Title
First Annual UCLA Computing Survey of North American Business Schools

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OF
NORTH AMERICAN BUSINESS SCHOOLS

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FIRST ANNUAL UCLA COMPUTING SURVEY OF NORTH AMERICAN BUSINESS SCHOOLS

I. INTRODUCTION

The computerization of business schools during the eighties will take numerous forms and involve millions of dollars of personnel and equipment, years of effort, and may have a significant impact on the curriculum. Although there have been other survey activities, this is the first of a series designed to monitor the changing nature of the business school computing environment. The purpose is to provide deans and other policy makers with information which they can use in making allocation decisions and program plans. As we enter the "information age," pressures for computerization grow from faculty, students, and vendors. The decision makers in business schools may be able to use this information as an independent source indicating trends and directions and the degree of computerization of their school, compared with other schools.

During 1980-81, an informal survey of twenty-five business schools was conducted and used for the internal purposes of the investigators. As a result of inquiries for the data, a working paper was prepared (Frand and Bertram, UCLA Information Systems Working Paper, 6/82). Based on a continued interest in the earlier survey, the current project was undertaken. The objective was to be more comprehensive and thorough in the data collection and more timely in reporting the findings.

A list of thirty-seven North American Business Schools was compiled by the Computer and Information Systems faculty at the UCLA Graduate School of Management. The schools were selected based either on their reputation as a leading school of business or management education or on their leadership in the use of computing. The sample was not random and should not be considered representative of North American business schools. However, the sample can be used as a gauge against which others can see what a select sample of schools are doing. Seventeen of the schools from the earlier survey were included in the current investigation.

After the schools were selected, a letter was sent to the deans inviting them to participate and requesting the name of an individual who could serve as the school's representative. Thirty-five schools chose to participate and they are listed in Table 1. Specific information on each school is given in the Summary Table at the end of this report.

To assure the accuracy of the data, a very extensive collection procedure was used. A nine page questionnaire was sent to each representative followed by a telephone interview to gather the data. All the interviews took place during March and April, 1984. Following the interview the completed questionnaire was returned to the representative for

Table 1

SCHOOLS PARTICIPATING IN THE
1984 BUSINESS SCHOOL SURVEY
N = 34

Boston U	Pennsylvania (Wharton)
Carnegie-Mellon	Pittsburg
Case Western Reserve	Purdue
Chicago	Rochester
Columbia	Southern California
Cornell	Stanford
Dartmouth	Texas, Austin
Duke	UC Berkeley
Georgia	UCLA
Harvard	Washington
Illinois, Urbana	Vanderbilt
Indiana	British Columbia
Michigan	Laval
Minnesota	McMaster
MIT	McGill
NYU	Toronto
Northwestern	Western Ontario

representatives for a second verification. This report is based upon the verified questionnaires and Summary Table.

The report is divided into six sections: profile of the schools, hardware resources, software availability, budget considerations, planning and governance, and a closing section on questions and trends.

II. PROFILE OF THE SCHOOLS

Table 2 displays general information about the thirty-four schools which participated in this survey. There were about the same number of public and private institutions, with approximately two-thirds offering both an undergraduate and graduate business degree and one-third offering a graduate degree only. A full range of school sizes, from the very small to the very large, were present. Two-thirds of the schools had their own computer facilities and three-fourths had microcomputers available for student use. Computer budgets varied widely. About two-thirds of the schools required a Computers and Information Systems (CIS) course and knowledge of a programming language for the business degree. A third of the schools had instructional goals for computing, about three-fourths use a computer committee to set policy, but only a few have a formal policy of providing faculty with release time for computer curriculum development.

Given this overview, let us now consider the hardware and software resources available to the schools.

Table 2

PROFILE OF PARTICIPATING SCHOOLS
N = 35

ATTRIBUTES	NUMBER OF SCHOOLS
Participating Schools	
Public Institutions	17
Private institutions	18
Degrees offered	
Undergraduate and graduate	23
Graduate only	12
Student enrollment (FTE)	
Less than 500 students	3
Between 500 - 1000	10
Between 1000 - 2000	8
Between 2000 - 3000	7
More than 3000 students	7
Computer Facilities Available	
Both School and University	19
School only	2
University only	14
Microcomputers	33
1983/84 Computer Budget	
Less than $200,000	7
Between $200,000 and $400,000	8
Between $400,000 and $600,000	7
Between $600,000 and $800,000	1
Greater than $1,200,000	5
Unavailable	7
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III. COMPUTER HARDWARE RESOURCES

For the purposes of this discussion, "business school computer hardware resources" are broadly defined to be any and all equipment directly available for use by the schools' faculty, students, and staff, whether or not the equipment is owned or operated by a central campus organization or the business school itself. Let us consider three aspects of the business school hardware resources: mainframe and minicomputers, microcomputers, and communications equipment.

Mainframe and Minicomputers Available to Business Schools

Two of the responding schools indicated they exclusively used their own computer systems for their computing needs while eighteen schools used both their own as well as the University systems. The remaining fourteen schools relied exclusively on the University systems. Of these fourteen schools, only one expressed an interest in having its own system; the other thirteen indicated the University system was sufficient to meet their needs. Almost all the schools using University resources indicated a recharge system was used to govern the level of usage.

The twenty business schools with their own minicomputer systems account for 36 individual computers. Table 3 displays the make, model, and number of systems which were reported. Although six vendors are represented in this sample, Digital Equipment Corporation had the largest number of systems. The VAX 11/780 was most the common computer, with the Hewlett Packard 3000 and DEC 2060 close behind. Half of the schools indicated plans to upgrade their existing minicomputer or to add a new minicomputer system. Twenty-nine of the systems were listed as "open-access" while eight were recharge systems. The open access arrangements varied with some schools offering open access for just faculty and students, others offering it for CIS students only. A common arrangement was to allow open access for instructional use only.

Microcomputers

This has been the most significant area of computer growth. In the 1980/81 survey, no data was collected on microcomputers. At the time of that survey, Apple was the only widely known microcomputer; the IBM PC was not announced until August, 1981, five months after the survey was completed. In the current survey, thirty-two of the schools reported having microcomputers available for their students and faculty and almost every make of microcomputer was represented. The microcomputers were used as "stand-alone" systems, as terminals to a host mainframe or minicomputer, or in networks with other micros. Table 4

Table 3

BUSINESS SCHOOL MINICOMPUTER SYSTEMS
N = 21

Make	Number Systems
DEC	
PDP 11s	2
DEC 10s	2
DEC 2060	5
VAX 11s	8
HP	
HP3000s	6
IBM	
S/3x	3
4341	2
Pixel	
100/AP	1
PRIME	
750, 780	2
Wang	
OISs	4
VS 80, 220	2

microcomputer was represented. The microcomputers were used as "stand-alone" systems, as terminals to a host mainframe or minicomputer, or in networks with other micros. Table 4 displays the mix of microcomputers found in the schools.

Fourteen schools reported using a single vendor for their microcomputers, eight used two vendors, and eleven schools used a variety. As can clearly be seen from the table, IBM has achieved a dominant position in the business schools. The big surprise was the lack of Apple microcomputers. No school singled out Apple as their dominant micro, although it appears as one of many in the "miscellaneous variety" category.

In response to the question regarding future plans, every school indicated that they planned to acquire more microcomptuers during the next year. The most frequently mentioned systems were IBM, Apple's MacIntosh, and HP150s.

Table 4

MICROCOMPUTER SYSTEMS
N = 32

Vendor	Number Schools
IBM only	12
DEC only	1
Zenith only	1
IBM and Altos	1
IBM and Atari	1
IBM and Burroughs	1
IBM and Commodore	1
IBM and DEC	1
IBM and HP	3
Miscellaneous variety	10

use either in a public location or in a private office. Note that these ratios do not take into account the microcomputer systems privately owned by faculty or students. Thus the demoninators in the ratios are probably understated and hence, the actual ratios are probably better (i.e., lower) than reported. Table 5 displays the student per micro ratios and Table 6 the faculty per micro ratios.

Communications and Networks

The number of terminals hard-wired in either public areas or in individual faculty offices varied among the schools. However, twenty schools reported having access to multiple CPUs from any terminal. This clearly reflects the trend toward distributed data processing and the use of local area networks (LANs). The hardware interfaces for the multiple CPU option included port selectors (8 schools), minicomputer or front-end processor (9 schools), digital phone switch (Chicago), and University data switch (Rochester).

Schools were polled as to whether they used their microcomputers as a "stand-alone" processor, a remote terminal, or in a network. Nine schools used them exclusively in a stand-alone mode. The other twenty-three also used them as terminals or part of a network.

With respect to local area networks (LANs), nine schools responded that they are currently operating a LAN: five schools said their LANs were "homegrown." Georgia is using Corvus, Minnesota is using Lanier, USC and UT both use Arcnet.

For the schools currently without a LAN, nineteen reported that they are planning one some time in the future. Several schools said the type has not yet been determined and others specifically said they are waiting for an IBM LAN announcement. However, seven schools had specific plans for next year: Boston is planning an Ungerman-Bass broadband network linking CPUs; Carnegie-Mellon is planning an Ethernet using TCT/IT under UNIX; Corvus or IBM (if announced) was

Table 5

MICROCOMPUTERS AVAILABLE FOR STUDENT USE
N = 33

Students per Micro	Number Schools
Less than 10	1
Between 10 and 20	2
Between 20 and 40	5
Between 40 and 80	4
Between 80 and 100	3
Between 100 and 500	7
Between 500 and 1000	4
More than 1000	7

Table 6

MICROCOMPUTERS AVAILABLE FOR FACULTY USE
N = 33

Faculty per Micro	Number Schools
Less than 2	1
Between 2 and 4	5
Between 4 and 6	4
Between 6 and 8	9
Between 8 and 10	6
More than 10	8

"homegrown." Georgia is using Corvus, Minnesota is using Lanier, USC and UT both use Arcnet, and Arizona is using both Omninet and Decnet.

For the schools currently without a LAN, nineteen reported that they are planning one some time in the future. Several schools said the type has not yet been determined and others specifically said they are waiting for an IBM LAN announcement. However, eight schools had specific plans for next year: Boston is planning an Ungerman-Bass broadband network linking CPUs; Carnegie-Mellon is planning an Ethernet using TCT/IT under UNIX; Corvus or IBM (if announced) was mentioned by Indiana, McMaster and Illinois; Micronet (with IBM software development as a pilot) was planned by MIT; and a new digital data/voice communications system by planned by Northwestern; and Arizona intends to implement Ethernet.

Word Processing Software

It appears that word processing is migrating from the mainframe and minicomputer environment to microcomputers. In the mainframe and minicomputer environments, it seems that text editors such as Script on the IBM systems and Emax on the DEC systems are used rather than true word processing packages which have built-in formatting routines. On the other hand, numerous word processing packages are being used with the microcomputers. The most frequently mentioned microcomputer package was Wordstar (17 schools), with no other package even a close second. Easywriter was listed by 4 schools, Wordperfect by 3 schools, and a dozen other packages were mentioned once or twice.

Spreadsheet Analysis Packages

In this area, microcomputers dominate. In the mainframe environment, four different packages were mentioned with only IFPS listed more than once (9 times). On the other hand, for microcomputers, both VisiCalc and Lotus 1-2-3 were each mentioned 15 times, and Multiplan 9 times. Another half dozen "visi-clones" were also listed. Furthermore, most schools indicated that they had more than one spreadsheet analysis package available.

Data Base Managment Systems

Twenty-five schools reported having a database management system (DBMS) available on their mainframe or minicomputer systems. The DEC System 1022 and HP's Image were mentioned six times each while numerous others were mentioned once or twice. The schools reported having a single DBMS for their mainframe or minicomputer systems. On the other hand, two or three different database systems were listed for use with their microcomputers. Dbase II was mentioned 19 times while Knowledgeman was listed 5 times, Condor twice, and several others once each. What was not clear from the data was which systems were receiving more use and whether there is a shift away from the minicomputer environmemt toward microcomputers.

For commerical database systems, all were mainframe or minicomputer based. The most frequent mentioned systems were: CRSP (stock market data) listed by twenty-three schools, Computstat (financial statements) twenty schools, Citibase (macroeconomic data) eight schools, and the Dow Jones database listed by five schools. Another half-dozen databases were listed once or twice.

Electronic Mail Software

Twenty-two schools reported an electronic mail system available on their mainframe or minicomputer systems. Six of these were "homegrown," four were Mail Manager on the DEC system, and the rest were unique to the system on which they were running. None of the electronic mail systems were microcomputer based. This may be related to the limited number of LANs and the fact that so many schools had means for all terminals to communicate via some type of network involving the central computer. Since most of the schools are using microcomputers as terminals as well as stand-alone systems, the electronic mail function may be left to the mainframe and minicomputer environment.

Mathematical Modeling and Statistics

There is no question of the superiority of the mainframe and minicomputer packages for statistical and mathematical modeling. The major packages are SPSS (29 schools), LINDO and SAS (21 schools each), IDA and MINITAB (11 schools each) and BMDP and TSP (10 schools each), and a few others mentioned once or twice. (IFPS was listed under different categories, includinmodeling, statistics, and spreadsheets.)

For microcomputers, LINDO PC was mentioned 6 times and Microstat 3 times. Micro TSP and Statpro were mentioned twice each and two other packages were mentioned once. The dominance of the mainframe and minicomputer is a result of the need for significant memory to accomodate the mathematical manipulation involved in the calculations of the various values.

Business Games

Twenty-seven schools indicated they use computer based business games, with Markstat mentioned 12 times and "home grown" games listed 11 times. Empire was listed 3 times and Intop twice, with nine other games each mentioned once. All of these games were run on a mainframe or minicomputer. Only two schools indicated that they had developed home grown microcomputer based business games (Dartmouth and USC).

Graphics

Graphics packages were about evenly divided between the mainframe/minicomputer and microcomputer environments. For the large systems, SAS/GRAPH, Calcomp, and TELL-A-GRAF were each mentioned four times each and HP graphics packages were mentioned three times. Eight other packages were each listed once. The microcomputer graphics software was equally diverse. Lotus 1-2-3 was listed six times and HP graphics five times; eight other microcomputer graphics packages were listed once each. Thus far, it appears that microcomputer graphics packages are not displacing the packages on the larger systems.

Programming Languages

Every conceivable language was listed as available on the mainframe and minicomputers while Basic, Fortran, Pascal, and C were the languages listed for microcomputers. Although many programming languages were available, Table 7 lists the languages specifically identified as a required language for a degree or used by faculty and doctoral students for research. Basic is the language most frequently mentioned as required for either an undergraduate or graduate busiess degree. However, Fortran is the language of choice of most researchers. (The total number of languages listed under "research use" is greater than twenty-nine because most schools indicated that more than one language was being used extensively by researchers.)

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V. COMPUTER BUDGETS

Adequate financial resources are critical to the successful implementation of any computer program. In this section the computer budgets are examined to better understand how the schools spent their dollars. The section is divided into four parts: preliminary observations, total budgets, instructional and research budgets, and a comparison of 1980/81 budgets with 1983/84 figures.

Preliminary Budget Observations

Table 7

PROGRAMMING LANGUAGE USAGE

Language	Required Undergraduate Degree N = 17	Required Graduate Degree N = 19	Used By Researchers N = 30
Basic	8	12	6
Fortran	3	2	28
Pascal	2	0	6
PL/1	1	1	1
Cobol	8	12	6
APL	0	0	6
other	3	3	1

There are several questions which must be raised with respect to the dollar amounts specified, and, hence, care should be used when interpreting the budget figures. First of all, some schools indicated the amount was primarily for recharging while others spent their funds on staff and maintenance. Because different schools use different charge algorithms for computer use, the amounts allocated for that purpose may not be comparable across schools. Also, some schools have a few highly paid professional staff while others use students. Further, it is highly probable that the amounts specified were generally underestimated because there are numerous "hidden" costs which may not have been considered. For example, it is not clear that the figures included expenditures by faculty members who are purchasing equipment or software on their own, either through grants or from personal funds. Nor is it clear that the budget figures include the cost of faculty release time, or tangible costs such as electricity, additional insurance for systems, security measures, and furniture. This raises the question of how "computer resources" should be defined and may help explain why so many schools cannot accurately determine their computer budgets. Given these caveats, we can proceed with a discussion of the reported budgets.

In discussing the budget allocations for the schools, we shall indicate the amounts in ratio form as "instructional dollar per student," "research dollar per faculty FTE," and "total dollars per student," rather than the raw amounts. Considering school size may allow for a more meaningful comparison and interpretation of the dollar allocations. For example, Table 8 displays the budgets of the seven business schools with budgets of $500,000 or more. Note that four of the schools had budgets in excess of $1,000,000. However, on a "per student" basis, there are several other schools with higher allocations.

Total Computer Budgets

Table 9 displays the level of expenditure per student for the twenty-seven schools which were able to report a total computer budget for 1983/84. For these schools, the range was from $8 to $1754 per student, with a median expenditure

Table 8

SCHOOLS RANKED BY TOTAL BUDGET ALLOCATIONS
Top Quartile

Rank	School	Total 1983/84 Budget	Number Students	Total $ per Student
1	Harvard	2,000,000	1603	1248
2	Georgia State	1,861,000	6940	268
3	U of Chicago	1,400,000	1575	889
4	NYU	1,350,000	4680	288
5	U of So. Cal	740,000	2995	247
6	U of PA (Wharton)	550,000	4050	136
7	Dartmouth	500,000	285	1754

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Total Computer Budgets

Table 9 displays the level of expenditure per student for the twenty-eight schools which were able to report a total computer budget for 1983/84. For these schools, the range was from $8 to $1754 per student, with a median expenditure of $282 per student. (The "median" is the average which indicates that half the schools are above that level and half below. Because of the extreme values in this sample, the median is a better measure of central tendancy than the mean.)

To gain a better understanding of the computer budgets, let us consider the data from different perspectives. Table 10 displays the range and median allocations per student by public or private institution, computer facilities and an undergraduate degree. From the table we can observe that the greatest differences between the median allocations per student occur when we compare the public and private institutions. In fact, it may be surprising that this difference is not greater. If we take the allocations and consider them by quartile, seven of the eight top spending schools are private while only 3 of the bottom 7 schools are private.

When we compare the schools in terms of those with and without their own computer facilities, the difference is relatively small. However, before we can interpret this finding with any confidence we would need to determine whether the schools computing needs are being met at the current dollar allocation level. (Unfortunately, this information, which is highly subjective and subject to much interpretation, was not collected in this survey.) Without this additional data, questions regarding the cost effectiveness of local computing facilities and the movement away from central campus operations must be left unanswered.

Perhaps the most interesting comparison is between schools with and without undergraduate programs. For the twelve business schools without an undergraduate program, the average allocation per student was almost double that of the average allocation for schools with an undergraduate program. In fact, ten of the twelve schools without undergraduate programs had allocations above the median value of the schools with undergraduate programs. An immediate question is "Why this significant difference?" Part of the difference may be attributed to the goals and objectives of the schools and the way in which computer resources are used in achieving those objectives. Or, it may simply be that schools use whatever resources are

Table 9

1983/84 TOTAL COMPUTER BUDGETS PER STUDENT
N = 28

Dollars per Student	Number Schools
Less than $200	9
Between $200 and $400	6
Between $400 and $600	8
Between $600 and $800	1
Between $800 and $1000	2
Between $1000 and $1500	1
More than $1500	1

Table 10

FACTORS ATTRIBUTING TO THE COMPUTER BUDGET
N = 28

Attribute	Number Schools	Minimum	Maximum	Median
All schools	28	8	1754	288
Public institution	10	8	431	147
Private institution	18	101	1754	455
Computer facility	18	101	1248	319
No computer facility	10	8	1754	276
Undergrad program	16	8	717	247
No undergrad program	12	101	1754	473

available, and the difference does not reflect what the schools would like to have or actually need to achieve their objectives. Alternatively, whether or not a school has an undergraduate program may not be an appropriate criterion for comparison. An examination of the instructional and research allocations may provide additional insights.

Instructional and Research Computing Budgets

Seventeen schools reported both instructional and research computing budgets. The schools spent between $20 and $361 per student, with a median expenditure of $115 per student, and between $470 and $5,172 per faculty FTE, with a median of $1835. Analyzing the data along the lines of Table 10 yielded the same results: private schools spent more than public and the provide a clear explanation of the function or application for which these additional computer dollars were allocated.

VI. COMPUTER PLANNING AND GOVERNANCE

Just as our sample schools do not appear to have a firm grasp of how much they are spending, they also do not appear to have an understanding of what they should be doing. Only twelve of the thirty-four schools had specific goal statements. Two schools specifically indicated their goal was to assume a "leadership" position:

"To assume a leadership position in links between artifical intelligence, decision support systems, information systems, operations research and management..." (Carnegie-Mellon)

"To gain a leadership position with respect to microcomputer communications with mainframes and management-oriented applications..." (Northwestern)

Three schools specified the "integration" of computing into the curriculum as their goal while five schools stated their goal as providing computer support to the School. The remaining two dealt with the development of the school's computing resources. Four schools indicated that they were in the process of formulating an instructional goal statement.

On the other hand, the schools were very explicit about equipment acquisition plans for next year. Thirty-one schools had existing plans to include networking mainframes, minicomputers, and/or microcomputers; upgrading existing minicomputers; adding more microcomputers (most frequently mentioned were IBM, HP, and Apple); and adding new capabilities such as graphics or a laser printer.

In response to the question "What is the major bottleneck(s) (other than funding) to accomplishing your objectives?" eight schools indicated space constraints. Administrative barriers and technical problems were listed by four schools each and lack of qualified personnel was indicated twice. Five schools indicated the question was not applicable, i.e., "no bottlenecks." For the remaining eleven schools, funding was the major constraint.

In an attempt to understand how decisions were made, the representatives were asked if there was a computer policy or oversight committee. Twenty-six of the schools have a computer committee: twelve of these committees were responsible for establishing policy while four were advisory to the dean, four were advisory to the computer center director, and another four were responsible for implementation decisions. (Two committees could not be classified.) Almost every committee had both faculty and administrative members (usually an associate or assistant dean) and was chaired either by the computer center director or a faculty member.

VII. ISSUES AND FUTURE CONCERNS

Since this is the first of a series of surveys to monitor the changes in business school computing, it is too early to identify "trends." However, there is one trend which is clear and does not require a survey to substantiate: The demand for computer resources at schools is growing at an tremendous rate. Almost every school polled in this survey is planning to add microcomputers; and, at the same time, many of the schools are planning to upgrade their existing minicomputer or add a new minicomputer. This trend will have far-reaching consequences and raises numerous issues which schools will have to address. We conclude this First Annual UCLA Computing Survey of North American Business School with a discussion of some of these issues. Many of these issues will be addressed in future survey reports.

Nature of Computer Use

How are computers used in business schools? This survey indicated what software was available for use. However, data on the quantity or quality of use was not gathered. Future surveys should investigate the nature of computer use as well as the availability of software.

User Expectations

Will more faculty and students start to use computers than have in the past? If so, what is attracting these individuals and will their expectations be fulfilled? Expectations regarding what computers can and cannot do, and what it takes to implement systems, are not well understood. Will computer literacy classes be established to assist the new users to become more sophisticated in their expectations?

Workstations

Is there a "best" configuration for a workstation for use in a business school environment? The current survey asked about the presence of terminals and microcomputers. Future surveys might include questions about configurations and capabilities. An anticipated trend will be for the number of terminals to remain constant or decline while the number of microcomputers will increase as they become the workstations of the future.

Number of Workstations

How many microcomputers will a school need to achieve its computing objectives? Over time, the number of micros will clearly increase, but to what level? Given that more and more students will have their own systems, how many should a school acquire to support its instructional program? Is it the case that every faculty member who wants one will have a microcomputer in his office? Should the school provide microcomputers for faculty use at home?

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Student Acquisition of Microcomputers

Are we going to require students to acquire their own systems or is it the school's responsibility? If computing does in fact become integrated into the curriculum and achieves the levels of use some anticipate, it may be absolutely necessary for each student to be able to access the system several hours each day. Under these circumstances, then, it may become essential for each student to have access to his own system. Will schools select a small subset of vendors and ask students to select from that list? Will schools negotiate vendor discount agreements and then provide the necessary mechanisms for students to acquire the systems?

Local Area Networks

LANs are considered an essential component of a school's computing resource. Will some LAN configuration emerge as a "business school standard?" What kind of hardware and software will be used? What special services or equipment will be provided through the LAN? If students acquire their own systems, then what computing services should be offered by the school? Will the school focus on providing a few high quality printers and expensive special application devices, and the communications capability to allow users to access the devices with their own equipment?

Software Ownership

Will the development of computer materials be seen as analogous to the development of other instructional materials such as textbooks and audio-visual materials? Will copyright and royalty arrangements be the same? This issue is, in part, related to the fact that if an individual does the work on a school owned machine and on school time (which is ill-defined for most faculty), then who should receive the financial benefit of the enterprise?

Software Acquisition and Distribution

Who is responsible for acquiring instructional software? Who is responsible for obtaining new versions and maintaining compatibility across different machines? Recently a major publishing company, Prentice-Hall, announced it will be distributing "instructional" versions of some of the leading software (subsets of the full commerical packages) at textbook prices. Other publishers are sure to follow suit. Will these materials be adequate for instructional purposes? Will faculty be constrainted to use only the software available in such a form because of the financial pressures against acquiring "commercial" grade packages?

Technical Support Staff

There is a very substantial shortage of data processing professionals including programmers and data communications experts. As we introduce micros and try to network them, will schools be able to attract (and keep) individuals with the necessary technical skills? Will faculty members be expected and required to become programmers as they develop ideas for instructional software?

Space Requirements

Will new labs need to be created in classroom space (which is already scarce on so many campuses)? Will we need new classroom arrangements using monitors and special display equipment?

Security

What about security, both physical security of the equipment and the copyright problems related to software? What alternatives are available? There are many options and future surveys should gather information on how schools are protecting their investments.

Word Processing for Students

Numerous schools indicated word processing packages were available with their micros. Will the schools provide word processing capabilities to students? Typewriters were never provided (except on some campus in a "pay per hour" mode). Is it appropriate to provide such services now? How will the schools address this issue?

individuals with the necessary technical skills? Will faculty members be expected and required to become programmers as they develop ideas for instructional software?

Space Requirements

Will new labs need to be created in classroom space (which is already scarce on so many campuses)? Will we need new classroom arrangements using monitors and special display equipment?

Security

What about security, both physical security of the equipment and the copyright problems related to software? What alternatives are available? There are many options and future surveys should gather information on how schools are protecting their investments.

Financial Considerations

Where will the financial resoures come from to achieve the goals and objectives? As schools acquire microcomputers in large number for their faculty and staff, new cost considerations must be addressed. For example, who is responsible for service and maintenance contracts? Who buys computer supplies? If a school currently purchases paper and pencils for their faculty, should faculty expect them to purchase floppy discs and other computer supplies? If a school elects to provide ribbons for printers rather than typewriters, which type of ribbons? Should some subset of vendors be selected and then the school can choose to provide support for that subset? Which subset and who decides? Do the same rules apply to school-acquired equipment as for privately owned faculty equipment?

SUMMARY OF 1984 COMPUTING SURVEY

Table 11:

INSTITUTION	B-SCH SIZE (FTE)	U-COMPUTER RESOURCES FOR B-SCH	B-SCHOOL COMPUTER RESOURCES	PLANNING STRUCTURE	B-SCH HARDWARE PLANS	CURRLM DEVEL POLICY	UNDGRAD CMPTR REQRMNT	MBA CMPTR REQRMNT	83-84 B-SCH COMPUTER BUDGET	RATIOS
Boston U	1763 u/g 972 MBA 40 PhD 108 fac	IBM 3082 100 terms	PDP 11/44 3 WANG 34 terms 17 micros		network CPUs		CIS course; Basic pgmming	CIS course; Cobol pgmming	instr: resch: admin: total:	ins$/stu: res$/fac: tot$/stu: stu/micr: 555 fac/micr: 7.7
Carnegie-Mellon U	300 u/g 243 MBA 56 PhD 55 Fac	3 DEC 20s 2 VAX 11/780s PDP 11 35 terms	44 micros 14 FTE stf	goal stmt; strategy committ	mainframe; 80 micros; network	release time	CIS course; Pascal pgmming	CIS course; Basic pgmming	instr: resch: admin: total: 430K	ins$/stu: res$/fac: tot$/stu: 717 stu/micr: 35 fac/micr: 2.0
Case Western Reserve	150 u/g 725 MBA 100 PhD 56 Fac	4 DEC 2060s 6 VAXs 10 terms	32 micros 7 FTE stf	no goal stmt; advis comm C-cntr	more micros; file server	release time; summer support	2 CIS courses; Basic or Pascal	CIS course; Basic	instr: 352K resch: 66K admin: 22K total: 440K	ins$/stu: 361 res$/fac: 1180 tot$/stu: 451 stu/micr: 33 fac/micr: 9.3
Columbia	0 u/g 600 MBA 120 PhD 125 Fac	IBM 4341 DEC 20 17 terms	IBM 4341 VAX 11/780 9 terms 61 micros 9 FTE stf	no goal stmt; proj apprv committ	LAN	release time	n/a	CIS course	instr: resch: admin: total: 230K	ins$/stu: res$/fac: tot$/stu: 319 stu/micr: 15.3 fac/micr: 8.9
Cornell	0 u/g 500 MBA 40 PhD 35 Fac	DEC 2060 IBM 3081 35 terms	15 micros 5 FTE stf	no goal stmt; advis comm C-cntr	LAN; supermini; more micros		n/a	no	instr: resch: admin: total: 450K	ins$/stu: res$/fac: tot$/stu: 833 stu/micr: 78.6 fac/micr: 4.5
Dartmouth	0 u/g 285 MBA 0 PhD 45 Fac	2 HONEYWELL DPS 8/44s PRIME 750 2 VAXs 41 terms	57 micros 3 FTE stf	no goal stmt; advis comm C-cntr	all dorms hardwired	yes	n/a	CIS course; Basic	instr: resch: admin: total: 500K	ins$/stu: res$/fac: tot$/stu: 1754 stu/micr: 6.3 fac/micr: 3.7
Duke	0 u/g 450 MBA 12 PhD 42 Fac	none used	IBM 4341 IBM S/38 64 micros 6 FTE stf	goal stmt; advis comm C-cntr	network; graphics	yes	n/a	CIS course; some Basic	instr: resch: admin: total: 250K	ins$/stu: res$/fac: tot$/stu: 541 stu/micr: 11 fac/micr: 2.1

INSTITUTION	B-SCH SIZE (FTE)	U-COMPUTER RESOURCES FOR B-SCH	B-SCHOOL COMPUTER RESOURCES	PLANNING STRUCTURE	B-SCH HARDWARE PLANS	CURRLM DEVEL POLICY	UNDGRAD CMPTR REQRMNT	MBA CMPTR REQRMNT	83-84 B-SCH COMPUTER BUDGET	RATIOS
Georgia State	4750 u/g 2030 MBA 160 PhD 191 Fac	2 UNIVAC 90/80s UNIVAC 1100/62 74 terms	2 IBM S/36s 3 WANG 40 terms 96 micros	in process		release time	CIS course; Basic	CIS course	instr: 343K resch: 781K admin: 737K total: 1861K	ins$/stu: 49 res$/fac: 4090 tot$/stu: 270 stu/micr: 99 fac/micr: 13
Harvard	0 u/g 1550 MBA 53 DBA 180 Fac	IBM 6 terms	DEC 1091 132 terms 190 micros 25 FTE stf		extend network; IBM 4381; more micros	yes	n/a	no	instr: 550K resch: 550K admin: 900K total: 2000K	ins$/stu: 343 res$/fac: 3060 tot$/stu: 1248 stu/micr: 200 fac/micr: 9.0
Indiana	2800 u/g 775 MBA 142 PhD 160 Fac	CDC 170/855 IBM 4341 2 DEC 2060s PRIME 750 6 VAX 11/780s 113 terms	41 micros 5 FTE stf	no goal stmt; advis comm to Dean	LAN; mini with 80 terms; 35 micros	yes	CIS course; Fortran pgmming	CIS course; Fortran pgmming	instr: 75K resch: 75K admin: 0 total: 150K	ins$/stu: 20 res$/fac: 470 tot$/stu: 40 stu/micr: 1858 fac/micr: 4.1
MIT	70 u/g 415 MBA 88 PhD 95 Fac	IBM 3033 4 terms	PRIME 850 20 terms 45 micros 4 FTE stf	goal stmt; policy committ	network; IBM 4341; 100 micros	no	CIS course; Fortran	CIS course; PL/I	instr: resch: admin: total: 300K	ins$/stu: res$/fac: tot$/stu: 524 stu/micr: ---- fac/micr: 6.0
NYU	2100 u/g 2500 MBA 80 PhD 200 Fac	IBM 4341	DEC 2060 VAX 11/780 64 terms 38 micros 16 FTE stf	goal stmt; policy committ	40 PCs; 30 terms; network	under develop	CIS course; Basic pgmming	CIS course	instr: 600K resch: 600K admin: 150K total: 1350K	ins$/stu: 125 res$/fac: 3000 tot$/stu: 288 stu/micr: 195 fac/micr: 14
Northwestern	0 u/g 1400 MBA 80 PhD 105 Fac	CDC CYBER 170/730 VAX 11/780 18 terms	HP 3000 4 terms 75 micros 12 FTE stf	goal stmt; policy committ	ugrade HP; VAX; 100 micros digtal swtch	proposal basis	n/a	no	instr: 60K resch: 60K admin: 30K total: 150K	ins$/stu: 40 res$/fac: 570 tot$/stu: 101 stu/micr: 29 fac/micr: 4.2
Purdue	1800 u/g 250 MBA 100 PhD 85 Fac	CDC CYBER 205 CDC 6500 & 6600 8 terms	HP 3000 24 terms 13 micros 6 FTE stf	no goal stmt; guide comp implementa	upgrade HP; 50 micros	proposal basis	Fortran pgmming	CIS course; Basic pgmming	instr: 130K resch: 180K admin: 80K total: 390K	ins$/stu: 60 res$/fac: 2118 tot$/stu: 181 stu/micr: 537 fac/micr: 17

INSTITUTION	B-SCH SIZE (FTE)	U-COMPUTER RESOURCES FOR B-SCH	B-SCHOOL COMPUTER RESOURCES	PLANNING STRUCTURE	B-SCH HARDWARE PLANS	CURRLM DEVEL POLICY	UNDGRAD CMPTR REQRMNT	MBA CMPTR REQRMNT	83-84 B-SCH COMPUTER BUDGET	RATIOS
Stanford	0 u/g 650 MBA 80 PhD 90 Fac		2 DEC 2060s 139 terms 25 micros 8 FTE stf	goal stmt; policy committ	network micros; file server	release time; summer support	n/a	CIS course; Basic pgmming	instr: resch: admin: total: 360K	ins$/stu: res$/fac: tot$/stu: 493 stu/micr: 49 fac/micr: 15
UC Berkeley	550 u/g 675 MBA 75 PhD 86 Fac	IBM 4341	PDP 11/70 micros 3 FTE stf	no goal stmt; policy committ					instr: resch: admin: total:	ins$/stu: res$/fac: tot$/stu: stu/micr: fac/micr:
UCLA	0 u/g 925 MBA 130 PhD 93 Fac	IBM 3033 35 terms	HP 3000 20 terms 10 micros 6 FTE stf	goal stmt; advis comm to Dean	upgrade HP; 100 micros; network	under develop	n/a	no	instr: 210K resch: 210K admin: 15K total: 435K	ins$/stu: 199 res$/fac: 2258 tot$/stu: 412 stu/micr: 92.5 fac/micr: 9.0
U of Chicago	0 u/g 1500 MBA 75 PhD 100 Fac	IBM 3081 VAX 11/730 30 terms	2 DEC 2060s 40 terms 12 micros 13 FTE stf		upgrade VAX; 50 micros	yes	n/a	no	instr: 290K resch: 220K admin: 420K total: 1400K	ins$/stu: 270 res$/fac: 2200 tot$/stu: 889 stu/micr: 787 fac/micr: 8.3
U of Ill, Urbana- Champaign	3500 u/g 478 MBA 234 PhD 150 Fac	CDC CYBER IBM PLATO 108 terms	33 micros	stmt in process; advis comm to Dean	network; more micros	yes	CIS course; Fortran pgmming	CIS course; Fortran pgmming	instr: resch: admin: total:	ins$/stu: res$/fac: tot$/stu: stu/micr: 183 fac/micr: 15
U of Michigan	610 u/g 1140 MBA 90 PhD 100 Fac	AMDAHL 5860 IBM 3083 34 terms	24 micros 9 FTE stf	goal stmt; advis committ	3 minis; 400 micros; network; exec dorm hardwired	no	CIS course	CIS course	instr: 235K resch: 235K admin: 48K total: 518K	ins$/stu: 136 res$/fac: 2500 tot$/stu: 282 stu/micr: 167 fac/micr: 10
U of Minnesota	1500 u/g 700 MBA 120 PhD 105 Fac	2 CDC CYBERs CRAY 30 terms	28 micros		network 100 micros	no	CIS course; Fortran or Cobol	1 cred intro to cmpting	instr: resch: admin: total:	ins$/stu: res$/fac: tot$/stu: stu/micr: --- fac/micr: 3.8

INSTITUTION	B-SCH SIZE (FTE)	U-COMPUTER RESOURCES FOR B-SCH	B-SCHOOL COMPUTER RESOURCES	PLANNING STRUCTURE	B-SCH HARDWARE PLANS	CURRLM DEVEL POLICY	UNDGRAD CMPTR REQRMNT	MBA CMPTR REQRMNT	83-84 B-SCH COMPUTER BUDGET	RATIOS
U of Penn (Wharton)	2300 u/g 1500 MBA 250 PhD 200 Fac	IBM 3081	DEC 1090 VAX 11/750 200 terms 70 micros 9 FTE	stmt in process; policy committ	network; 600 micros	under develop	no	Basic pgmming	instr: resch: admin: total: 550K	ins$/stu: res$/fac: tot$/stu: 136 stu/micr: 103 fac/micr: 6.7
U of Pittsburg	0 u/g 550 MBA 90 PhD 56 Fac	2 DEC 10s terms	14 micros	goal stmt; policy committ	ugrade micros	no	n/a	CIS course; pgmming	instr: 68K resch: 68K admin: 37K total: 173K	ins$/stu: 106 res$/fac: 1210 tot$/stu: 270 stu/micr: 26 fac/micr: 7.0
U of Rochester	0 u/g 540 MBA 50 PhD 38 Fac	IBM 3081 IBM 4341 DEC 20 VAX 11/780	HP 3000/64 100 terms 5 micros 9 FTE stf portselector		upgrade HP; micros	no	n/a	CIS course; Basic pgmming	instr: 100K resch: 100K admin: 70K total: 270K	ins$/stu: 169 res$/fac: 2632 tot$/stu: 458 stu/micr: ---- fac/micr: 7.6
U of So. Calif	1900 u/g 975 MBA 120 PhD 144 Fac	IBM 370/168 DEC 20 VAX 11/750	HP 3000/44 28 terms 98 micros 15 FTE stf	no goal stmt; policy committ	more micros	no	Basic pgmming	no	instr: 220K resch: 370K admin: 148K total: 740K	ins$/stu: 72 res$/fac: 2570 tot$/stu: 247 stu/micr: 51 fac/micr: 7.2
U of Texas, Austin	7600 u/g 925 MBA 160 PhD Fac	DEC 20 IBM 3081 CDC 170/750 3 VAX 11/780s 150 terms	2 VAX11/780s 15 terms 65 micros 10 FTE stf	goal stmt; recomm hw/sw	more micros	no	Basic pgmming	no	instr: resch: admin: total:	ins$/stu: res$/fac: tot$/stu: stu/micr: 166 fac/micr:
U of Washington	1371 u/g 475 MBA 90 PhD 122 Fac	CDC CYBER 9 terms	VAX 11/780 HP 3000/42 88 terms 27 micros 7 FTE stf	goal stmt; advis comm C-cntr	upgrade VAX; 100 micros	release time; summer support	Basic pgmming	Basic pgmming	instr: 143K resch: 142K admin: 0K total: 285K	ins$/stu: 74 res$/fac: 1164 tot$/stu: 147 stu/micr: 968 fac/micr: 8.1
Vanderbilt	0 u/g 320 MBA 3 PhD 30 Fac	2 DEC 10s VAX 50 terms	4 micros		more micros	no	n/a	CIS course; Basic pgmming	instr: resch: admin: total: 37K	ins$/stu: res$/fac: tot$/stu: 115 stu/micr: fac/micr: 7.5

INSTITUTION	B-SCH SIZE (FTE)	U-COMPUTER RESOURCES FOR B-SCH	B-SCHOOL COMPUTER RESOURCES	PLANNING STRUCTURE	B-SCH HARDWARE PLANS	CURRLM DEVEL POLICY	UNDGRAD CMPTR REQRMNT	MBA CMPTR REQRMNT	83-84 B-SCH COMPUTER BUDGET (US $)	RATIOS
Laval	600 u/g 350 MBA 25 PhD 100 Fac	PDP 11/70 2 IBM 4341s 53 terms	28 micros 2 FTE stf	no goal stmt; allocat mi committee	LAN; micros	no	CIS course; Basic or Pascal	CIS course; Basic or Pascal	instr: 212K resch: 117K admin: 71K total: 400K	ins$/stu: 217 res$/fac: 1170 tot$/stu: 410 stu/micr: 49 fac/micr: 12
McGill	1560 u/g 540 MBA 25 PhD 85 Fac	AMDAHL 580/50 IBM 4341/2 59 terms	42 micros 2 FTE stf	no goal stmt; policy committ	more micros	proposal basis	CIS course; Pascal pgmming	CIS course; Basic pgmming	instr: resch: AA: total: 18K	ins$/stu: res$/fac: tot$/stu: 8 stu/micr: 212 fac/micr: 6.5
McMaster	1250 u/g 375 MBA 10 PhD 52 Fac	CDC 170/730 CDC 170/815 IBM 3031 17 terms	VAX 11/780 PIXEL 100/AP 54 terms 10 micros	no goal stmt; advis comm to Dean	PC network	proposal basis	CIS course; Basic pgmming	Basic pgmming	instr: resch: admin: total:	ins$/stu: res$/fac: tot$/stu: stu/micr: --- fac/micr: 6.5
U of British Columbia	1700 u/g 400 MBA 45 PhD 117 Fac	AMDAHL 470/V8 AMDAHL 470/V7A 74 terms		stmt in process; policy committ		no	CIS course; choice of lang	CIS course; Cobol + APL	instr: 100K resch: 92K admin: 28K total: 220K	ins$/stu: 47 res$/fac: 786 tot$/stu: 103 stu/micr: fac/micr:
U of Toronto	1900 u/g 400 MBA 35 PhD 60 Fac	IBM 3033 DEC 10 22 terms		no goal stmt; advis comm Fac council	more micros	no	PL/1 pgmming	CIS course	instr: resch: admin: total:	ins$/stu: res$/fac: tot$/stu: stu/micr: fac/micr:
U of Western Ontario	300 u/g 500 MBA 30 PhD 65 Fac	DEC 11/70 CYBER 850 55 terms	PRIME 750 50 micros 3 FTE stf	goal stmt; policy committ	20 micros	proposal basis	no	no	instr: resch: admin: total: 120K	ins$/stu: res$/fac: tot$/stu: 145 stu/micr: 22 fac/micr: 2.6