PUB	3500	576	231	.	.	173	600000	139	2.9	160
INDIANA UNIV	PUB	2400	615	100	50	108	165	.	.	.	215
INDIANA-PURDUE UNIV AT FORT WAYNE	PUB	1109	156	.	.	.	45	27181	21	1.2	.
INDIANA UNIV SOUTHEAST	PUB	.	.	.	.	.	.	.	.	.	.
UNIV OF KANSAS	PUB	937	455	45	.	17	50	.	.	.	581
KANSAS STATE UNIV	PUB	2752	130	.	.	.	55	135759	47	4.0	721
LOUISIANA STATE UNIV	PUB	1528	356	107	.	50	141	.	.	.	93
UNIV OF LOUISVILLE	PUB	1521	460	40	.	58	116	224303	108	2.6	.
LOYOLA MARYMOUNT UNIV	PRIV	1050	.	.	.	.	42	100000	95	.	350
LOYOLA UNIV, CHICAGO	PRIV	1400	450	.	.	.	85	.	.	.	.
LOYOLA UNIV, NEW ORLEANS	PRIV	1025	295	.	.	1	42	.	.	.	.
UNIV OF MAINE	PUB	738	72	.	.	.	24	81608	101	4.7	3240
UNIV OF MASSACHUSETTS AT AMHERST	PUB	1600	190	60	.	.	70	72000	39	1.4	925
MASS INST OF TECH (SLOAN)	PRIV	300	650	100	100	70	120	820000	732	.	112
MIAMI UNIV	PUB	3951	147	.	.	9	166	81000	20	14.2	1095
UNIV OF MICHIGAN	PUB	552	1913	95	.	229	158	1450000	520	2.5	94
UNIV OF MINNESOTA (CARLSON)	PUB	1386	2268	153	.	8	112	684000	179	3.4	477
UNIV OF MISSOURI	PUB	1200	300	45	.	.	50	95000	61	1.6	909
UNIV OF MISSOURI, KANSAS CITY	PUB	458	499	9	.	44	47	60000	59	2.0	.
UNIV OF MISSOURI, ST LOUIS	PUB	2400	240	.	.	13	60	25000	9	0.6	3537
UNIV OF MONTANA	PUB	1800	150	.	.	.	39	.	.	.	7800
UNIV OF NEBRASKA, OMAHA	PUB	3505	486	.	39	38	90	350000	87	7.0	620
UNIV OF NEVADA, RENO	PUB	1670	315	.	.	.	55	55000	28	43.0	794
UNIV OF NEVADA, LAS VEGAS	PUB	3500	370	.	.	.	120	30000	8	0.6	968
UNIV OF NEW MEXICO	PUB	950	210	1	50	.	64	90000	78	2.3	244
UNIV OF NEW ORLEANS	PUB	2919	429	40	.	.	91	144300	43	2.5	678
NEW YORK UNIV (STERN)	PRIV	2124	1970	136	180	.	207	4700000	1111	7.8	63
NICHOLLS STATE UNIV	PUB	620	90	.	.	.	46	85000	120	4.7	284
UNIV OF NORTH CAROLINA, CHARLOTTE	PUB	2325	314	.	.	.	82	52000	20	0.9	.
UNIV OF NORTH CAROLINA, GREENSBORO	PUB	2000	.	.	.	.	60	.	.	.	2000
UNIV OF NORTHERN COLORADO	PUB	1000	.	.	.	.	45	200000	200	5.7	286
UNIV OF NORTH FLORIDA	PUB	1500	.	.	.	.	55	20000	13	0.6	3000
NORTHEAST LOUISIANA UNIV	PUB	1700	.	.	.	.	54	45000	26	.	567

NORTHERN ARIZONA UNIV	PUB	1825	73	.	.	.	66	.	.	.	759
UNIV OF NOTRE DAME	PRIV	1484	389	.	78	15	94	90000	48	1.0	944
OAKLAND UNIV	PUB	1192	138	.	.	.	54	70000	53	1.4	309
OHIO STATE UNIV	PUB	2860	569	137	.	34	131	415000	115	1.7	212
UNIV OF OREGON	PUB	2095	195	46	42	7	51	220000	94	5.5	335
UNIV OF PENN (WHARTON)	PRIV	2913	1575	206	199	151	.	2100000	433	2.1	122
PENN STATE UNIV	PUB	4126	333	108	.	74	162	147570	32	0.7	530
PORTLAND STATE UNIV	PUB	958	238	.	.	83	61	78500	61	1.6	366
PURDUE UNIV	PUB	2050	275	110	110	10	97	560000	229	4.9	163
RADFORD UNIV	PUB	1740	70	.	.	.	59	.	.	.	.
RENSSELAER POLYTECHNIC INSTITUTE		350	200	50	.	6	48	.	.	.	1213
UNIV OF RHODE ISLAND	PUB	1350	320	.	40	.	63	45000	27	24.1	1670
ROCHESTER INSTITUTE OF TECHNOLOGY		688	255	.	.	3	.	150000	159	3.0	.
ROLLINS COLLEGE (CRUMMER)	PRIV	.	280	.	.	11	18	.	.	.	48
SAN DIEGO STATE UNIV	PUB	5500	1000	.	50	.	103	200000	31	2.5	2167
SAN JOSE STATE UNIV	PUB	3935	355	.	.	.	115	296443	69	4.1	613
SEATTLE UNIV	PRIV	647	396	.	.	.	55	.	.	.	1391
SETON HALL UNIV	PRIV	1056	436	.	.	3	80	62000	41	37.6	598
SHIPPENSBURG UNIV	PUB	1350	.	.	.	2	49	10000	7	11.5	.
UNIV OF SAN FRANCISCO	PRIV	900	450	.	.	7	55	40000	29	.	6783
UNIV OF SOUTH CAROLINA	PUB	2300	1009	100	.	.	147	.	.	.	95
SOUTHERN ILLINOIS UNIV AT EDWARDSV	PUBE	1225	655	.	.	13	73	100000	53	3.3	237
UNIV OF SOUTHERN MISSISSIPPI	PUB	1809	87	.	.	.	67	25000	13	11.4	1896
STANFORD UNIV	PRIV	.	683	88	47	116	95	1640000	1849	4.6	47
STATE UNIV OF NEW YORK AT BUFFALO	PUB	741	643	.	.	34	61	40000	28	0.5	473
SUFFOLK UNIV	PRIV	949	484	.	55	3	70	419000	292	3.0	410
TEMPLE UNIV	PUB	3805	758	186	.	.	211	247000	52	1.4	950
UNIV OF TENNESSEE	PUB	3500	450	100	25	83	116	500000	121	6.9	413
TENNESSEE TECH UNIV	PUB	1600	100	.	.	.	42	39000	23	1.3	2429
UNIV OF TEXAS, ARLINGTON	PUB	5218	979	108	.	43	135	200000	32	16.2	668
UNIV OF TEXAS,SAN ANTONIA	PUB	5500	550	.	120	.	18	.	.	.	.
TEXAS A & M UNIV	PUB	5000	500	110	.	.	140	.	.	.	.
TEXAS CHRISTIAN UNIV (NEELEY)	PRIV	860	224	.	.	6	46	41130	38	4.1	242
TEXAS TECH UNIV	PUB	3270	393	94	.	13	101	166639	44	18.0	838
TOWSON STATE UNIV	PUB	2000	.	.	.	.	.	20000	10	0.4	1333
TULANE UNIV (FREEMAN)	PRIV	312	219	14	106	8	54	380000	687	2.4	148
UNIV OF UTAH	PUB	850	250	50	52	14	60	.	.	.	90
UTAH STATE UNIV	PUB	2243	324	.	.	30	55	177000	68	5.9	519
VANDERBILT UNIV (OWEN)	PRIV	.	396	14	99	23	48	77000	178	19.3	104
UNIV OF VERMONT	PUB	810	70	.	.	.	26	0	.	.	1173
UNIV OF VIRGINIA (DARDEN)	PUB	.	471	5	.	71	60	350000	640	3.9	75
UNIV OF VIRGINIA (MCINTIRE)	PUB	666	79	.	.	21	65	350000	457	7.0	36
WAKE FOREST UNIV (MBA)	PRIV	.	320	.	.	.	26	250000	781	3.8	107
WASHINGTON UNIV, ST LOUIS (SIMON)	PRIV	504	641	29	111	.	54	472000	402	3.1	117
WAHINGTON & LEE UNIV	PRIV	85	.	.	.	.	11	75000	882	2.9	43
WAYNE STATE UNIV	PUB	1366	2024	.	.	42	115	700000	204	7.4	352
WEBER STATE UNIV	PRIV	.	.	.	.	.	.	.	.	.	.

WESTERN ILLINOIS UNIV	PUB	1444	155	.	.	.	73	38000	24	0.8	.
WESTERN MICHIGAN UNIV (HAWORTH)	PUB	6965	778	.	.	.	106	130700	17	1.4	1106
WESTERN WASHINGTON UNIV	PUB	729	62	.	.	.	48	120392	152	62.8	452
COLLEGE OF WILLIAM & MARY	PUB	.	.	.	.	.	.	16800	.	5.0	.
UNIV OF WISCONSIN, EAU CLAIRE	PUB	2300	.	.	.	.	62	.	.	.	.
UNIV OF WISCONSIN, LA CROSSE	PUB	1700	120	.	.	.	47	.	.	.	7280
UNIV OF WISCONSIN, OSHKOSH	PUB	1900	500	.	.	.	45	35000	15	3.2	3200
YALE	PRIV	.	425	20	.	8	52	.	.	.	57
UNIV OF ALBERTA	PUB	1731	225	44	.	29	88	206000	102	2.3	812
UNIV OF BRITISH COLUMBIA	PUB	1500	400	70	.	7	110	200000	101	1.2	282
UNIV OF CALGARY	PUB	1000	350	19	.	5	107	1100000	801	10.0	250
DALHOUSIE UNIV	PUB	1000	300	.	.	.	50	300000	231	15.0	186
LAVAL UNIV	PUB	3657	656	.	.	.	250	400000	93	3.1	392
MCMASTER UNIV	PUB	1485	316	14	.	3	58	160000	88	2.7	606
QUEEN'S UNIVERSITY	PUB	800	250	40	.	5	62	60000	55	1.5	183
UNIV OF TORONTO	PUB	850	457	39	87	19	72	245250	180	3.1	390
HANDELSHOJSKOLEN/AARHUS	PUB	1573	631	18	.	.	94	.	.	.	123
COPENHAGEN BUSINESS SCHOOL	PRIV	3500	1950	75	.	.	422	1000000	181	3.9	502
ECOLE SUPERIEURE DES SCIENCES ECON	PUBQUE	600SE	1000	40	80	1667	111	.	.	.	661
GROUPE ESC TOULOUSE	PRIV	300	750	.	.	51	105	600000	545	6.0	157
UNIVERSITAT ZU KOLN	PUB	.	2000	300	.	.	250	.	.	.	256
NORGES HANDELSHOYSKOLE	PRIV	1800	440	50	.	15	150	750000	325	3.8	256
IESE	PRIV	.	570	20	600	400	120	300000	303	100.0	124
STOCKHOLM SCHOOL OF ECONOMICS	PRIV	.	1500	100	.	7	210	900000	560	50.0	153
INTL INSTITUTE FOR MGMT DEVELOPMEN	PRIVMD	.	82	.	200	250	40	.	.	.	33
RIJKSUNIVERSITEIT GRONINGEN	PUB	600	20	.	.	.	90	1000000	1613	10.0	207
UNIV OF LEEDS	PUB	1200	65	30	.	.	63	75000	58	.	648
UNIV OF WARWICK	PUB	567	769	88	.	21	85	323000	224	2.4	193
UNIV OF STELLENBOSCH	PUB	.	165	.	.	339	22	40000	79	.	252
UNIV OF NEW SOUTH WALES	PUB	.	250	30	.	17	40	403000	1358	4.5	37
UNIV OF QUEENSLAND	PUB	244	337	22	.	1	16	21000	35	1.6	863
UNIV OF AUCKLAND	PUB	2138	455	.	.	.	150	500000	193	6.3	288
TSINGHUA UNIV	PUB	190	.	.	.	50	.	.	.	.	60
CHINESE UNIV OF HONG KONG	PUB	1599	192	9	.	95	83	77000	41	.	632
NARSEE MONJEE INSTITUTE OF MGMT ST	PRIVS	.S)	737	.	445	2	100	35000	47	11.7	123
TOKYO KEIZAI UNIV	PRIV	3600	10	2	.	.	45	.	.	.	.
KOREA UNIV	PRIV	.	.	.	.	87	31	40000	462	3.6	9
NANYANG TECHNOLOGICAL UNIV	PUB	4000	420	.	.	.	200	180000	41	.	737
NATIONAL CENTRAL UNIV	PUB	1097	136	.	.	.	132	.	.	.	154
ASSUMPTION UNIVERSITY	PUB	12000	600	17	.	50	571	.	.	.	.
FGV-FUNDACAO GETULIO VARGAS (EAESP	PRIV	5700	300	100	400	125	250	500000	80	5.0	178
UNIV OF SAO PAULO	PUB	514	236	78	.	.	58	300000	362	.	59
UNIVERSIDAD CATOLICA DE CHILE	PUB	1000	.	.	.	.	55	.	.	.	500
UNIVERSIDAD DEL VALLE	PUB	2111	10	.	.	63	45	875000	401	17500	364
INSTITUTO TECHOLOGICO DE MONTERREY	PRIV	5179	42	.	.	.	475	73100	14	1.2	.

TENTH ANNUAL UCLA SURVEY: 1993
HARDWARE RESOURCES

INSTITUTION	MAINFRAME MODEL(S), YR(S)	#	MICROCOMPUTERS (N>3)	TOTAL MICROS	STUDS/ MICRO	FAC/ MICRO
	* B-SCHOOL ACCESS ONLY					
U OF AKRON	DEC VAX STATION (1982)	20	IBM PC/XT,PS2/25	256	15	2.2
	IBM 370 (1985)	55	IBM PC/AT,PS2/30,50,55,60			
	IBM 3090 (1987)	179	GATEWAY 386			
U OF ALABAMA	IBM 3091	5	APPLE MAC, PLUS, SE, CLASSIC	365	29	0.7
		56	IBM PC/XT,PS2/25			
		12	IBM PC/AT,PS2/30,50,55,60			
		18	IBM PS2/70,80			
		12	ZENITH Z150			
		10	ZENITH Z286			
		10	ZENITH Z386			
		6	8086 CLONES			
		27	80286 CLONES			
		187	80386 CLONES			
		20	80486 CLONES			
U OF ALASKA, FAIRBANKS	* VAX (80,92)	25	APPLE MAC, PLUS, SE, CLASSIC	87	14	1.1
	CRAY	19	APPLE MAC II, II LC			
		4	APPLE MAC IIFX			
		19	HP VECTRA 386			
		9	80386 CLONES			
AMERICAN U	IBM 3090	83	80286 CLONES	100	0	.
	AS/400	17	80486 CLONES			
ARIZONA STATE U	IBM 3090	20	APPLE MAC, PLUS, SE, CLASSIC	252	490	0.9
	IBM 3084	10	HP VECTRA 386			
	VAX	130	80286 CLONES			
		55	80386 CLONES			
		35	80486 CLONES			
U OF ARKANSAS	IBM 4381 R-14	37	APPLE MAC II, II LC	242	16	1.8
		4	APPLE MAC IICI, CX, SI			
		20	IBM PC/XT,PS2/25			
		40	IBM PC/AT,PS2/30,50,55,60			
		23	80286 CLONES			
		65	80386 CLONES			
		50	80486 CLONES			
ARKANSAS STATE U	* DEC 5500	24	APPLE MAC, PLUS, SE, CLASSIC	449	32	0.8
		20	APPLE MAC II, II LC			
		10	HP VECTRA 286			
		10	HP VECTRA 386			
		200	IBM PC/XT,PS2/25			
		50	IBM PC/AT,PS2/30,50,55,60			
		7	IBM PS2/70,80			
		13	IBM RT			

		20	ZENITH Z286			
		60	ZENITH Z386			
		5	80286 CLONES			
		30	80386 CLONES			
AUBURN U	IBM ES/9121 610	22	AT & T 6300	257	31	0.8
	DEC VAX 6320	65	IBM PC/XT,PS2/25			
	CRAY X-MP 21	93	IBM PC/AT,PS2/30,50,55,60			
		6	IBM PS2/70,80			
		4	IBM PS2/90,95			
		10	ZENITH Z150			
		7	80286 CLONES			
		41	80386 CLONES			
		4	80486 CLONES			
BABSON COLLEGE	DEC VAX 6410 (80)	83	APPLE MAC, PLUS, SE, CLASSIC	738	18	0.7
	DEC VAX 8530 (84)	24	APPLE MAC IICI, CX, SI			
		5	HP VECTRA 386			
		76	IBM PC/XT,PS2/25			
		17	IBM PC/AT,PS2/30,50,55,60			
		30	8086 CLONES			
		156	80286 CLONES			
		334	80386 CLONES			
		5	NO NAME GIVEN			
BOISE STATE UNIV	IBM ES9000	59	AT & T 386	150	21	7.9
		5	HP VECTRA 386			
		7	IBM PC/XT,PS2/25			
		25	IBM PC/AT,PS2/30,50,55,60			
		5	ZENITH Z286			
		20	BEC 386			
		16	BEC 386			
		8	BEC 386			
BOSTON UNIV	* ENCORE MULTIMAX 120	124	APPLE MAC, PLUS, SE, CLASSIC	387	24	0.8
	IBM 3090	28	APPLE MAC II, II LC			
	IBM 3090	23	APPLE MAC IICI, CX, SI			
		8	IBM PC/XT,PS2/25			
		187	IBM PC/AT,PS2/30,50,55,60			
		8	80486 CLONES			
BOWLING GREEN STATE UNIV	IBM 9121	11	IBM PC/XT,PS2/25	178	44	1.4
	IBM 4341	93	IBM PC/AT,PS2/30,50,55,60			
	IBM 3192	6	IBM PS2/70,80			
	VAX 6610	16	8086 CLONES			
	VAX 8650	5	80286 CLONES			
	VAX 8500	21	80386 CLONES			
	IBM 4381	15	80486 CLONES			
BRIGHAM YOUNG UNIV	DEC VAX 1	30	APPLE MAC, PLUS, SE, CLASSIC	307	15	0.9
	* IBM 3090	34	APPLE MAC IICI, CX, SI			
		15	IBM PC/AT,PS2/30,50,55,60			
		40	8086 CLONES			
		118	80386 CLONES			
		70	80486 CLONES			

UNIV OF CALIF, IRVINE	CONVEX C240 DEC VAX 6310 DEC VAX 8350 BALANCE SEQUENT 21000 IBM 9121/320	26 54 42 48 58	APPLE MAC II, II LC HP VECTRA 286 HP VECTRA 386 80386 CLONES 80486 CLONES	236	4	0.7
UNIV CALIF, LOS ANGELES	IBM 9000 (92) * HP 9000/850 (88)	9 64 4 96 56 9 146 9 4	APPLE MAC, PLUS, SE, CLASSIC APPLE MAC IICI, CX, SI APPLE MAC IIFX HP VECTRA 286 HP VECTRA 386 IBM PC/XT,PS2/25 IBM PC/AT,PS2/30,50,55,60 IBM PS2/70,80 80486 CLONES	403	8	0.7
CAL POLY STATE UNIV	* HP 9000/817 * HP 3000/930 * HP 3000/MICORVAX	4 19 18 347 12	APPLE MAC, PLUS, SE, CLASSIC APPLE MAC IICI, CX, SI HP VECTRA 286 HP VECTRA 386 IBM RT	405	7	0.8
CAL STATE U, CHICO	IBM 4381 IBM3090 CDC830 VAX 6310	9 37 60 28 6 56 16 25 21	APPLE MAC, PLUS, SE, CLASSIC AT & T 6300 HP VECTRA 286 HP VECTRA 386 IBM RISC 6000 8086 CLONES 80386 CLONES 80486 CLONES VECTRA 486	264	14	1.1
CAL STATE UNIV, SACRAMENTO	IBM 4381 VAX 8820	15 84 102	HP VECTRA 386 80286 CLONES 80386 CLONES	203	24	1.2
CAL STATE UNIV, FULLERTON	DEC VAX 8550 IBM 3090	53 6 6 17 32 14 49 20 25 104	APPLE MAC, PLUS, SE, CLASSIC APPLE MAC II, II LC APPLE MAC IICI, CX, SI IBM PC/XT,PS2/25 IBM PC/AT,PS2/30,50,55,60 IBM PS2/70,80 8086 CLONES 80286 CLONES 80386 CLONES 80486 CLONES	331	32	1
CAL STATE UNIV, LONG BEACH	VAX 6320 DEC 5810 IBM 3090 (89)	4 60 148 56 18 10 4	APPLE MAC, PLUS, SE, CLASSIC APPLE MAC IICI, CX, SI IBM PC/AT,PS2/30,50,55,60 IBM PS2/70,80 ZENITH Z386 80386 CLONES 80486 CLONES	303	18	1.1

CAL STATE UNIV, NORTHRIDGE	IBM 4381 (91) VAX 8550 (87) AT&T 3B15 (88) CYBER 960	9 38 106 66 4 23	APPLE MAC, PLUS, SE, CLASSIC IBM PC/XT,PS2/25 80286 CLONES 80386 CLONES 80486 CLONES BIG XT CLONE	248	42	1.2
CAL STATE UNIV, FRESNO	IBM4381 (89) IBM 9370 (90)	246 35 35 17	IBM PC/AT,PS2/30,50,55,60 8086 CLONES 80386 CLONES BURROUGH 8088	342	10	0.9
CANISIUS COLLEGE	DEC VAX 4000 (90) DEC VAX 4000 (91) DEC 5000 (90)	9 64 4 6 6 27 9	APPLE MAC IICI, CX, SI HP VECTRA 386 IBM PC/XT,PS2/25 IBM PS2/70,80 ZENITH Z286 80386 CLONES 80486 CLONES	136	22	1.2
CARNEGIE MELLON UNIV	VAX 6420 * 4 SUN ELC * 1 DEC 5100 * 2 VAX STATION 3100 * 4 HP 720 * 4 SPARC STATIONS	18 38 43 4 19 4 26 52 98 5 8 7 25	APPLE MAC, PLUS, SE, CLASSIC APPLE MAC II, II LC APPLE MAC IICI, CX, SI APPLE MAC IIFX AT & T 286 HP APOLLO IBM PC/XT,PS2/25 IBM PC/AT,PS2/30,50,55,60 IBM PS2/70,80 IBM RT IBM RT 80386 CLONES 80486 CLONES	354	12	1.1
CASE WESTERN (WEATHERHEAD)	IBM 4371 (87)	14 7 17 9 16 4 113 89 14	APPLE MAC, PLUS, SE, CLASSIC APPLE MAC II, II LC APPLE MAC IICI, CX, SI DEC VAXSTATION IBM RT 8086 CLONES 80286 CLONES 80386 CLONES 80486 CLONES	290	11	1
UNIV OF CENTRAL FLORIDA	IBM 4381	20 40 120 4 32 71	APPLE MAC II, II LC IBM PC/XT,PS2/25 IBM PC/AT,PS2/30,50,55,60 IBM PS2/70,80 IBM PS2/90,95 80386 CLONES	287	0	0
CENTRAL MICHIGAN UNIV	IBM 3090 * IBM 36 (MINI)	8 128 33 4 4 4 4	AT & T 6300 IBM PC/XT,PS2/25 IBM PC/AT,PS2/30,50,55,60 IBM PS2/70,80 IBM PS2/90,95 ZENITH Z386 80386 CLONES	233	18	1.6

		48	EPSON			
COLLEGE OF CHARLESTON	DEC VAX (89)	8	IBM PC/XT,PS2/25	82	22	0.7
		9	ZENITH Z386			
		15	8086 CLONES			
		44	80486 CLONES			
UNIV OF CINCINNATI	AMDAHL 5580, 470 (80, 84)	10	APPLE MAC, PLUS, SE, CLASSIC	158	25	2.2
	VAX 785 (85)	25	APPLE MAC IICI, CX, SI			
	VAX 750 (87)	50	IBM PC/XT,PS2/25			
	* AT&T 3B2 (87)	8	ZENITH Z386			
	* MICROVAX II (87)	45	80386 CLONES			
		15	80486 CLONES			
CLEMSON UNIV	* IBM AS/400 (90)	13	APPLE MAC, PLUS, SE, CLASSIC	210	557	1.1
	HITACHI 3090 (90)	46	APPLE MAC II, II LC			
	VAX (4)	11	APPLE MAC IICI, CX, SI			
		61	IBM PC/AT,PS2/30,50,55,60			
		20	IBM PS2/70,80			
		37	80286 CLONES			
		16	80386 CLONES			
CLEVELAND STATE UNIV (NANCE)	IBM 3081 (86)	26	DEC VAXSTATION	379	11	1.2
	VAX 750, 2 (84,86)	23	IBM PC/XT,PS2/25			
	VAX 730, 2 (83,85)	33	IBM PC/AT,PS2/30,50,55,60			
	IBM 3090	57	IBM PS2/70,80			
		170	8086 CLONES			
		67	80386 CLONES			
UNIV OF COLORADO, BOULDER	CDC 720	7	APPLE MAC IICI, CX, SI	177	37	1.2
	DEC VAX 11/750, 2	10	IBM PC/XT,PS2/25			
	DEC VAX 11/780	114	IBM PC/AT,PS2/30,50,55,60			
	DEC VAX 11/785	29	IBM PS2/70,80			
		4	ZEOS			
COLORADO STATE UNIV	RS6000 - IBM	15	APPLE MAC IICI, CX, SI	314	9	0.6
	* HP 9000 380	41	HP VECTRA 286			
	* HP 9000 360	90	HP VECTRA 386			
	IBM 3084	31	IBM PC/AT,PS2/30,50,55,60			
	* HP 9000 720	11	8086 CLONES			
	* HP 9000 720	7	80286 CLONES			
	* HP 9000/800G	77	80386 CLONES			
		9	80486 CLONES			
		25	VECTRA 486			
COLUMBIA	* IBM RS/6000 980 (93)	9	APPLE MAC, PLUS, SE, CLASSIC	296	28	1.1
	* IBM RS/6000 950 (93)	4	APPLE MAC IIFX			
	IBM ES/9000	9	IBM RISC 6000			
		53	80286 CLONES			
		156	80386 CLONES			
		61	80486 CLONES			
UNIV OF CONNETICUT	IBM-ES 9000	22	APPLE MAC, PLUS, SE, CLASSIC	191	30	1.1
		4	APPLE MAC IICI, CX, SI			

		155	IBM PC/AT,PS2/30,50,55,60			
		6	IBM PS2/70,80			
CORNELL UNIV (JOHNSON)	* VAX 6410	12	APPLE MAC, PLUS, SE, CLASSIC	199	7	0.9
	* MICROVAX II	50	APPLE MAC II, II LC			
	IBM 4381	25	APPLE MAC IICI, CX, SI			
	IBM 3090	6	HP VECTRA 286			
	* HP 900 835	6	HP VECTRA 386			
	* HP 9000 425	24	IBM PC/AT,PS2/30,50,55,60			
	* VAX 3100	31	IBM PS2/70,80			
		10	80286 CLONES			
		4	80386 CLONES			
		23	DIGITAL 386			
CREIGHTON UNIV	UNISYS 2200	30	AT & T 6300	110	236	4.7
		40	AT & T 386			
		5	IBM PC/XT,PS2/25			
		15	8086 CLONES			
		20	80486 CLONES			
DARTMOUTH (TUCK)	DIGITAL VAX CLUSTER	48	APPLE MAC, PLUS, SE, CLASSIC	208	5	0.7
	HONEYWELL DPS	6	APPLE MAC II, II LC			
	IBM 4281	69	APPLE MAC IICI, CX, SI			
		4	APPLE MAC IIFX			
		4	IBM PC/XT,PS2/25			
		6	IBM PC/AT,PS2/30,50,55,60			
		60	IBM PS2/70,80			
		6	IBM RISC 6000			
U OF DAYTON	VAX 4000 MODEL 300(90)	8	APPLE MAC IICI, CX, SI	186	29	0.6
		6	IBM PS2/70,80			
		5	IBM RT			
		4	ZENITH Z286			
		30	ZENITH Z386			
		6	80286 CLONES			
		75	80386 CLONES			
		47	80486 CLONES			
		4				
UNIV OF DELAWARE	SUN 2000 (93)	30	APPLE MAC IICI, CX, SI	299	33	0.9
	UBM 3090/300E	120	IBM PC/AT,PS2/30,50,55,60			
		55	ZENITH Z386			
		60	80386 CLONES			
		20	80486 CLONES			
		10	486 ??			
DEPAUL UNIV	VAX 6410 (VMS)	43	APPLE MAC, PLUS, SE, CLASSIC	665	10	
	IN, ES/9000-170 (MVS)	16	APPLE MAC II, II LC			
		33	APPLE MAC IICI, CX, SI			
		5	APPLE MAC IIFX			
		60	AT & T 6300			
		10	AT & T 286			
		102	AT & T 386			
		5	IBM PC/AT,PS2/30,50,55,60			
		20	ZENITH Z150			
		5	ZENITH Z286			
		23	80286 CLONES			
		305	80386 CLONES			

		37	80486 CLONES			
UNIV OF DETROIT MERCY	UNISYS (87)	33	APPLE MAC, PLUS, SE, CLASSIC	199	8	1.9
		21	APPLE MAC II, II LC			
		6	HP VECTRA 286			
		44	IBM PC/XT,PS2/25			
		10	IBM PC/AT,PS2/30,50,55,60			
		38	IBM PS2/90,95			
		6	IBM RISC 6000			
		5	8086 CLONES			
		35	80386 CLONES			
DREXEL UNIV	IBM 91/21	148	APPLE MAC II, II LC	178	96	0.9
	PRIME 6450	15	APPLE MAC IICI, CX, SI			
		6	APPLE MAC IIFX			
		7	80386 CLONES			
DUKE UNIV (FUQUA)	* IBM 4381 (89) MODEL R23	7	APPLE MAC IICI, CX, SI	395	7	0.8
		47	AT & T 286			
		27	IBM PC/XT,PS2/25			
		13	IBM PC/AT,PS2/30,50,55,60			
		21	IBM PS2/70,80			
		70	UNISYS			
		54	80386 CLONES			
		48	80486 CLONES			
		99	NCR			
EAST CAROLINA STATE UNIV	SPERRY 1100, 2	9	APPLE MAC, PLUS, SE, CLASSIC	163	12	1.3
	IBM ES9000, 2	18	APPLE MAC II, II LC			
	AT&T 32B	23	APPLE MAC IICI, CX, SI			
	DEC VAX, 2	5	IBM PC/XT,PS2/25			
	AS/400	48	IBM PC/AT,PS2/30,50,55,60			
		50	IBM PS2/70,80			
EMORY	* VAX 4300	30	APPLE MAC, PLUS, SE, CLASSIC	170	15	1.1
	IBM 3090	27	APPLE MAC IICI, CX, SI			
	VAX 8550	5	DEC VAXSTATION			
		11	80286 CLONES			
		89	80386 CLONES			
		4	80486 CLONES			
UNIV OF FLORIDA	IBM ES9000/MODEL 740 (93)	17	APPLE MAC, PLUS, SE, CLASSIC	327	63	0.6
	* IBM SYS 36 (88)	54	IBM PC/XT,PS2/25			
		96	IBM PC/AT,PS2/30,50,55,60			
		23	IBM PS2/70,80			
		4	ZENITH Z386			
		67	80386 CLONES			
		54	80486 CLONES			
FLORIDA INTERNATIONAL UNIV	DEC VAX 8800 (86)	37	IBM PC/XT,PS2/25	167	34	1.9
		65	IBM PC/AT,PS2/30,50,55,60			
		23	IBM PS2/70,80			
		7	ZENITH Z150			
		11	ZENITH Z286			
		7	ZENITH Z386			
		10	80286 CLONES			

		5	80386 CLONES			
FLORIDA STATE UNIV	IBM 4381 (89) CDC CYBER 850 (80) DEC VAX 6210 (89) IBM 3090 (90) CRAY Y/MP (88) * IBM AS400 (92) IBM RS/6000 580	51 97 5 74 9 7 54	IBM PC/XT,PS2/25 IBM PC/AT,PS2/30,50,55,60 IBM PS2/70,80 ZENITH Z150 80286 CLONES 80386 CLONES 80486 CLONES	310	21	1.1
FORDHAM UNIV	DEC VAX 6410 (92) DEC VAX 6410 (92)	10 5 10 58 30 7 20	APPLE MAC, PLUS, SE, CLASSIC APPLE MAC IICI, CX, SI AT & T 6300 IBM PC/AT,PS2/30,50,55,60 IBM PS2/70,80 80386 CLONES 80486 CLONES	149	115	1
GEORGE MASON UNIV	IBM 4381 VAX 6000-420 VAX 8530	30 40 52 12	8086 CLONES 80286 CLONES 80386 CLONES 80486 CLONES	134	0	1.1
GEORGETOWN UNIV	IBM ES/9000 (91) IBM 3090 (89) VAX 8700 (88) VAX 4200 (91) VAX 4300 (91)	6 16 30 15 111 9 36	APPLE MAC II, II LC APPLE MAC IICI, CX, SI IBM PC/XT,PS2/25 80286 CLONES 80386 CLONES 80486 CLONES COLUMBIA 386	225	12	.
UNIV OF GEORGIA, ATHENS	* IBM 4381 * SUN 4/280 IBM ES9000/720 CDC CYBER 180/960	30 22 5 84 206 5 13 9 18 13 4	APPLE MAC, PLUS, SE, CLASSIC APPLE MAC II, II LC APPLE MAC IICI, CX, SI IBM PC/XT,PS2/25 IBM PC/AT,PS2/30,50,55,60 IBM PS2/70,80 IBM RT 80386 CLONES 80486 CLONES COMPUADD METAPHOR	415	17	1.1
GEORGIA SOUTHERN UNIV	MICROVAX (2)	55 30 15 50 20	IBM PC/XT,PS2/25 8086 CLONES 80286 CLONES 80386 CLONES 80486 CLONES	170	128	0.6
GEORGIA STATE UNIV	AMDAHL 5995 SILICON GRAPHICS (2) UNISYS 1100-92	31 15 195 183 47 60	APPLE MAC, PLUS, SE, CLASSIC APPLE MAC IICI, CX, SI IBM PC/XT,PS2/25 IBM PC/AT,PS2/30,50,55,60 IBM PS2/70,80 80486 CLONES	534	91	1

GONZAGA UNIV	VAX 6410	20	HP VECTRA 286	88	11	1.8
		14	IBM PC/XT,PS2/25			
		34	80386 CLONES			
		16	80486 CLONES			
UNIV OF ILLINOIS AT URBANA	UBM	4	APPLE MAC, PLUS, SE, CLASSIC	486	32	0.9
	CONVEX	4	HP VECTRA 386			
	CRAY	359	IBM PC/AT,PS2/30,50,55,60			
		85	IBM PS2/70,80			
		10	80386 CLONES			
		18	80486 CLONES			
INDIANA UNIV	IBM 3090-120	7	APPLE MAC, PLUS, SE, CLASSIC	656	12	0.8
	VAX 11/780	4	APPLE MAC II, II LC			
	VAX 11/800	4	APPLE MAC IICI, CX, SI			
	VAX 11/900	35	IBM PC/XT,PS2/25			
	VAX 9000	130	IBM PC/AT,PS2/30,50,55,60			
		205	IBM PS2/70,80			
		91	IBM PS2/90,95			
		10	80386 CLONES			
		50	NCR PC6'S			
		115	NCR 386SX/486			
INDIANA-PURDUE UNIV AT FORT WAYNE	VAX 11/780	19	ZENITH Z150	68	316	0.9
	IBM 4381	5	ZENITH Z286			
		32	80386 CLONES			
		6	80486 CLONES			
INDIANA UNIV SOUTHEAST		24	80486 CLONES	34	0	.
		10	NAME NOT GIVEN			
UNIV OF KANSAS	DEC VAX 9000	21	APPLE MAC, PLUS, SE, CLASSIC	141	20	0.9
	IBM 3081 KS	7	AT & T 6300			
		5	IBM PC/XT,PS2/25			
		12	IBM PC/AT,PS2/30,50,55,60			
		32	ZENITH Z150			
		16	ZENITH Z386			
		36	80386 CLONES			
KANSAS STATE UNIV	IBM 3084	13	IBM PC/XT,PS2/25	137	37	1.4
		54	ZENITH Z150			
		5	ZENITH Z386			
		55	80386 CLONES			
		5	80486 CLONES			
LOUISIANA STATE UNIV	IBM 3070 2090-6003	39	IBM PC/XT,PS2/25	308	17	0.9
	IBM 370 3084QX6	175	IBM PC/AT,PS2/30,50,55,60			
		10	IBM PS2/70,80			
		43	ZENITH Z150			
		25	ZENITH Z286			
		12	ZENITH Z386			
UNIV OF LOUISVILLE	IBM 3090 (90)	12	APPLE MAC IICI, CX, SI	372	12	0.9
	VAX CLUSTER (92)	18	AT & T 286			
		58	AT & T 386			
		87	IBM PC/AT,PS2/30,50,55,60			

		5	IBM PS2/70,80			
		47	80386 CLONES			
		6	80486 CLONES			
		130	ITT			
LOYOLA MARYMOUNT UNIV	IBM 9000 SERIES MICROVAX 3400	5	APPLE MAC, PLUS, SE, CLASSIC	128	14	1
		26	DEC VAXSTATION			
		26	80286 CLONES			
		70	80386 CLONES			
LOYOLA UNIV, CHICAGO	IBM 3091 DEC	10	IBM PC/XT,PS2/25	125	56	0.9
		10	IBM PC/AT,PS2/30,50,55,60			
		10	ZENITH Z286			
		73	ZENITH Z386			
		20	80486 CLONES			
LOYOLA UNIV, NEW ORLEANS	VAX 11/750 IBM 4361 IBM 9375	12	APPLE MAC, PLUS, SE, CLASSIC	33	0	1.4
		21	8086 CLONES			
UNIV OF MAINE	IBM 3090 1 * AT&T 3B2	17	APPLE MAC, PLUS, SE, CLASSIC	76	16	1.2
		4	APPLE MAC IICI, CX, SI			
		21	AT & T 386			
		23	IBM PC/XT,PS2/25			
		4	IBM PS2/70,80			
UNIV OF MASSACHUSETTS AT AMHERST	VAX	4	APPLE MAC, PLUS, SE, CLASSIC	90	925	0.8
		25	IBM PC/AT,PS2/30,50,55,60			
		12	IBM PS2/70,80			
		15	8086 CLONES			
		4	80286 CLONES			
		10	80386 CLONES			
		20	80486 CLONES			
MASS INST OF TECH (SLOAN)	* IBM 4381 (89)	59	APPLE MAC, PLUS, SE, CLASSIC	527	19	0.4
		52	APPLE MAC II, II LC			
		95	APPLE MAC IICI, CX, SI			
		41	APPLE MAC IIFX			
		45	AT & T 286			
		42	AT & T 386			
		6	DEC VAXSTATION			
		8	HP APOLLO			
		67	IBM PC/AT,PS2/30,50,55,60			
		53	IBM PS2/70,80			
		5	IBM RISC 6000			
		10	IBM RT			
		10	80386 CLONES			
		15	80486 CLONES			
		5	DELL 386/486			
		12	VALUE POINT 386/486			
MIAMI UNIV	IBM 3975 (91 IBM 4381 (87) VAX 6210 (90) IBM ESA 9000 (92)	28	APPLE MAC, PLUS, SE, CLASSIC	254	56	1.1
		4	APPLE MAC II, II LC			
		8	APPLE MAC IICI, CX, SI			
		40	IBM PC/XT,PS2/25			
		29	IBM PC/AT,PS2/30,50,55,60			
		100	IBM PS2/70,80			
		4	IBM PS2/90,95			

		10	8086 CLONES			
		28	80286 CLONES			
UNIV OF MICHIGAN	IBM 3090-600E (MTS) DEC VAX (OCC USE) IBM ES9000 9021/720	134	APPLE MAC, PLUS, SE, CLASSIC	751	12	0.6
		7	APPLE MAC II, II LC			
		45	APPLE MAC IICI, CX, SI			
		8	APPLE MAC IIFX			
		4	IBM PC/AT,PS2/30,50,55,60			
		60	IBM PS2/70,80			
		11	IBM RT			
		5	ZENITH Z286			
		90	80286 CLONES			
		81	80386 CLONES			
		304	80486 CLONES			
UNIV OF MINNESOTA (CARLSON)	CRAY ENCORE VAX 8600 IBM 9121	30	APPLE MAC, PLUS, SE, CLASSIC	401	44	0.6
		8	APPLE MAC II, II LC			
		12	APPLE MAC IICI, CX, SI			
		15	IBM PC/XT,PS2/25			
		30	IBM PC/AT,PS2/30,50,55,60			
		11	IBM PS2/70,80			
		50	ZENITH Z286			
		20	8086 CLONES			
		65	80286 CLONES			
		142	80386 CLONES			
		14	80486 CLONES			
UNIV OF MISSOURI	IBM 3090 MVB IBM 4381	4	APPLE MAC, PLUS, SE, CLASSIC	87	0	0.9
		24	IBM PC/XT,PS2/25			
		27	IBM PC/AT,PS2/30,50,55,60			
		27	IBM PS2/70,80			
		5	80486 CLONES			
UNIV OF MISSOURI, KANSAS CITY	VAX 6000/460 (90) IBM 5520	7	IBM PC/XT,PS2/25	154	14	0.9
		4	IBM PC/AT,PS2/30,50,55,60			
		40	8086 CLONES			
		22	80386 CLONES			
		5	80486 CLONES			
		17	IBM 5150			
		56	AT&T 6386 WGS			
UNIV OF MISSOURI, ST LOUIS	HITACHI 1 IBM 30XX (87) DEC VAX (86)	47	IBM PC/XT,PS2/25	93	221	0.9
		9	IBM PC/AT,PS2/30,50,55,60			
		24	IBM PS2/70,80			
		5	80386 CLONES			
UNIV OF MONTANA	VAX-VMS VAX-UNIX	29	80386 CLONES	40	0	1.1
		11	80486 CLONES			
UNIV OF NEBRASKA, OMAHA	DEC STATION 5000 MICROVAX 3100 MICROVAX 3100 DEC STATION 5000	8	APPLE MAC, PLUS, SE, CLASSIC	198	68	0.8
		29	ZENITH Z150			
		15	ZENITH Z286			
		26	80286 CLONES			
		61	80386 CLONES			
		50	80486 CLONES			

UNIV OF NEVADA, RENO	SUN 3/280 (88) SUN 4/280 (91) VAX VMS (92)	4 4 10 5 45 7 24 6 60 10	APPLE MAC, PLUS, SE, CLASSIC IBM PC/AT,PS2/30,50,55,60 IBM PS2/70,80 IBM PS2/90,95 ZENITH Z150 ZENITH Z386 8086 CLONES 80286 CLONES 80386 CLONES 80486 CLONES	180	24	0.9
UNIV OF NEVADA, LAS VEGAS	DEC VAX 6000 (91) SUN MINI 4 (89) AS400 (89) IBM 3090 (91) CRAY YMP-2 (90) AS400 (91)	4 10 20 8 20 27 21 10 8 77	APPLE MAC IICI, CX, SI APPLE MAC IIFX IBM PC/XT,PS2/25 IBM PC/AT,PS2/30,50,55,60 ZENITH Z150 ZENITH Z286 ZENITH Z386 80286 CLONES 80386 CLONES 80486 CLONES	208	48	1.1
UNIV OF NEW MEXICO	IBM ES 9121/MOD 320 DEC VAX 6320	4 4 4 25 6 9 9 6 46	APPLE MAC II, II LC APPLE MAC IICI, CX, SI IBM PC/XT,PS2/25 IBM PC/AT,PS2/30,50,55,60 IBM PS2/70,80 80386 CLONES 80486 CLONES INTEL 386 PS/VALUE POINT 486	118	29	1.3
UNIV OF NEW ORLEANS	VAX 7620 (93) IBM 4381 (86)	80 61 44 6 5	IBM PC/AT,PS2/30,50,55,60 IBM PS2/70,80 ZENITH Z150 ZENITH Z386 80286 CLONES	199	32	1.2
NEW YORK UNIV (STERN)	* SUN 490, 2 * SUN 4-380 * VAX 5900 * AUSPEX FILE SERVER * 14 DEC 5000/250 * DEC 8550	38 4 115 85 115 14 33 30 266 15	APPLE MAC IICI, CX, SI APPLE MAC IIFX HP VECTRA 386 IBM PC/XT,PS2/25 IBM PC/AT,PS2/30,50,55,60 IBM PS2/70,80 IBM RT ZENITH Z150 80386 CLONES 80486 CLONES	715	21	0.7
NICHOLLS STATE UNIV	* VAX 3900 (90)	63 5 45 37	ZENITH Z150 ZENITH Z286 ZENITH Z386 80486 CLONES	152	8	1
UNIV OF NORTH CAROLINA, CHARLOTTE	IBM 4381 VAX 8530	4 7 15 16	APPLE MAC, PLUS, SE, CLASSIC APPLE MAC IICI, CX, SI IBM PC/XT,PS2/25 IBM PC/AT,PS2/30,50,55,60	156	46	1

		31	ZENITH Z150			
		25	ZENITH Z386			
		48	80386 CLONES			
		10	80486 CLONES			
UNIV OF NORTH CAROLINA, GREENSBORO	VAX				0	0
UNIV OF NORTHERN COLORADO	* HP 9000	25	HP VECTRA 286	178	10	0.6
	HP 9000	45	HP VECTRA 386			
		20	ZENITH Z150			
		75	OUR OWN			
		10	HP 486			
UNIV OF NORTH FLORIDA	IBM 4381	15	IBM PC/XT,PS2/25	75	0	0.9
	IBM 4381	40	ZENITH Z286			
	SEQUENT	10	ZENITH Z386			
	ATT 3B2	5	80286 CLONES			
	ATT 3B15	5	80386 CLONES			
NORTHEAST LOUISIANA UNIV	IBM 4381	31	IBM RT	173	14	1.4
	VAX 6400	47	8086 CLONES			
		93	80286 CLONES			
NORTHERN ARIZONA UNIV	IBM ES9000	16	IBM PC/AT,PS2/30,50,55,60	182	19	1.1
	VAX	60	80286 CLONES			
	IBM 9375	32	80386 CLONES			
		62	80486 CLONES			
		6				
UNIV OF NOTRE DAME	IBM 3000	60	APPLE MAC, PLUS, SE, CLASSIC	193	25	1
	IBM 4381	70	IBM PC/AT,PS2/30,50,55,60			
	CONVEX C1	52	IBM PS2/70,80			
		5	80386 CLONES			
OAKLAND UNIV	DEC VAX 6320 (90)	4	APPLE MAC, PLUS, SE, CLASSIC	145	20	0.8
	DEC SYSTEM 5500	22	AT & T 6300			
	* DEC VAX STATION 4000/60	27	UNISYS			
		31	80386 CLONES			
		27	80486 CLONES			
		32	DEC VAXMATES			
OHIO STATE UNIV	* PRIME 9955	12	APPLE MAC, PLUS, SE, CLASSIC	403	31	0.6
	* BANYON SERVER	13	APPLE MAC II, II LC			
	IBM 3091	35	APPLE MAC IICI, CX, SI			
	VAX CLUSTER	8	APPLE MAC IIFX			
	AMDAHLS	50	IBM PC/XT,PS2/25			
		11	IBM PC/AT,PS2/30,50,55,60			
		5	IBM PS2/70,80			
		9	IBM RT			
		4	UNISYS			
		7	ZENITH Z286			
		5	ZENITH Z386			
		15	8086 CLONES			

		6	80286 CLONES			
		48	80386 CLONES			
		34	80486 CLONES			
		37	NCR PC6			
		74	NCR PC8			
		25	NCR PC8			
UNIV OF OREGON		64	APPLE MAC, PLUS, SE, CLASSIC	179	29	0.7
		18	APPLE MAC IICI, CX, SI			
		47	HP VECTRA 286			
		13	HP VECTRA 386			
		11	IBM PC/XT,PS2/25			
		8	80386 CLONES			
		9	80486 CLONES			
UNIV OF PENN (WHARTON)	* DEC VAX 6420	18	APPLE MAC, PLUS, SE, CLASSIC	921	16	.
	* DEC VAX 6410	70	APPLE MAC II, II LC			
	* DEC VAX 8700	33	APPLE MAC IICI, CX, SI			
	* DEC VAX MICROVAX 14 (2)	12	APPLE MAC IIFX			
	* DEC MICROVAX 4	68	AT & T 286			
	IBM 3090	31	AT & T 386			
		4	DEC VAXSTATION			
		81	HP VECTRA 286			
		151	HP VECTRA 386			
		10	HP APOLLO			
		36	IBM PC/XT,PS2/25			
		65	IBM PC/AT,PS2/30,50,55,60			
		81	IBM PS2/70,80			
		13	IBM PS2/90,95			
		5	UNISYS			
		5	80286 CLONES			
		42	80386 CLONES			
		82	80486 CLONES			
		74	DIGITAL 80486			
		23	DECSTATION 2100,3XXX/5000			
		7	DECSTATION 2100,3XXX/5000			
PENN STATE UNIV	IBM 3090 600 (89)	41	APPLE MAC, PLUS, SE, CLASSIC	455	23	1.3
	IBM 3090	16	APPLE MAC IICI, CX, SI			
	* IBM AS499 (90)	26	AT & T 6300			
		13	HP VECTRA 286			
		5	HP VECTRA 386			
		44	IBM PC/XT,PS2/25			
		209	IBM PC/AT,PS2/30,50,55,60			
		21	IBM PS2/70,80			
		10	IBM PS2/90,95			
		5	8086 CLONES			
		21	80386 CLONES			
		25	80486 CLONES			
		4	DTK TECH 1230			
PORTLAND STATE UNIV	IBM 4381	14	APPLE MAC, PLUS, SE, CLASSIC	149	17	1
	GOULD	16	APPLE MAC IICI, CX, SI			
	SEQUENT	43	IBM PC/AT,PS2/30,50,55,60			
		12	80286 CLONES			
		14	80386 CLONES			
		47	80486 CLONES			
PURDUE UNIV	ETA-10	40	APPLE MAC, PLUS, SE, CLASSIC	336	14	1

	IBM 3090 (85) CYBER 205 (84) (90) VAX 8600 (89) SEQUENT SYMMETRY (89) * HP 9000/380 (91) HP 9000/720 (91)	12 44 20 10 52 130 25	APPLE MAC II, II LC APPLE MAC IICI, CX, SI APPLE MAC IIFX HP VECTRA 286 HP VECTRA 386 IBM PS2/70,80 NCR 486			
RADFORD UNIV	HEWLETT PACKARD	52 71	80286 CLONES 80386 CLONES	123	30	1.1
RENSSELAER POLYTECHNIC INSTITUTE	IBM ES/9000 DISTRIBUTOR RS/6000 SYSTEMS	6 20 33	APPLE MAC IICI, CX, SI IBM PC/AT,PS2/30,50,55,60 IBM PS2/70,80	63	61	1.1
UNIV OF RHODE ISLAND	IBM 4381-3	7 17 20 34 4	APPLE MAC II, II LC APPLE MAC IICI, CX, SI 80286 CLONES 80386 CLONES 80486 CLONES	83	1710	1
ROCHESTER INSTITUTE OF TECHNOLOGY	IBM 9221 MOD 200 (93) DIGITAL VAX 6000-620 (92) DIGITAL VAX 6000-430 (92) DIGITAL VAX 6000-520 (92)	54 40 9	IBM PC/XT,PS2/25 IBM PC/AT,PS2/30,50,55,60 ZENITH Z286	103	24	.
ROLLINS COLLEGE (CRUMMER)	MICROVAX 3100 MODEL 40 IBM RISC 6000 MOD 530H	10 26 10 7 5 9	AT & T 6300 IBM PC/AT,PS2/30,50,55,60 ZENITH Z386 80286 CLONES 80386 CLONES 80486 CLONES	75	13	0.8
SAN DIEGO STATE UNIV	VAX 6300 SUN SPARC SERVER 10 SUN SPARC STATION IPC	7 38 6 47 10 30 40 38 25 83	APPLE MAC, PLUS, SE, CLASSIC APPLE MAC II, II LC APPLE MAC IICI, CX, SI IBM PC/AT,PS2/30,50,55,60 IBM PS2/70,80 8086 CLONES 80286 CLONES 80386 CLONES 80486 CLONES 486	325	37	0.8
SAN JOSE STATE UNIV	IBM 3090 * HP 3000 * HP 9000	17 10 75 30 116 89 19	APPLE MAC, PLUS, SE, CLASSIC APPLE MAC II, II LC APPLE MAC IICI, CX, SI HP VECTRA 286 HP VECTRA 386 80286 CLONES 80386 CLONES	360	21	1.2
SEATTLE UNIV	IBM RS 6000/55 (92) SUN SPARC 10/30 (93)	4 7	APPLE MAC, PLUS, SE, CLASSIC IBM PC/XT,PS2/25	70	0	1.2

		15	8086 CLONES			
		6	80286 CLONES			
		29	80386 CLONES			
		8	80486 CLONES			
SETON HALL UNIV	IBM 4381, 2	14	IBM PC/XT,PS2/25	109	42	1.8
		4	IBM PC/AT,PS2/30,50,55,60			
		68	80386 CLONES			
		15	80486 CLONES			
		4	DELL 386			
SHIPPENSBURG UNIV	UNISYS	17	ZENITH Z150	78	48	1.2
	VAX DECK	35	ZENITH Z286			
		6	ZENITH Z386			
		4	80386 CLONES			
		15	80486 CLONES			
UNIV OF SAN FRANCISCO	VAX	12	APPLE MAC, PLUS, SE, CLASSIC	103	40	1.4
		18	APPLE MAC II, II LC			
		9	APPLE MAC IICI, CX, SI			
		21	UNISYS			
		10	80286 CLONES			
		16	80386 CLONES			
		5	80486 CLONES			
		12	8088			
UNIV OF SOUTH CAROLINA	IBM 4381	89	APPLE MAC, PLUS, SE, CLASSIC	452	15	1
	* IBM 4381 P-14 (88)	8	APPLE MAC II, II LC			
	DEC VAX11-780 (84)	8	APPLE MAC IICI, CX, SI			
	* IBM 9370, 2	55	AT & T 386			
	IBM 3090	109	IBM PC/XT,PS2/25			
		75	IBM PC/AT,PS2/30,50,55,60			
		4	IBM PS2/70,80			
		6	UNISYS			
		45	ZENITH Z386			
		36	80386 CLONES			
		5	80486 CLONES			
		6	DISPLAY WRITER			
SOUTHERN ILLINOIS UNIV AT EDWARDSVILLE	IBM 4381 (86)	7	IBM PC/XT,PS2/25	104	27	2.8
		38	IBM PC/AT,PS2/30,50,55,60			
		8	ZENITH Z286			
		40	ZENITH Z386			
		8	80386 CLONES			
UNIV OF SOUTHERN MISSISSIPPI	HONEYWELL	35	IBM PC/XT,PS2/25	180	19	1
		12	8086 CLONES			
		36	80286 CLONES			
		81	80386 CLONES			
		15	80486 CLONES			
STANFORD UNIV	* VAX 4300	163	APPLE MAC, PLUS, SE, CLASSIC	494	8	0.7
	* VAX 4300	11	APPLE MAC II, II LC			
	* VAX 3800	66	APPLE MAC IICI, CX, SI			
	IBM 3090	19	HP VECTRA 286			
		44	HP VECTRA 386			
		30	IBM PC/XT,PS2/25			

		25	IBM PC/AT,PS2/30,50,55,60			
		18	IBM PS2/70,80			
		9	IBM RT			
		25	80286 CLONES			
		80	80486 CLONES			
STATE UNIV OF NEW YORK AT BUFFALO	IBM 3090/300-J (92) DEC VAX CLUSTER SUN CLUSTER	87 115 11 12	IBM PC/XT,PS2/25 IBM PC/AT,PS2/30,50,55,60 IBM PS2/70,80 80486 CLONES	229	18	0.9
SUFFOLK UNIV	PRIME 6350	13 5 5 44 30 36 42	APPLE MAC, PLUS, SE, CLASSIC APPLE MAC II, II LC IBM PC/XT,PS2/25 8086 CLONES 80286 CLONES 80386 CLONES 80486 CLONES	179	18	1.1
TEMPLE UNIV	IBM 3084Q * VAX CDC 4680	4 15 101 16 5 5 4 15 116	APPLE MAC, PLUS, SE, CLASSIC IBM PC/XT,PS2/25 IBM PC/AT,PS2/30,50,55,60 IBM PS2/70,80 IBM RT ZENITH Z150 ZENITH Z286 80386 CLONES 80486 CLONES	283	52	1.9
UNIV OF TENNESSEE	VAX IBM	8 61 6 75 30 10	APPLE MAC, PLUS, SE, CLASSIC APPLE MAC II, II LC APPLE MAC IICI, CX, SI IBM PC/XT,PS2/25 IBM PC/AT,PS2/30,50,55,60 IBM PS2/70,80	193	41	1.9
TENNESSEE TECH UNIV	DEC 11/70 DEC 8000	122	IBM PC/AT,PS2/30,50,55,60	123	28	1
UNIV OF TEXAS, ARLINGTON	IBM 4341 IBM 4381 NOVELL LAN	4 51 69 8	APPLE MAC IICI, CX, SI IBM PC/XT,PS2/25 80386 CLONES 80486 CLONES	133	63	6.1
UNIV OF TEXAS,SAN ANTONIA	IBM 4381 VAX 8650	4 30 50 40 9	HP VECTRA 286 8086 CLONES 80286 CLONES 80386 CLONES 80486 CLONES	133	181	0.2
TEXAS A & M UNIV	IBM 3090-600E CRAY 4-MP VAX CLUSTER 9000 AMDAHL	25 11 45 40 10 8	APPLE MAC II, II LC APPLE MAC IICI, CX, SI HP VECTRA 386 IBM PC/AT,PS2/30,50,55,60 IBM PS2/70,80 IBM RT	373	41	1

		40 80286 CLONES			
		60 80386 CLONES			
		130 80486 CLONES			
TEXAS CHRISTIAN UNIV (NEELEY)	IBM 4381 (82)	42 8086 CLONES	194	10	1
	IBM 9375 (89)	43 80286 CLONES			
	VAX 6310 (89)	102 80386 CLONES			
	VAX 9000 (90)				
	VAX 9000 (92)				
TEXAS TECH UNIV	IBM 3081-KK	26 APPLE MAC, PLUS, SE, CLASSIC	236	39	1
	* VAX 8650 & 6520	9 APPLE MAC II, II LC			
	* VAX 6000-310	6 IBM PC/XT,PS2/25			
	* VAX 3100	102 ZENITH Z150			
	MASSPAR	50 80386 CLONES			
		13 80486 CLONES			
		17 PACKARD BELL AT			
		10 COMPUADD 286			
TOWSON STATE UNIV	VAX 4000/8000	35 IBM PC/XT,PS2/25	106	50	.
		22 8086 CLONES			
		37 80286 CLONES			
		12 80386 CLONES			
TULANE UNIV (FREEMAN)	IBM 3081	9 APPLE MAC, PLUS, SE, CLASSIC	164	11	1.5
	* AS/400	22 IBM PS2/70,80			
	RS 6000	4 ZENITH Z150			
	CONVEX C210	11 ZENITH Z286			
		11 80286 CLONES			
		64 80386 CLONES			
		7 80486 CLONES			
		24 ITT XTRA			
UNIV OF UTAH	IBM 3090 600S	5 APPLE MAC, PLUS, SE, CLASSIC	241	10	0.8
		51 AT & T 386			
		25 IBM PC/AT,PS2/30,50,55,60			
		10 8086 CLONES			
		4 80286 CLONES			
		67 80386 CLONES			
		34 80486 CLONES			
		40 NO NAME GIVEN			
UTAH STATE UNIV	VAX 6510	40 IBM PS2/70,80	310	13	0.8
	IBM 4381	44 IBM PS2/90,95			
		14 UNISYS			
		122 80386 CLONES			
		80 80486 CLONES			
		10 TELEVIDEO			
VANDERBILT UNIV (OWEN)	VAX 6620	36 APPLE MAC, PLUS, SE, CLASSIC	149	11	0.8
	IBM	12 APPLE MAC II, II LC			
		11 APPLE MAC IICI, CX, SI			
		4 APPLE MAC IIFX			
		40 AT & T 386			
		20 IBM PC/AT,PS2/30,50,55,60			
		8 ZENITH Z386			
		4 80386 CLONES			
		4 80486 CLONES			
		5 IBM PA/VALUE POINT 486			

UNIV OF VERMONT	IBM 4381, 2 (85,87) 8650 (90) IBM RS 6000 SUN 4/490, 5	5 8 37	AT & T 6300 AT & T 386 IBM PC/AT,PS2/30,50,55,60	55	110	0.8
UNIV OF VIRGINIA (DARDEN)	IBM RS 6000 IBM 3090 * VAX 4000	5 10 41 40 6 36 14	APPLE MAC II, II LC IBM PC/XT,PS2/25 IBM PC/AT,PS2/30,50,55,60 IBM PS2/70,80 8086 CLONES 80386 CLONES 80486 CLONES	160	11	0.9
UNIV OF VIRGINIA (MCINTIRE)	* IBM 9370 * ATT 3B2-1000 IBM 3090	10 17 30 30 40 62	AT & T 6300 AT & T 286 AT & T 386 IBM PC/AT,PS2/30,50,55,60 IBM PS2/70,80 80286 CLONES	191	7	1
WAKE FOREST UNIV (MBA)	HP 9000 (91)	4 5 37 30 39 8	APPLE MAC, PLUS, SE, CLASSIC APPLE MAC IICI, CX, SI ZENITH Z150 ZENITH Z286 ZENITH Z386 80386 CLONES	136	5	0.7
WASHINGTON UNIV, ST LOUIS (SIMON)	IBM 43XX, 4 * VAX 8810 (88) VAX 6000-610 (92)	5 12 10 45 6 9 16 53 11	APPLE MAC II, II LC APPLE MAC IICI, CX, SI IBM PC/XT,PS2/25 IBM PC/AT,PS2/30,50,55,60 IBM PS2/70,80 IBM RT 80286 CLONES 80386 CLONES 80486 CLONES	170	16	0.8
WAHINGTON & LEE UNIV	PRIME 9955 (84)	8 34 19 13	APPLE MAC, PLUS, SE, CLASSIC IBM PC/AT,PS2/30,50,55,60 80286 CLONES 80386 CLONES	76	2	0.3
WAYNE STATE UNIV	AMDAHL 5890/300E IBM 9000-210 IBM 3081GX	37 13 45 36 129 51	APPLE MAC, PLUS, SE, CLASSIC APPLE MAC IICI, CX, SI ZENITH Z150 80286 CLONES 80386 CLONES 80486 CLONES	313	24	1.2
WEBER STATE UNIV	VAX 9000	18 6 80 6	APPLE MAC IICI, CX, SI 80286 CLONES 80386 CLONES 80486 CLONES	110	0	.
WESTERN ILLINOIS UNIV	IBM 4381, 2 (84, 87) DEC MICROVAX II (86)	35 4	IBM PC/XT,PS2/25 IBM PS2/70,80	162	43	0.8

	CDC CYBER 180-830 (79)	63 ZENITH Z150 27 ZENITH Z286 25 ZENITH Z386 5 80286 CLONES			
WESTERN MICHIGAN UNIV (HAWORTH)	* DUAL HOST VAX 4000-300 VAX 6000 (91) * A/S 400	21 APPLE MAC II, II LC 77 APPLE MAC IICI, CX, SI 20 APPLE MAC IIFX 21 ZENITH Z150 212 ZENITH Z386 12 80486 CLONES	365	36	1.1
WESTERN WASHINGTON UNIV	DEC VAX 11-780 DEC VAX 11-780 SEQUENT DEC MICROVAX	11 AT & T 6300 12 IBM PC/XT,PS2/25 90 ZENITH Z386 22 80286 CLONES 4 80386 CLONES	142	13	0.7
COLLEGE OF WILLIAM & MARY	IBM 4381 HDS 6660	15 APPLE MAC, PLUS, SE, CLASSIC 9 APPLE MAC IICI, CX, SI 4 IBM PC/AT,PS2/30,50,55,60 70 80386 CLONES 13 80486 CLONES	111	0	.
UNIV OF WISCONSIN, EAU CLAIRE	VAX 6420	5 APPLE MAC, PLUS, SE, CLASSIC 54 IBM PC/XT,PS2/25 71 IBM PC/AT,PS2/30,50,55,60 10 UNISYS 6 ZENITH Z286 35 80286 CLONES 50 80386 CLONES 55 80486 CLONES	288	16	0.5
UNIV OF WISCONSIN, LA CROSSE	MICROVAX CLUSTER 1	52 ZENITH Z386 23 8086 CLONES	81	0	0.8
UNIV OF WISCONSIN, OSHKOSH	IBM 4300 VAX, 2	4 APPLE MAC II, II LC 18 IBM PC/XT,PS2/25 4 IBM PC/AT,PS2/30,50,55,60 29 ZENITH Z150 36 ZENITH Z386	98	104	0.7
YALE	IBM 3090 (85) AMDAHL V8 * SUN SPARCSTATION 2	20 APPLE MAC, PLUS, SE, CLASSIC 25 APPLE MAC IICI, CX, SI 32 IBM PC/XT,PS2/25 81 IBM PC/AT,PS2/30,50,55,60 8 IBM PS2/70,80 24 IBM PS2/90,95 8 ZENITH Z286 8 ZENITH Z386 18 80386 CLONES 4 80486 CLONES	238	4	1.1
UNIV OF ALBERTA	AMDAHL 5870 (78) MTS	76 APPLE MAC, PLUS, SE, CLASSIC	283	18	1

	IBM 4381 (80) VM	27	APPLE MAC II, II LC			
	IBM 3081 (K) MVS	56	IBM PC/XT,PS2/25			
	IBM RS6000	10	IBM PC/AT,PS2/30,50,55,60			
		8	ZENITH Z150			
		11	ZENITH Z286			
		7	8086 CLONES			
		7	80286 CLONES			
		25	80386 CLONES			
		48	80486 CLONES			
UNIV OF BRITISH COLUMBIA	* DATA GEN MV100000	6	APPLE MAC, PLUS, SE, CLASSIC	521	20	0.4
	UBC MAINFRAME	22	APPLE MAC IICI, CX, SI			
		6	IBM PC/XT,PS2/25			
		76	IBM PC/AT,PS2/30,50,55,60			
		8	IBM PS2/70,80			
		15	IBM RT			
		4	IBM RT			
		18	8086 CLONES			
		110	80286 CLONES			
		232	80386 CLONES			
		15	80486 CLONES			
		8	80486,EVEREX STEP			
UNIV OF CALGARY	BULL DPS/870M	211	IBM PC/AT,PS2/30,50,55,60	310	10	1.1
	CDC CYBER 860	79	IBM PS2/70,80			
	IBM 4381 (ACSS)	18	IBM MOD 77			
	CDC CYBER 830					
	IBM RS 6000 (91)					
DALHOUSIE UNIV	* MICROVAX II	5	APPLE MAC IICI, CX, SI	112	29	1.2
	* DEC 5000	22	80386 CLONES			
		85	80486 CLONES			
LAVAL UNIV	* IBM (MINI)	158	APPLE MAC, PLUS, SE, CLASSIC	614	19	1
		13	APPLE MAC II, II LC			
		91	APPLE MAC IICI, CX, SI			
		4	APPLE MAC IIFX			
		150	IBM PC/XT,PS2/25			
		157	IBM PC/AT,PS2/30,50,55,60			
		28	IBM PS2/70,80			
		12	IBM PS2/90,95			
MCMASTER UNIV	VAX 11/780	25	IBM PC/XT,PS2/25	202	22	0.6
	IBM 4381	6	IBM PC/AT,PS2/30,50,55,60			
		4	IBM PS2/70,80			
		24	8086 CLONES			
		5	80286 CLONES			
		102	80386 CLONES			
		28	80486 CLONES			
QUEEN'S UNIVERSITY	IBM 9000	5	APPLE MAC, PLUS, SE, CLASSIC	88	17	4.1
		5	APPLE MAC II, II LC			
		12	IBM PC/AT,PS2/30,50,55,60			
		12	80386 CLONES			
		11	80486 CLONES			
		35	TOSHIBA			
		6	COMPAQ			

UNIV OF TORONTO	* DIGITAL DEC 5810 (90) * DIGITAL VAX 3500 (88) * DIGITAL MICRO VAX (88)	9 11 23 18 10 54 18 5	APPLE MAC, PLUS, SE, CLASSIC IBM PC/XT,PS2/25 IBM PC/AT,PS2/30,50,55,60 IBM PS2/70,80 ZENITH Z150 80286 CLONES 80386 CLONES 80486 CLONES	152	21	1.7
HANDELSHOJSKOLEN/AARHUS	* VAX 6610 (92) * VAX 6510 (93) * VAX 4000 (91) * VAX 4000 (91) * VAX 3300 (90)	35 20 20 120 60	APPLE MAC II, II LC IBM PC/AT,PS2/30,50,55,60 IBM PS2/70,80 80386 CLONES 80486 CLONES	256	25	0.8
COPENHAGEN BUSINESS SCHOOL		43 479 20 20	APPLE MAC, PLUS, SE, CLASSIC HP VECTRA 286 IBM PC/AT,PS2/30,50,55,60 80386 CLONES	562	32	1.1
ECOLE SUPERIEURE DES SCIENCES (ESSEC)	* VAX 8530 (89) MCIRO VAX 3800 (89) MICRO VAX II (88)	144 60 11 11 10 8 31 10 42	APPLE MAC, PLUS, SE,308ASSIC APPLE MAC II, II LC APPLE MAC IICI, CX, SI IBM PC/AT,PS2/30,50,55,60 8086 CLONES 80286 CLONES 80386 CLONES COMPAQ 386 VARIOUS BRANDS	34	1.5	
GROUPE ESC TOULOUSE	* HP 3000	80 10 38	HP VECTRA 286 80386 CLONES 80486 CLONES	131	16	0
UNIVERSITAT ZU KOLN	* SIEMENS MX500 (80)	8 14 5 51 24 6 41 122 34	APPLE MAC, PLUS, SE, CLASSIC APPLE MAC II, II LC IBM PC/XT,PS2/25 IBM PC/AT,PS2/30,50,55,60 IBM PS2/70,80 IBM RT 80286 CLONES 80386 CLONES 80486 CLONES	309	18	1.6
NORGES HANDELSHOYSKOLE	* VAX 4000/500, 2 * VAX 3100/80	50 50 50 60 5 40 40 40 50 47	APPLE MAC, PLUS, SE, CLASSIC APPLE MAC II, II LC APPLE MAC IICI, CX, SI APPLE MAC IIFX DEC VAXSTATION IBM PC/AT,PS2/30,50,55,60 DEC300 DEC316 DEC316 DEC316	432	20	0.7
IESE	* DIGITAL MICROVAX/3800 (90	200	APPLE MAC, PLUS, SE, CLASSIC	255	43	1.4

		30	APPLE MAC II, II LC			
		17	APPLE MAC IICI, CX, SI			
		4	IBM PC/XT,PS2/25			
STOCKHOLM SCHOOL OF ECONOMICS	* VAX 6310, 2 (90) * MICRO VAX, 3 (90)	87	APPLE MAC, PLUS, SE, CLASSIC	502	18	0.6
		20	APPLE MAC II, II LC			
		5	APPLE MAC IICI, CX, SI			
		20	IBM PC/AT,PS2/30,50,55,60			
		80	80286 CLONES			
		290	80386 CLONES			
INTL INSTITUTE FOR MGMT DEVELOPMENT (IMD)		8	APPLE MAC IIFX	170	0	0.2
		30	HP VECTRA 286			
		30	HP VECTRA 386			
		50	IBM PS2/70,80			
		50	IBM PS2/90,95			
RIJKSUNIVERSITEIT GRONINGEN	* VAX 3800	63	8086 CLONES	180	0	0.5
		53	80286 CLONES			
		46	80386 CLONES			
		18	80486 CLONES			
UNIV OF LEEDS	CIF SILICON GRAPHIY	15	8086 CLONES	159	18	1
		10	80286 CLONES			
		78	80386 CLONES			
		55	80486 CLONES			
UNIV OF WARWICK	IBM 4381 (85) SPARCSERVER 690 (90) SPARCSERVER 690 (90) SPARCSERVER 690 (92)	23	IBM PC/XT,PS2/25	264	23	0.7
		10	IBM PC/AT,PS2/30,50,55,60			
		7	IBM PS2/70,80			
		29	8086 CLONES			
		5	80286 CLONES			
		74	80386 CLONES			
		66	80486 CLONES			
		29	OLIVETTI 286			
		13	OLIVETTI 386			
		4	OLIVETTI 386			
UNIV OF STELLENBOSCH	VAX 6000/410 VAX 8550 PRIME EXL 7360	10	AT & T 6300	77	14	2
		14	8086 CLONES			
		17	80286 CLONES			
		33	80386 CLONES			
UNIV OF NEW SOUTH WALES	* PYRAMID 9825 (92) * MIPS M120 * IBM RS6000/530	8	APPLE MAC, PLUS, SE, CLASSIC	138	12	0.4
		66	APPLE MAC IICI, CX, SI			
		9	HP APOLLO			
		23	IBM PC/AT,PS2/30,50,55,60			
		6	IBM PS2/70,80			
		25	IBM RISC 6000			
UNIV OF QUEENSLAND	VAX	9	APPLE MAC, PLUS, SE, CLASSIC	45	30	1.1
		22	IBM PC/AT,PS2/30,50,55,60			
		14	80286 CLONES			

UNIV OF AUCKLAND	SILICON GRAPHICS SILICON GRAPHICS	7 52 157 23 99 10 4	APPLE MAC, PLUS, SE, CLASSIC APPLE MAC II, II LC IBM PC/AT,PS2/30,50,55,60 80286 CLONES 80386 CLONES 80486 CLONES DEC STATION	360	15	1
TSINGHUA UNIV		30	80386 CLONES	31	8	0
CHINESE UNIV OF HONG KONG		4 10 5 47 89 15	APPLE MAC, PLUS, SE, CLASSIC IBM PC/XT,PS2/25 8086 CLONES 80286 CLONES 80386 CLONES 80486 CLONES	173	30	0.9
NARSEE MONJEE INSTITUTE OF MGMT STUDIES (NMIMS)		31	8086 CLONES	31	66	50
TOKYO KEIZAI UNIV	IBM 4381	33 83	IBM PC/AT,PS2/30,50,55,60 80286 CLONES	118	33	6.4
KOREA UNIV		5 40 17	8086 CLONES 80286 CLONES 80386 CLONES	65	2	10.3
NANYANG TECHNOLOGICAL UNIV	VAX 9000-210 VAX 9000-110 VAX 8820	100 4 210 409	APPLE MAC, PLUS, SE, CLASSIC APPLE MAC IIFX 80386 CLONES 80486 CLONES	726	10	0.8
NATIONAL CENTRAL UNIV	DEC MICROVAX 3900 * HP 9000/825 * HP 9000/970	6 22 9 8 93 39	APPLE MAC, PLUS, SE, CLASSIC APPLE MAC II, II LC APPLE MAC IICI, CX, SI IBM RT 80386 CLONES 80486 CLONES	183	20	2.3
ASSUMPTION UNIVERSITY	IBM 3083 IBM AS/400 IBM 9370 HP9000	10 100 20	APPLE MAC IICI, CX, SI IBM PC/AT,PS2/30,50,55,60 80486 CLONES	130	133	26
FGV-FUNDACAO GETULIO VARGAS (EAESP)	IBM 4381 * SIEMENS IBM RS 486 SIEMENS	35 12 90 32 4	8086 CLONES 80286 CLONES 80386 CLONES 80486 CLONES ACER	177	87	11.9

UNIV OF SAO PAULO	IBM 4381 (89) UNISYS, EAGLE A9F (92) UNISYS, A9 (88) CONVEX 220 FOX (89) CDC 4360 CAT (88)	101 15 76 7	8086 CLONES 80286 CLONES 80386 CLONES 80486 CLONES	199	10	1.1
UNIVERSIDAD CATOLICA DE CHILE		90 24 24 32 4 10	APPLE MAC, PLUS, SE, CLASSIC IBM PC/XT,PS2/25 IBM PC/AT,PS2/30,50,55,60 8086 CLONES 80286 CLONES 80386 CLONES	185	9	2
UNIVERSIDAD DEL VALLE	SUN SPARC, MOD 41 (93)	19 11 18	8086 CLONES 80286 CLONES 80386 CLONES	51	78	5.6
INSTITUTO TECHOLOGICO DE MONTERREY	IBM RS/6000 MOD 970, 2 IBM RS/6000 MOD 550, 2 IBM RS/6000 MOD 520	366 58 186 169 155 7 40 29	APPLE MAC, PLUS, SE, CLASSIC APPLE MAC II, II LC HP VECTRA 386 IBM PC/XT,PS2/25 IBM PC/AT,PS2/30,50,55,60 IBM PS2/70,80 IBM RISC 6000 IBM RT	1015	6	3.3